

NUTRITION SOCIETY OF INDIA

(Regd.No.125 of 1966)

43rd National Conference

Theme :

*Economic Transition in Nutrition – Life Style Diseases & Health and Nutrition
Wellness*

November 11-12, 2011



Programme, Proceedings And Abstracts

Venue :

NATIONAL INSTITUTE OF NUTRITION

Indian Council of Medical Research
Jamai-Osmania PO, Hyderabad – 500 007, Andhra Pradesh

Acknowledgements

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Government

- Indian Council of Medical Research, Department of Health Research, Government of India, New Delhi
- Department of Biotechnology, Government of India, New Delhi
- Department of Science & Technology, Government of India, New Delhi
- Indian Council of Agricultural Research, New Delhi
- Defence Research and Development Organization, Government of India, New Delhi
- Indian National Science Academy, New Delhi

International Agencies

- World Health Organization, SEARO, New Delhi

Non-Government

- GlaxoSmithkline Consumer Health Care Ltd., Gurgaon, Haryana
- Heinz Nutrition Foundation of India, Mumbai
- Nestle India Ltd., Gurgaon, Haryana
- Kellogg's India Ltd., Mumbai
- Hindustan Unilever Ltd., Mumbai
- Saffola Marigold, Mumbai
- Mead Johnson Nutrition India Pvt. Ltd., Mumbai
- The Micronutrient Initiative, New Delhi
- DSM Nutritional Products India Pvt. Ltd., Mumbai
- PEPSICO
- *State Bank of Hyderabad, Hyderabad*
- Durga Jewelleries, Hyderabad
- Vasmo Foods, Chennai, Tamil Nadu

Welcome

It is indeed a great pleasure to invite one and all to the 43rd National Conference of the Nutrition Society of India. We cordially welcome all the delegates to this august gathering of nutrition stalwarts. The focal theme of this year's conference is "Economic Transition in Nutrition – Life Style Diseases & Health and Nutrition Wellness". We have chosen this theme to reflect the rapidly changing economies of the Nation which is having and will have a huge impact on nutrition and wellness of the population. This is a major emerging concern and challenge for all the stake holders in India and world over.

This year is also the Centenary Year of the Indian Council of Medical Research and International year of Chemistry. The members of the NSI are extremely proud to acknowledge the ICMR for the support it has rendered to the society over the years and the contributions of Chemistry and the knowledge- base it has offered to in understanding the nutritional sciences. The Conference is dedicating two symposia viz., "Bone Health and Nutrition" and "Chemical Basis of Nutrient Function" to these celebrations.

Nutrition is an important determinant of bone health and knowledge gaps exist in the area of calcium and vitamin D requirements for acquisition of optimal peak bone mass and maintenance of bone density in the population. ICMR has carried out a multi-centric population based study assessing the bone health in the low, middle and high income group adults and demonstrated a marked socio-economic gradient in the BMD values and the prevalence of osteoporosis. It would be pertinent to review this contribution as ICMR celebrates its centenary. To celebrate the 100 years of biomedical research of ICMR (1811-2011), NSI is hosting a symposium on "Bone Health and Nutrition". The Symposium deals with aspects relating to "Vitamin D and Bone Health", "Bone Health and Nutrition" and "Evaluation of threshold value of 25 (OH) D₃ (Vitamin D) in Indians".

Amongst all the branches of sciences, it is biology that enjoyed the maximum advantages of the contributions of chemistry. Hence, to celebrate the International year of Chemistry 2011, Nutrition Society of India is hosting a symposium "Chemical basis of nutrient function". The Symposium will cover topics on Poly Unsaturated Fatty Acids in Health and Disease, Iron homeostasis and metabolic disorders and Mutations, Retinal Dystrophies and Phytonutrients by eminent scientists which encompasses the chemical basis of nutrients in order to encourage and attract the young nutrition scientists to take up challenges of the chemistry of nutrition.

This year, Prof. Barry M Popkin, the W. R. Kenan Jr. Distinguished Professor of Nutrition, at the University of North Carolina (UNC) at Chapel Hill, USA, will deliver the 35th Gopalan Oration on "The Global Dynamics of Diet, Activity and Body Composition: Rapid Shifts in the stages of the Nutrition Transition". The 23rd Srikantia Memorial Lecture will be delivered by Dr. B. Sesikeran, Director, National Institute of Nutrition, Hyderabad, on "Technology for Better Nutrition". The Second Rajammal P Devadas Memorial Lecture will be delivered by Dr. Rita S. Raghuvanshi, Dean, College of Home Science, G.B.Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, on "Reorganizing Nutrition for a Better Tomorrow".

As is the tradition, the Senior/Junior Awards continue to provide a forum for the young nutritionists to prove their mettle. The posters and free communication sessions furnish ample scope for intense scientific deliberations and exchange of ideas. This year, two Pre-Conference Workshops viz., (1) Concepts, Principles and Application of Nutrigenomics" and (2) Methodology of nutrition assessment

and body composition are also being held on 10th November 2011 for the benefit of the faculty as well as students respectively.

We expect that the conference will provide great opportunity for the delegates for exchange of scientific ideas and information in order to generate new initiatives in nutrition research under the guidance of senior nutrition scientists. We also hope that this Conference would take a lead role in creating a platform for active participation of the delegates.

We look forward to fruitful deliberations during the conference.

Best wishes

Dr. V. Prakash
President, NSI

Dr. K. Madhavan Nair
Organising Secretary

Dr.B. Sesikeran
Director, NIN & Ex-Officio, NSI

NUTRITION SOCIETY OF INDIA

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Vice-Chairperson	:	Dr. B. Sesikeran
Organising Secretary	:	Dr. K. Madhavan Nair
Members	:	Dr. G.N.V. Brahmam Dr. M. Raghunath Dr. R. Hemalatha Dr. G. Bhanuprakash Reddy

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**MESSAGE TO THE MEMBERS OF THE
NUTRITION SOCIETY OF INDIA
ON THE OCCASION OF THE FORTY-THIRD NATIONAL CONFERENCE**

Dr.C.Gopalan

Founder President

Friends,

I have very great pleasure in sending you my greetings and best wishes on this occasion of the Forty-third National Conference of the Nutrition Society of India.

This year is also the Centenary Year of the Indian Council of Medical Research. For me personally, this is a momentous occasion. Out of the one hundred years of ICMR's existence, I have been part of the organisation for forty years, and have continued to keep in close touch even after I retired from service. Therefore on this occasion I have the additional pleasure of sending my best wishes to ICMR as it prepares to face new challenges in a new and rapidly changing India.

The organizers of this conference have chosen a very contemporary theme, one that reflects emerging concerns in India. With its commendable rate of economic growth over the past decade or so, India has undergone an economic transition in the perception of the world. It is continually being bracketed with China as the emerging economic force of the future. India's economic transition has impacted Indians at various levels to various extents. The rich have got richer and, from all available data, the poor have become less poor. Above all, a burgeoning middle class is setting the agenda for the country in many ways. How has this economic transition impacted nutrition transition?

There have been striking changes in lifestyles, dietary habits, and value systems of Indians. The population continues to rise, as does rural-to-urban migration and, more noticeably of late, poverty-to-middle class transition. Simultaneously, technology and its manifestations have been making inroads into all corners of the country and into the homes of all classes of Indians. Thus, a large and growing number of Indian homes have a television set, and the cellphone has become a ubiquitous accessory for people of all strata of society. Communication is at levels never seen before, and the mass media evoke the aspirations of upwardly mobile young India.

More importantly, technology has brought in labour-saving devices at affordable cost, and this has led to a steep reduction in expenditure of energy in carrying out daily tasks. An increasingly sedentary population is beginning to see the emergence of the so-called "lifestyle diseases" - obesity, hypertension, diabetes mellitus and cardiovascular diseases. These lifestyle diseases are in the spotlight in this conference.

But while turning the spotlight on these emerging problems, we as nutrition scientists cannot afford to ignore the problems that still linger on the stage and lurk in the wings. We have banished extreme malnutrition with its florid manifestations such as beri-beri, kwashiorkor, pellagra, and keratomalacia. We have averted acute food shortages and the threat of famines because of the Green Revolution and better inputs and management. However, maternal and infant mortality rates remain high and well above the Millennium Development Goals, and anaemia in all sections of the population is at unacceptably high levels. Nearly one-third of our infants are of low birth weight and at risk of stunting. These problems adversely affect our human resources and the productivity of our people.

Unfortunately, despite the many national programmes aimed at tackling these problems, we have not yet solved them. In most Indian homes today, poverty is no longer the main cause of undernutrition but the lack of balanced diet is. Mere handouts of food grains are unlikely to solve the problem. What is needed is better access to a variety of affordable micronutrient-rich greens and vegetables, nutrition education, better sanitation and easy access to medical care. The new “lifestyle diseases” constitute a dual burden - the existing problems of undernutrition are persisting while the problems of overnutrition are leading to a sharp rise in the incidence of non-communicable lifestyle diseases. These latter diseases can be even more difficult to tackle, and may drain even more of our public health expenditure than the acute “kill-or-cure” diseases of childhood in the last century.

Lifestyle diseases are not confined to the rich or even the middle-class, contrary to what the name may suggest. People of all classes are showing signs of these problems to varying degrees. More worryingly, it is likely that the seeds of these adult lifestyle diseases are sown in childhood. Obviously, the problems of overnutrition and obesity can be tackled only by educational outreach. Given the different kinds of population that have to be addressed and persuaded in the matter of diet and exercise, a whole spectrum of educational messages and delivery vehicles may need to be harnessed.

The challenges that nutrition scientists face today may seem forbidding. With economic transition and nutrition transition, we must have management transition - an approach that is more holistic and integrates and synergises the strengths of all stakeholders. I am particularly glad that the concept of “wellness” is part of the theme of this conference. It is no longer sufficient to wait for a problem to emerge and then try to tackle it. Prevention is better than cure; and wellness is much, much more than mere absence of illness. It is this transition in the attitude of nutrition scientists that is most necessary as India goes forward into the twentyfirst century.

PRESIDENTIAL ADDRESS

Food, Nutrition, Life Style and Health – Role of NSI in Networking with a “Team India” Approach

V. Prakash

President, Nutrition Society of India, India
Council Member of International Union of Nutritional Sciences, Vienna, Austria
& *Distinguished Scientist of CSIR at JSS-MVP, Mysore, India*
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A nutritious and safe food is the birth right of all individuals. With the advent of food technology, with more and more processed foods on the market shelf, the concept and dimensions of food safety are also changing. Changes in lifestyles, occupational pattern, and urbanization have also contributed to changes in culinary practices and dietary habits, and have increased the need for safe and convenience foods. On one hand, the regulatory limits of chemicals / contaminants or additives for foods, which describe the food as safe or unsafe, are dictated by the limits of instrumental analysis and detection rather than actual scientific evidence in some cases; on the other, the consumer is more informed and aware of nutritional and health claims and demands a healthy, safe, organically grown and environmentally friendly foods. The consumer is also being increasingly influenced by the media. Hence, technology related issues, whether it is the nutritional quality, health promoting ability or assurance of safety of food have posed new challenges for scientists, nutritionists and policy makers.

The need to shift science towards constant innovation in the direction of health from food science and technology and food processing is a very challenging affair especially when it complexes itself with nutrition. This is more difficult and moves into further complication with the environment of social changes emphasizing quality and safety of food. Today's knowledge of nutrition is fundamentally based on basic nutrition, knowledge of proteins, carbohydrates, fats, vitamins and minerals and the concept of balanced diet, which has emerged into newer thinking of spreading the wings of Nutrition to engulf Nutraceuticals along with integrating itself into safety of food and the quality of food. This includes retention of Nutrition and Quality of food upon processing. India is able to launch a very massive nutrition programme for children below 5 years of age and the Mid-day meals for the school-going children as well as many other programmes under various banners, but we have not been very successful in addressing *maternal nutrition*. The management aspect of this is very crucial and on a mega scale for India as we look aspiringly for a Healthy India tomorrow.

At the core of these issues, apart from addressing the existing challenges of under and over nutrition in population which globally has reached 7 billion last week, lies the quality and quantity of a nutrient, its properties in biological systems, arriving at the safety levels, requirements and recommendations. These are all a part of the process aiming at wellness of human beings in general. For a student of food technology, nutrition and allied sciences, managing the facilities, resources and programs related to the above are also part of a grand challenge for better delivery of services and products to the unreachable for better nutrition.

Therefore, the demands from the children and mothers for better nutrition is a very legitimate one and perhaps need to be addressed from networking of NSI with various organizations of R and D and Industries together to have a unique “Team India” approach. Are we ready for it ? Shall NSI take a lead in this and also be a prime mover as an advisor to the Government on various policy issues apart from focusing on fundamental aspects of nutritional studies to make India proud ? I am convinced that the young nutritionists of today with so much opportunities on hand will have “*to achieve much more from more*” as compared to, perhaps a couple of decades ago, wherein the struggle was “*to achieve more from less*”!

Let us all join hands and work towards this Goal with the spirit of “Team India” with a clear mandate of health & wellness from conception to geriatrics which must include maternal nutrition as top priority.

**PRE-CONFERENCE WORKSHOPS
ON
CONCEPTS, PRINCIPLES AND APPLICATION OF NUTRIGENOMICS
AND
METHODOLOGY OF NUTRITION ASSESSMENT AND BODY COMPOSITION**

Thursday, 10 November 2011

PROGRAMME

08.00 am – 09.00 am	Registration	
09.00 am – 10.15 am	Inauguration	
	Welcome	: Dr. B. Sesikeran, Director, NIN
	About the Workshops	: Dr.K.Madhavan Nair Joint Secretary, NSI
	Inaugural address	Dr.Kamala Krishnaswamy Former Director, NIN & Immediate Former President, NIN
	Key-Note Address:	
	Utilization of Informatics to Enhance Nutritional Awareness	: Dr. Ashish Joshi Assistant Professor Center for Global Health and Development Department of Health Services Research & Administration College of Public Health, Nebraska Medical Center, NE
	Vote of thanks	Dr. M. Raghunath, Treasurer, NSI
10.15 am – 10.45 am	<i>High Tea</i>	

WORKSHOP 1
CONCEPTS, PRINCIPLES AND APPLICATION OF NUTRIGENOMICS

Venue: Assembly Hall

Theory Session

Time	Programme	Faculty
10.45 am – 11.15 am	Concepts and Principles of Nutrigenomics : An Overview	GBPR
11.15 am - 12.05 pm	Genomics: The Technology and its Application in Nutrition Research.	SG
12.05 pm – 12.35 pm	Proteomics in Nutrition Research : Practical Aspects	PR
12.35 pm – 01.30 pm	Epigenetics : the Concepts and Relevance to Non-communicable Diseases	KRR

01.30 pm – 02.30 pm *Lunch*

Practical Session

(In three batches of 10 members each)

Time	Programme	Faculty
02.30 pm – 03.15 pm	Visit to Genomics Lab (Microarray/Real-Time Facility)	SG
03.15 pm – 04.00 pm	Visit to Proteomics Lab (MALDI-TOF-TOF Lab)	PR
04.00 pm – 04.45 pm	Visit to Epigenetics (Sequenome) Lab	KRR

WORKSHOP 2

METHODOLOGY OF NUTRITION ASSESSMENT AND BODY COMPOSITION

(Organised in two groups simultaneously)

Time	GROUP I Methodology of Nutrition Assessment Venue: Conference Hall		GROUP II Techniques of Body Composition Measurements Venue: Main Venue	
	Programme	Faculty	Programme	Faculty
11.00 a.m. to 11.45 a.m.	Lecture on Methods for Assessment of Nutritional Status	AL	Lecture-cum-Demonstration on Techniques of Body Composition Measurements	YVR
11.45 a.m. to 12.30 p.m.	Lecture on Anthropometric Techniques	KMR		
12.30 p.m. to 01.15 p.m.	Demonstration of Anthropometric Techniques (<i>in small groups</i>)	AL/KMR/GR/SK/MRN/ SRK		

01.30 pm – 02.30 pm *Lunch*

Groups will be interchanged for Post-Lunch Session

Time	GROUP II Venue: Conference Hall		GROUP I Venue: Main Venue	
	Programme	Faculty	Programme	Faculty
02.30 p.m. to 03.15 p.m.	Lecture on Methods for Assessment of Nutritional status	AL	Lecture-cum-Demonstration on Techniques of Body Composition Measurements	YVR
03.15 p.m. to 04.00 p.m.	Lecture on Anthropometric Techniques	KMR		
04.00 p.m. to 04.45 p.m.	Demonstration of Anthropometric Techniques (<i>in small groups</i>)	AL/KMR/GR/SK/MRN/ SRK		

04.45 pm – 05.00 pm *Tea*

05.00 pm – 05.30 pm **Concluding Session, Feed back, Clarifications from Faculty, Distribution of Certificates**

FACULTY

Workshop 1		Workshop 2	
GBPR	Dr. G. Bhanuprakash Reddy	AL	Dr. A. Laxmaiah
KRR	Dr. K. Rajendar Rao	GR	Mr. Ch. Gal Reddy
PR	Dr. P. Raghu	KMR	Dr. K. Mallikarjuna Rao
SG	Dr. Sudip Ghosh	MRN	Mr. M. Ravindranath
		SK	Mr. Sharad Kumar
		SRK	Mr. K. Sreeramakrishna
		YVR	Dr. Y. Venkata Ramana

43rd ANNUAL NATIONAL CONFERENCE
Theme: Economic Transition in Nutrition – Life Style Diseases & Health and Nutrition Wellness

PROGRAMME

Friday, 11th November 2011

08.00 am – 09.00 am **REGISTRATION**

09.00 am – 09.45 am **INAUGURATION**

Welcome	Dr. B. Sesikeran, Director, NIN
Message from Dr. C. Gopalan, Founder President	: Dr. B. Sesikeran
About the Conference	: Dr. K. Madhavan Nair, Joint Secretary, NSI
Remarks by Past President	: Dr. Kamala Krishnaswamy
Release of the Souvenir of the Conference and Presidential Address	: Dr. V. Prakash, President, NSI
Vote of Thanks	: Dr. M. Raghunath, Treasurer, NSI

09.45 am – 10.15 am Inauguration of exhibition by Dr. V. Prakash, President, NSI
High Tea

10.15 am – 11.45 am **ICMR CENTENARY SYMPOSIUM ON “BONE HEALTH AND NUTRITION”**

<i>Chairpersons</i>	: Dr.B.Sivakumar and Dr. Anura V. Kurpad
<i>Session Coordinator</i>	: Dr. K.V.Radhakrishna
<i>Student Rapporteur</i>	:
Vitamin D and Bone Health	Dr. S.V.Madhu Professor & Head, Department of Medicine and Head, Division of Endocrinology and Metabolism, University College of Medical Sciences, Delhi
Bone Health and Nutrition	Dr.Bharati Kulkarni Scientist ‘E’ National Institute of Nutrition (ICMR) Hyderabad
Evaluation of threshold value of 25 (OH) D ₃ (Vitamin D) in Indians	Dr.Ajit Mukharjee Scientist ‘F’, Division of RHN Indian Council of Medical Research New Delhi

11.45 am – 12.45 pm **POSTER SESSION – I (COMMUNITY NUTRITION & CLINICAL NUTRITION)**

Session Coordinators : Dr. Y.Venkata Ramana
Dr. V. Sudarshan Rao
Dr. SSYH Quadri

Meeting of the 44th Executive Committee will be held concurrently between 11.45 am to 12.45 pm.

12.45 pm – 01.30 pm *Lunch*

01.30 pm – 04.10 pm **YOUNG SCIENTISTS' AWARDS – SESSION I
(SENIOR & JUNIOR AWARDS IN EXPERIMENTAL NUTRITION)**

Chairpersons : Dr. M. Mohan Ram & Dr. Jamuna Prakash
Session Coordinator : Dr. P.Raghu
Student Rapporteur :

04.10 pm– 4.30 pm *Tea*

04.30 pm – 06.10 pm **FREE COMMUNICATIONS – SESSION – I
(COMMUNITY NUTRITION & CLINICAL NUTRITION)**

Chairpersons : Dr. T. C. Raghuram & Dr. L. Vijayalekshmi
Session Coordinator : Dr.M.Radhika
Student Rapporteur :

06.10 pm– 07.10 pm **ANNUAL GENERAL BODY MEETING**

Welcome by President
Presentation of Minutes of the last General Body Meeting
Secretary's Report
Action taken report on the Minutes of the last AGB meeting
Treasurer's Report
Announcements
Election of new Executive Committee
Other matters with the permission of the Chair
Vote of Thanks

07.15pm – 08.15 pm **THIRTY FIFTH GOPALAN ORATION**

Chairperson : Dr.V.Prakash
Welcome and about the Award : Dr. K Madhavan Nair, Jt. Secretary, NSI &
Session Coordinator
Introducing the Orator : Dr. B. Sesikeran, Ex-Officio, NSI
Gopalan Oration : **Prof. Barry M Popkin**
on W. R. Kenan Jr. Distinguished Professor of Nutrition
University of North Carolina (UNC), Chapel Hill
USA
"The Global Dynamics of Diet, Activity
and Body Composition: Rapid Shifts
in the Stages of the Nutrition
Transition"

08.15 pm *Dinner*

Saturday, 12th November 2011

- 08.30 am – 10.00 am **FREE COMMUNICATIONS – SESSION – II (EXPERIMENTAL NUTRITION)**
Chairpersons : Dr. D. Peramma & Prof. Rajoo Singh Chhina
Session Coordinator : Dr. N. Sarvanan
Student Rapporteur :
- 10.00 am – 11.00 am **TWENTYTHIRD SRIKANTIA MEMORIAL LECTURE:**
“Technology for better Nutrition”
Chairperson : Dr. V. Prakash, President, NSI
Welcome and About the Award : Dr. S. V. Rana, Vice-President, NSI
Introducing the Speaker : Dr. V. Ramesh Bhat
Srikantia Memorial Lecture : **Dr. B. Sesikera**
on Director, National Institute of Nutrition
“Technology for Better Nutrition” (ICMR), Hyderabad
- 11.00 am – 11.45 am **SECOND RAJAMMAL P.DEVADAS MEMORIAL LECTURE**
“Reorganizing Nutrition for a Better Tomorrow”
Chairperson : Dr.V.Prakash, President, NSI
Welcome and About the Award : Dr R. Hemalatha, EC Member, NSI
Introducing the Speaker : Dr. Sheela Ramachandran, Vice Chancellor,
Avinashilingam University, Coimbatore
Rajammal P Devadas Memorial Lecture : **Dr.Rita S. Raghuvanshi**
“Reorganizing Nutrition for a Better Tomorrow” Dean, College of Home Science
G.B.Pant University of Agriculture and
Technology, Pantnagar, Uttarakhand
- 11.45 am – 12.45 pm **Tea & POSTER SESSION – II (EXPERIMENTAL NUTRITION, FOOD SCIENCE & NUTRITION EDUCATION)**
Session Coordinators : Dr. Y.Venkata Ramana
Dr. V. Sudarshan Rao
Dr. SSYH Quadri
- 12.45 pm – 01.30 pm *Lunch*
- 01.30 pm – 03.20 pm **YOUNG SCIENTISTS’ AWARDS – SESSION-II : JUNIOR AWARD IN COMMUNITY NUTRITION**
Chairpersons : Dr. G. Subbulakshmi & Dr.K.Vijayaraghavan
Session Coordinator : Dr. L.Vasanthi
Student Rapporteur :
- 03.20 pm – 04.50 pm **SYMPOSIUM ON “CHEMICAL BASIS OF NUTRIENT FUNCTION”**
Chairpersons : Dr.Mahtab S. Bamji & Dr. K. K. Sharma
Session Coordinator : Dr.Sudip Ghosh
Student Rapporteur :
Poly Unsaturated Fatty Acids in Health and Disease Prof. P.Reddanna
Officer-on-Special Duty
National Institute of Animal Biotechnology
University of Hyderabad Campus, Hyderabad
Iron Homeostasis and Metabolic Disorders Dr. Chinmay K. Mukhopadhyay
Professor
Special Centre for Molecular Medicine
Jawaharlal Nehru University, New Delhi

Mutations, Retinal Dystrophies and
Phytonutrients

Dr. G. Bhanuprakash Reddy
Scientist 'E' & Head, Eye Research
National Institute of Nutrition (ICMR)
Hyderabad

04.50 pm – 05.10 pm *Tea*

05.10 pm– 05.45 pm **CONCLUDING SESSION**

Chairperson

Review of poster presentations

Announcement of Awards

Presentation of Awards

Remarks by Chairperson

Vote of Thanks

: Dr. V. Prakash, President, NSI

: Dr. K. Madhavan Nair

THIRTY FIFTH GOPALAN ORATION – 2011

THE AWARD

The Gopalan Oration Award was instituted in the year 1974 by the Nutrition Society of India in honour of its Founder-President, Dr. C. Gopalan, who has been the guiding force behind the Society since its inception. In his capacity as the Founder-President and as a permanent Executive Committee Member, Dr. Gopalan has nurtured the Society and has built it up to its present stature. The Society, as it is today, bears testimony to his genius as an architect and father of nutrition sciences in India.

Dr. Gopalan, presently President, Nutrition Foundation of India, is a scientist of international eminence and has spearheaded the cause of nutrition science for over four decades. His contribution towards the betterment of nutrition of population has benefited not only India but other developing countries as well. It has helped to strengthen and inspire movements for the eradication of under-nutrition among the underprivileged in many Third World countries.

Dr. Gopalan had a brilliant academic career at the Madras Medical College and obtained a Doctoral degree in Medicine. During his illustrious career, Dr. Gopalan has held several prestigious positions with distinction that has brought fame not only to him but to his country as well. He was the first Asian to be elected the President of the International Union of Nutrition Sciences and the first Chairman of the Regional Advisory Committee on Medical Research for South-East Asia of WHO. He was on several World Health Organisation Expert Panels for many years and was the Chairman of the Technical Session of the World Health Assembly. He was elected Fellow of the Royal Society of London. He was also the first Nuffield Foundation Fellow from India in Medical Research Council of United Kingdom and a Rockefeller Foundation Fellow.

The National Institute of Nutrition (NIN), Hyderabad, India, was nurtured by Dr. Gopalan with rare dedication as its Director from 1960 to 1974. Dr. Gopalan was also responsible for forging a fraternity of Asian nutrition scientists and initiating the first Asian Congress of Nutrition and promoting the subsequent ones, which led to the formation of the Federation of Asian Nutrition Societies. He is an able administrator and a visionary. During his tenure, as the Director of NIN and later as the Director-General of ICMR, the country as a whole focussed its attention on nutritional and medical problems of public health importance. Under his leadership a wealth of information was generated to tackle problems such as Protein Energy Malnutrition, Vitamin A deficiency, Phrynoderma, Lathyrism, Fluorosis and Pellagra. The foundation of the National Nutrition Monitoring Bureau was laid by him. Dr. Gopalan has also created the Nutrition Foundation of India, which has a wide interdisciplinary research network in the country and has brought out valuable reports which are of great value to nutrition scientists, administrators and policy makers. Some of the renowned national and international honours bestowed on him for his outstanding contributions include Dr. B.C. Roy National Award (1974), Dhanvanthri Award (1978), WHO Health for All Medal (1988), Sir C.V. Raman Gold Medal of the Indian National Science Academy (1988), International Union of Nutrition Sciences Award (1989), R.D. Birla Award (1990) and Fellow of the International Union of Nutrition Sciences (1993).

The Gopalan Oration Award is given every year to an expert who has made significant contributions in the field of nutrition and allied sciences.

The Nutrition Society of India is proud to announce that the Thirty Fifth Gopalan Oration on “The Global Dynamics of Diet, Activity and Body Composition: Rapid Shifts in the stages of the Nutrition Transition” will be delivered by Prof. Barry M Popkin, W. R. Kenan Jr. Distinguished Professor of Nutrition, at the University of North Carolina (UNC) at Chapel Hill, USA.

THE RECIPIENT

Dr. Barry M. Popkin, Ph.D., is the W. R. Kenan Jr. Distinguished Professor of Nutrition, at the University of North Carolina (UNC) at Chapel Hill. Apart from this, he holds the position of Director at the Chapel Hill's Interdisciplinary Center for Obesity - University of North Carolina and is the Director of The Nutrition Transition Research Programme. He is an Adjunct Professor in the Department of Economics, and a member of the Lineberger Comprehensive Cancer Centre. He obtained his M.S. Degree in Economics from University of Wisconsin (1968-69) and Ph.D. in Agricultural Economics from Cornell University in 1973-74. His research interests are Cancer, Cardiovascular Disease, Global Health, Health Economics, Nutrition and Obesity.

Prof. Popkin has established the Division of Nutrition Epidemiology at UNC. He has developed the concept of the Nutrition Transition, the study of the dynamic shifts in dietary intake and physical activity patterns and trends and obesity and other nutrition-related non-communicable diseases. His research program focuses globally on understanding the shifts in stages of the transition and programs and policies to improve the population- health linked with this transition. His international research is equally large-scale. His research is primarily funded by a large number of NIH R01's. In the US, this involves long-term research on the economic and physical environment with CARDIA which is a 25 year long longitudinal study, the National Longitudinal Study of Adolescent Health, and the UNC Food Research Program, which is evaluating the impact of global food company changes in product formulation as it impacts the diets of Americans. The research is funded by Robert Wood Johnson Foundation and linked with the M Obama child obesity prevention initiative. Prof. Popkin directs longitudinal surveys in China and Russia, initiated another in the Philippines, and is also involved in survey research in other countries, including Brazil, Mexico, the United Arab Emirates, India, Norway and the Philippines. He is actively involved at the national and global level in policy formulation for many countries, particularly Mexico and China.

Dr. Popkin serves on several scientific advisory organizations. He has published 350 refereed journal articles, is one of the most cited nutrition scholars in the world, and is the author of a new book entitled the WORLD IS FAT (January 2009, Avery-Penguin Publishers), translated into 9 languages.

RECIPIENTS OF GOPALAN ORATION AWARD

- 1977 *Dr. D. B. Jelliffe*
World Trends in Infants Feeding.
- 1978 *Dr. J. Cravioto*
Intersensory Integration as a Function of Nutrition and Stimulation.
- 1979 *Dr. M. Behar*
National Nutrition Policy & Trace Elements and Metabolism.
- 1980 *Dr. M. S. Swaminathan*
Green Power and Freedom from Hunger.
- 1981 *Dr. V. M. Dandekar*
Measurement of Undernutrition.
- 1982 *Dr. S. Varadarajan*
Technology for Better Nutrition.
- 1983 *Dr. H. K. Jain*
Evolutionary March of Indian Agriculture.
- 1984 *Dr. S. G. Srikantia*
Nutrition Adaptation in Man.
- 1985 *Dr. K. T. Achaya*
Invisible Fats Revised.
- 1986 *Dr. V. Kurien*
Oils and Fats Beyond Nutrition.
- 1987 *Dr. R. K. Chandra*
Nutrition Immunity and Clinical Outcome.
- 1988 *Dr. Anand S. Prasad*
Human Zinc Deficiency.
- 1989 *Dr. J.V.G.A. Durnin*
Is Satisfactory Energy Balance Possible on Low Energy Intake ?
- 1990 *Dr. J. C. Waterlow*
A New Look at Protein-Energy Malnutrition - Controversies and Challenges.
- 1991 *Dr. Vernon R. Young*
Amino Acids Kinetics in Humans
- 1992 *Dr. M. C. Latham*
Alleviating malnutrition in the developing countries of the World.
- 1993 *Dr. Nevin S. Scrimshaw*
Complementarities among foods and nutrients.
- 1994 *Dr. W.P.T. James*
Assessing Energy Need : Recent Advances.

- 1995 *Dr. Florentino S Solon*
Food Fortification Programme Development in the Philippines.
- 1996 *Dr. John D Potter*
Plant Foods and Cancer Risk - Science and Tradition.
- 1997 *Dr. B. N. Tandon*
Nutrition Intervention in 2000 AD
- 1998 *Dr. Artemis P. Simopoulos*
Genetic variation and nutrition.
- 1999 *Dr. R.S. Paroda*
Household Food and Nutritional Security Through Advances in Agriculture.
- 2000 *Dr. Gurudev S Khush*
Strategies to Meet the Global Food and Nutrient Needs in the New Millennium.
- 2001 *Dr. B. S. Narasinga Rao*
Newer Perspectives in Energy Nutrition and Malnutrition and their Relevance to India.
- 2003 *Dr. Chen Chunming (At IX Asian Congress of Nutrition)*
Nutrition and Economic Development.
- Dr. Prakash S Shetty*
Non-Communicable Diseases in Developing Societies : Causes, Costs and Consequences.
- 2004 *Prof. Mark L Wahlqvist*
The New Nutrition Science : Solutions for Development.
- 2005 *Dr. Shanti Ghosh*
For Better Health and Nutrition, Prioritize the Young Child.
- 2006 *Dr. M.K. Bhan*
Preparing to Face the Challenge.
- 2007 *Dr. Ricardo Uauy*
Leadership more than new knowledge is required to improve nutrition in India.
- 2008 *Dr. John M Pettifor*
Vitamin D and Calcium Nutrition in Children in Developing Countries.
- 2009 *Prof. K. Srinath Reddy*
Public Health Nutrition in India : Moving from Science to Policy and Action.
- 2010 *Prof. David Barker*
Nutrition in the Womb.

The Global Dynamics of Diet, Activity and Body Composition: Rapid Shifts in the stages of the Nutrition Transition

Barry M. Popkin, Professor of Nutrition
W. R. Kenan, Jr. Distinguished Professor
University of North Carolina at Chapel Hill
Chapel Hill, NC 27516-3997

Several decades ago, it was heresy to talk about an impending pandemic of obesity across the globe. At that point, only the US was considered a country with an obesity problem: more than half of adults in some age-gender-race-ethnic specific subpopulations were overweight or obese. Home economics was dying as a taught art in the schools, processed food and prepared meals were increasingly common, away from home eating and in particular, fast food, was becoming a major part of our lives, and we became increasingly concerned about a wider array of health conditions related to obesity. However by the early 1990's I began to see several key themes : urbanization was a major driving force in global obesity, food technology changes were hitting the globe, mass media marketing began to penetrate all countries, and food distribution systems became much more sophisticated. Also overweight and obesity were emerging in low and middle income countries. Further, we documented how changes in edible oil production created cheap vegetable oils that allowed low and middle countries to increase energy consumption at very low income levels. The same occurred with nutritive sweeteners. Later also greater consumption of animal source foods also began to shift toward low and middle income countries in many ways. However, at that point in history, we assumed global hunger and malnutrition were the dominant concerns in low and middle income countries, and it was very difficult to draw attention to the importance of how dietary and physical activity shifts were increasing the threat of obesity in -these settings.

Today, obesity affects nearly 2 billion globally, while undernutrition (while increasing under these stressful income, employment and food price times), affects about half that number. Further, urban residence is no longer the dominant factor; rather it is modernization of the food supply, the rapid increase of easy access to processed and packaged foods , alongside the very rapid decline in physical activity and increase in sedentary behaviour that contribute to rising obesity rates in the low and middle income world .

We have now learned about major shifts in energy balance, overall dietary patterns, and body composition, and are gaining a more in-depth view of within each of these realms. For example, we now understand that our ability to regulate energy intake on a daily basis is influenced by the form of energy consumed. Mattes led the way in providing an understanding of the role of food versus beverage intake, showing that humans do not compensate in the same meal or later times of the day when excess calories are consumed as beverages. This can lead to overconsumption of energy since beverage consumption will add calories without a compensatory reduction in food intake. This research opened up much more exploration of not only that mechanism but a large new set of studies on beverages, types of sweeteners and their metabolic effects and ultimately to a great deal of focus in the program and policy area on sugar-sweetened and other caloric beverages . Clearly, we have understood for a long time about the satiety effects of fat, and about fat and sweet preferences and our desire to reduce exertion. In sum, we are caught in the perfect storm of technological changes, urbanization and globalisation, along with our biological makeup and preferences coming together to contribute to the observed growth in global obesity. I summed up these conflicts of evolution vs modern technology in my various papers in the last two decades and more recent my book "the world is fat".

Technological Clashes with our biology

Biology	Technology
Sweet preferences	Cheap caloric sweeteners, food processing benefits
Thirst and hunger/satiety mechanisms not linked	Caloric beverage revolution
Fatty food preference	Edible oil revolution-high yield oilseeds, cheap removal of oils
Desire to eliminate exertion	Technology in all phases of movement/exertion

Overweight and obesity were estimated to afflict nearly 1.5 billion adults worldwide in 2008 . If the current secular trend continues, in 2030 globally an estimated 2.16 billion adults will be overweight, and 1.12 billion will be

obese . Some of the largest increases in obesity rates are found in low- and middle-income countries. The implications of these trends for health, quality of life, productivity, and health care costs are staggering. The burden is greater for much of Asia, Latin America, the Middle East, and Africa due to differences in fat patterning and body composition and the cardiometabolic effects of body mass index (BMI) at levels far below standard BMI overweight cutoffs of 25 . These results are seen in India in relation to the prevalence of diabetes and impaired fasting glucose and in China in the prevalence of hypertension and diabetes. In fact while I do not cover this here, my lecture will show child diabetes rates in China are higher than in the US (using A1c).

Also there will be a paper published in January 2012 in Nutrition Reviews which will provide references and very up-to-date understanding of where we stand on this topic and what options we now seem to have to address this.

OBESITY IN LOW AND MIDDLE-INCOME COUNTRIES

Recent studies have used data from a large number of countries to estimate current prevalence rates and project increases in all regions of the world . However, there is little detailed information on longitudinal trends in low- and middle-income countries aside from Brazil, China, India, and Mexico . In addition, none of these recent studies have focused on within-country trends related to urban-rural or income/wealth differences. The general impression has been that in higher-income countries we often find greater obesity rates in rural areas and among the poor—the reverse of what is seen in lower-income countries. However, new evidence suggests that these patterns are changing, and the increasing rate of obesity among the poor has important implications for the distribution of health inequalities. In the past three decades the age-standardized mean BMI, the most widely used metric for defining overweight and obesity has increased by 0.4–0.5 kilograms/meter²/year .

The major gaps in this literature relate to lack of data and superficial examinations of patterns and trends without sufficient attention to the extant literature and the dynamics of change rather than simplistic cross-sectional perspectives. For example, in recent papers, Subramaniam and colleagues (Subramaniam and colleagues 2011), using just one wave of data and ignoring dynamics , come to a very different conclusion from Jones-Smith and colleagues, who use similar data, but longitudinal analysis with not one but 3-5 surveys from each country [two for India].

Another limitation is the focus on women of childbearing age and preschoolers. This reflects the availability of data from multiple countries which have relied on the Demographic and Health Surveys, which focus on women of childbearing age and their children. A few studies, in particular some national surveys in Mexico and Brazil and a few large-scale longitudinal studies, including the China Health and Nutrition Survey, the Indonesia Family Life Survey, and the Mexico Family Life Survey, cover all age and gender groups .

Using inclusive data, one sees quite different gender-specific patterns of change and differentials by socioeconomic status. According to the limited research and data available, higher socioeconomic status (SES) men have higher rates of overweight and obesity than do lower SES men.

What we do know is that obesity prevalence appears to be rising across all low- and middle-income countries. Various methods have been used to estimate rates of change in obesity prevalence. One group estimated that overall there is a 0.4 percentage point annual increase in the prevalence of obesity, but this estimate may be too low. We used repeated nationally representative cross-sectional surveys that include 441,916 rural and 364,267 urban (806,183 total) adult women (18–49 years old) from 42 countries in Asia, the Middle East, Africa (East, West, central, and southern), and Latin America. The age-adjusted prevalence of overweight plus obesity (overweight=BMI \geq 25, obesity=BMI \geq 30) at baseline and the absolute and relative change for each of the 42 countries and the key regions to which they belong are shown in Table 2. The prevalence of overweight and obesity (OWOB) grew for all 42 countries at about 0.7 percentage points per year on average. Using the most recent estimates for each country weighted by the population of women 18–49 years old from each country in the last available year as a percentage of the total number of women 18–49 years old from the 42 countries combined, we estimate that 19 percent of rural women and 37.2 percent of urban women are overweight or obese.

KEY FACTORS THAT EXPLAIN INCREASED OBESITY

Ultimately, obesity reflects energy imbalance, so the major areas for intervention relate to dietary intake and energy expenditure, for which the main modifiable component is physical activity. It is clear that large shifts in

access to technology have reduced energy expenditure at work in the more labour-intensive occupations, such as farming and mining, as well as in the less energy-intensive service and manufacturing sectors. Changes in transportation, leisure, and home production relate to reduced physical activity. In addition the complex interplay between biological factors operating during fetal and infant development and these energy imbalances exacerbates many health problems. Such changes have been well documented for China and are also found in varying manifestations in many countries.

Finding ways to increase physical activity across all age groups is important for public health, but options for increasing energy expenditure through physical activity may be limited in low- and middle-income countries. To offset 110 calories from an 8-ounce (236 millilitre) sugar-sweetened beverage, a woman weighing 54 kg must walk moderately fast for 30 minutes and a man weighing 82 kg for about 25 minutes. Thus a normal 12-ounce beverage would require 45 minutes of walking for a woman and 33 minutes for a man. Such levels of physical activity may be too much to expect, and so diet modification is a key approach to lower obesity prevalence, particularly with the ongoing decline in physical activity and increase in sedentary time. The dietary dynamics represent a major set of complex issues. On the global level, new access to technologies (e.g., cheap edible oils, processed foods, modern supermarkets, and food distribution and marketing) and regulatory environments (e.g., the World Trade Organization [WTO] and freer flow of goods, services, and technologies) are changing diets in low- and middle-income countries. Accompanying this are all the critical issues of food security and global access to adequate levels of intake. Many populations focus on basic grain and legume food supplies, while the overall transition has shifted the structure of prices and food availability and created a nutrition transition linked with obesity as well as hunger. We have used detailed time use data along with energy expenditures and other data to examine past patterns and trends and predict until 2020 and 2030 patterns of physical activity and sedentary time in the US, UK, Brazil, China, and India.

I will not address in depth a topic studied in detail in my India talk but based on thinking and writing of my colleague, Linda Adair, I do want to mention this potentially critical biological factor affecting obesity and non-communicable diseases (NCDs) in rapidly developing countries in India. This factor is the biological insults suffered during fetal and infant development that may influence susceptibility to the changes described above, thus influencing the development and severity of NCD trends for these countries. The patterns of change in dietary intake and energy expenditure related to the global nutrition transition are particularly important in the context of current theories of the developmental origins of adult disease. Based on three decades of research, we now recognize that susceptibility to obesity and chronic diseases is influenced by environmental exposures from the time of conception to adulthood. An extensive literature demonstrates that fetal nutritional insufficiency triggers a set of anatomical, hormonal, and physiological changes that enhance survival in a "resource poor" environment. However, in a postnatal environment with plentiful resources, these developmental adaptations may contribute to the development of disease. Some of the strongest evidence on the long-term effects of moderate to severe nutrition restriction during pregnancy comes from follow-up of infants born after maternal exposure to famine conditions, such as those experienced in parts of Europe during World War II. For example, A. C. Ravelli and colleagues found higher rates of obesity in 50-year-old men and women whose mothers were exposed to the Dutch famine in the first half of their pregnancies, and G. P. Ravelli and colleagues found obesity in 19-year-old men whose mothers experienced famine during their pregnancies. Similarly, a follow-up of Hmong refugee immigrants shows higher rates of central obesity among those raised in a war zone, with effects amplified in those who migrated to the United States compared to those living in a traditional rural setting. This theory of "mismatch," that is, early nutritional deficits followed by excesses, may be particularly important in low- and middle-income countries undergoing rapid social and economic changes, because economic progress amplifies mismatch. Owing to the relative recency and pace of economic development, many adults in low- and middle-income countries were born when maternal morbidity and undernutrition were more prevalent, resulting in high rates of fetal growth retardation and low birth weight. However, given recent dietary trends, many now live in environments that promote higher energy intake and less energy expenditure at work. If susceptibility to these obesogenic environments is altered by early life exposures, individuals with a history of poor nutrition and stress are at greater risk of developing obesity and related NCDs. Much of the literature on developmental origins of health and disease (DOHAD) focuses on NCDs. However, given the strong association of NCDs with obesity and in particular with central obesity, this evidence is highly relevant and provides a strong rationale for obesity prevention in populations that have experienced dramatic changes in the nutritional environment as a consequence of the nutrition transition.

Dietary changes

The shift in the nutrition transition to one dominated by more accessible and cheaper edible oils, caloric sweeteners, and caloric beverages have imposed major biological mismatches. Changes in the food environment are accelerating with access to modern shopping environments and increased consumption of what we would term empty calories or junk food, namely high-sugar, high-sodium, and high-fat foods. The shift away from water to limited caloric beverages in the modern world is one example, but there are many others. Even exposures during infancy matter. For instance, in addition to the direct effects of diet, it has been hypothesized that early life exposure to highly sweetened or high-fat diets contributes to a development of preferences for these tastes, which may in turn influence later intake.

The knowledge emerging with the DOHAD research provides only one dimension of the shift toward greater obesity. While early life exposures and biological insults appear to enhance the adverse effects of dietary change, in the end shifts in energy balance and the entire structure of the diet have played major concomitant and separate roles. We speak first of broad trends and then return to the issues of poverty and availability. These link the set of dynamic changes in our food supply with food security.

It is useful to understand how vastly diets have changed across the low- and medium-income world to converge on what we often term the “Western diet.” This is broadly defined by high intake of refined carbohydrates, added sugars, fats, and animal-source foods. Data available for low- and middle-income countries document this trend in all urban areas and increasingly in rural areas. Diets rich in legumes, other vegetables, and coarse grains are disappearing in all regions and countries. Some major global developments in technology have been behind this shift.

Edible oil–vegetable oil revolution. Fats have major benefits in affecting taste. Some scientists suggest that the selection of fat- as opposed to carbohydrate-rich foods is primarily determined by brain mechanisms that may include central levels of neurotransmitters, hormones, or neuropeptides. In the 1950s and 1960s in the United States and Japan, technology was developed to cheaply remove oils from oilseeds (corn, soybean, cottonseed, red palm seeds, etc.). Breeding techniques to increase the oil content of these seeds accompanied the shifts, and higher-income countries saw a large increase in the availability of cheap vegetable oils. This was followed by removal of the erucic acid from rapeseed oil to create healthier canola oil accompanied by extensive research on the good and bad components of each edible oil (e.g., trans fats and specific fatty acids). By 2010 cheap oils were available throughout the developing world. Between 1985 and 2010 individual intake of vegetable oils increased threefold to sixfold, depending on the subpopulation studied. In China, which has moderate but not high vegetable oil intake, persons age two and older now consume on average almost 300 calories and more than 30 grams of vegetable oil daily. Frying food is replacing traditional methods of cooking throughout the world.

Caloric sweeteners. The globe’s diet is much sweeter today than heretofore. For example, 75 percent of foods and beverages bought in the US contain added caloric sweeteners. In the United States, one of the few countries where added sugar in the food supply is estimated by the USDA, research has shown a remarkable stability of added sugar intake from food over the last 30 years, while added sugar from beverages has increased.

TWENTY THIRD SRIKANTIA MEMORIAL LECTURE – 2011

THE AWARD

Srikantia Memorial Lecture Award was instituted in 1989 by the Nutrition Society of India to honour late Dr.S.G.Srikantia, one of the Founder-Members of the Society. As a Member, and later as its Treasurer (1974-1978) and Vice-President (1978-80), Dr.Srikantia was instrumental in building, expanding and consolidating the activities of the Society.

Dr. Srikantia was born in 1926 in an illustrious family in Mysore. After his brilliant undergraduate career in Mysore Medical College, he joined the National Institute of Nutrition - then known as the Nutrition Research Laboratories, Coonoor, in 1951. He served the Institute with rare distinction and dedication for more than three decades till his voluntary retirement in 1980. From 1974 to 1980, he was the Director of the Institute and contributed to the growth and development of the Institute.

Dr. Srikantia was an internationally renowned nutrition scientist and made outstanding contributions in clinical nutrition. He was a versatile, knowledgeable and well informed scientist not only in clinical nutrition but also in nutritional biochemistry and public health nutrition. Under his able stewardship, the National Institute of Nutrition diversified its research activities and had a coordinated approach, which added new dimension and depth to nutrition research.

A scientist with ideas, vision, initiative and drive, he could enthuse colleagues in an inimitable, gentle and persuasive manner. His elegant studies on the role of ferritin in the pathogenesis of nutritional oedema have attracted considerable attention. His pioneering research contributions on protein energy malnutrition, vitamin A deficiency, nutritional anaemias, pellagra and fluorosis have earned him academic recognition. He led the studies on the prevention and control of vitamin A deficiency in the country and was the man behind the National Vitamin A Prophylaxis Programme. Even after his voluntary retirement, he continued to be active in research and teaching, and was associated with the University of Mysore and served as Temporary Adviser, WHO. He was a member of the Editorial Board of the Indian Journal of Medical Research and was valued for his unbiased critical and mature views on a wide range of topics.

Dr.Srikantia has several publications to his credit including Chapters in books. He was frequently invited by national and international agencies to be on their expert committees.

He was a tower of support and strength to the Nutrition Foundation of India and played a leading role in the formulation and implementation of many of its research projects and in the preparation of its scientific reports.

A man of simple habits and sterling qualities; upright, sincere and devoted to scientific pursuits and loyal to the committed cause, Srikantia was a friend, philosopher and guide to many a junior colleagues. He was a diamond among men, transparent in his dealing with people, dazzling in intelligence, hard in getting the work done and sharp in seeing through people.

The Nutrition Society of India is proud to announce that the Twenty Third Srikantia Memorial Lecture on "Technology for better Nutrition" will be delivered by Dr. B. Sesikeran, Director, National Institute of Nutrition, Indian Council of Medical Research, Hyderabad.

THE RECIPIENT

Born on 30th July 1951, Dr. B. Sesikeran obtained his Doctorate Degree in Medicine from Madras University in 1975 and Post-Graduate Degree in Pathology from Osmania University in 1983. He started his research career at the National Institute of Nutrition in 1977 and has held several positions. As Director of the Institute, Dr.Sesikeran has been guiding the National Institute of Nutrition since April 2006. His areas of research interest where he has made significant contributions is in nutritional pathology, diet and cancer, micronutrients and apoptosis and iron absorption from the gut. He has helped in setting up several Toxicology Laboratories in Government as well as industrial sector. He was Co-ordinator for the Pre-clinical Toxicology Unit at the institute, which is now known all over the country for its excellence. He, in addition, is a well known diagnostic pathologist in Andhra Pradesh.

Dr. Sesikeran has several scientific publications and chapters in two text books to his credit. He is a research guide to Ph.D., MD and MDS students.

Dr. Sesikeran is a recipient of various prestigious International/National Awards/Honours, which include Dr.K.V.Rao Memorial Oration, Dr.K.V.Rao Scientific Society, Hyderabad (2007), Dr. D. Govind Reddy Memorial Oration, NTR University of Health Sciences, Vijayawada (2008), Dr. P. Narasimha Rao International Award, International Medical Sciences Academy, New Delhi (2009), Kamalapuri Sabharwal Memorial Oration, Lady Irwin College, New Delhi (2009), Soilendra Krishna Mitra Memorial Award –2009, All India Food Processors' Association at New Delhi (2010), Dr. Florence Theophilus Endowment Lecture (2011),

He is a Life Member of Scientific Societies viz., Indian Association of Pathologists and Microbiologists, AP Chapter of Pathologists and Microbiologists, Nutrition Society of India and A.P.Akademi of Sciences.

Dr. Sesikeran served as Secretary, Indian Association of Pathologists & Microbiologists of AP and Joint Secretary for Nutrition Society of India. He is a Fellow of the A.P. Akademi of Sciences, fellow of National Academy of Medical Sciences and International Medical Scientists Academy. He is the chairperson of the committee dealing with food labelling of the FSSAI and is a member various taskforces on health and nutrition of the Government of India.

PREVIOUS RECIPIENTS

- 1989 *Dr.P.S.Shetty*
Energy Metabolism in Chronic Energy Deficiency.
- 1990 *Dr.M.Gabr*
Better Nutrition for the World Poor : A Challenge of the Future.
- 1991 *Dr.B.N.Tandon*
Malnutrition and Gastroenterological Disorders.
- 1992 *Dr.B.S.Narasinga Rao*
Current concepts in human nutrient requirements and allowances - A critique of their use in practice and a need for an alternative.
- 1993 *Dr.Rajammal P. Devadas*
Empowering women towards improving family nutrition.
- 1994 *Dr.Tara Gopaldas*
Problems and prospects in upscaling Nutrition-Research-Action Projects or Pilots to Programmes.
- 1995 *Dr. Vinodini Reddy*
Dietary approaches to combat vitamin A deficiency.
- 1996 *Dr. N. Kochupillai*
Micronutrient Deficiency and Human Health and Development.
- 1997 *Dr. M. V. Rao*
Population - Food - Nutrition : Challenges and Options Before India.
- 1998 *Dr. Shanti Ghosh*
Nutrition, Growth and Development - The first two years are crucial.
- 1999 *Dr. Mahtab S. Bamji*
Understanding and combating recognized and less recognized vitamin deficiencies.
- 2000 *Dr. S. Rajagopalan*
Perspective Planning for Human Development.
- 2001 *Dr. Prema Ramachandran*
Research Studies on Mother Child Dyad - Foundation for National Programmes.
- 2003 *Dr. M. S. Swaminathan*
Ensuring Ecological, Social and Economic Access to Balanced Diets and Safe Drinking Water.
- Prof. K. N. Agarwal*
Nutrition and Brain.
- 2004 *Dr. Kamala Krishnaswamy*
Turmeric – The Salt of the Orient is the Spice of Life.

- 2005 *Dr. Subadra Seshadri*
The Persistent Problem of Iron Deficiency Anaemia and its Consequences: A Life Cycle Approach is Critical for its Control.
- 2006 *Dr. K. Vijayaraghavan*
Community Nutrition Research in India – Contributions, Constraints and Controversies.
- 2007 *Dr. V. Prakash*
Nutrition Links in the Food Chain.
- 2008 *Dr. Ramesh V Bhat*
Status of Food Safety in India : Past, Present and Future.
- 2009 *Prof. H.P.S. Sachdev*
Improving Nutrition through Relevant Evidence: Transforming an Indian Dream into Reality.
- 2010 *Dr. B. Sivakumar*
Carotene conversion to vitamin A is not inefficient.

Technology for better Nutrition

B. Sesikeran

Director

National Institute of Nutrition (ICMR), Hyderabad

“It is science and science alone which can solve the problem of hunger and poverty.....”

Pandit Jawaharlal Nehru, First Prime Minister of Independent India

Introduction

The challenge of nation development is to improve the quality of life across all sections of society in a sustainable manner. Food and nutrition security plays a central role in this process. Repeated surveys have shown high rates of under nutrition in India. Almost 50% of children under 5 are underweight and stunted. About 30% of women are also undernourished leading to increased child and maternal mortality in the region. This stems from inadequate protein and energy intake as well as deficiencies of multiple micronutrients, especially of iodine, iron, vitamin A, zinc and many other micronutrients. These deficiencies have adverse health outcomes such as retarded physical growth, impaired cognitive development, impaired resistance to infection and reduced work output. Moreover these deficiencies have greater economic and social impacts, which translate into millions of lost years of healthy life. The current economic transition has also resulted in diet and life style diseases leading to increased incidence of non communicable diseases such as cardio vascular disease, type 2- diabetes, overweight and obesity. Nutrition security is a very complex and challenging goal to achieve requiring implementation of multi-sectoral cost effective interventions and the will to think in an innovative manner. We as major stakeholders in this complex problem have a significant role to play in making available balanced nutrition to our citizens.

Most traditional diets and food habits provided a range of micronutrients that were able to meet the requirements of most groups. However, diet surveys from rural India have shown that the cereal based Indian diets does not have adequate micronutrient balance to satisfy the requirement of one or more micronutrients. The two approaches that have been adopted by many countries to overcome the deficit are dietary supplementation and food fortification. Though supplementation of iron and folic acid has been a National programme, their outreach has not been satisfactory due to low population coverage and acceptance.

Food fortification

Food fortification is a universally accepted low cost high impact intervention implemented in many countries to control inadequacies of multiple micronutrients. It is based on the principles of increasing the density of nutrients through addition of nutrients at levels higher than those found in the original food. This is achieved by post harvest technology or commercial fortification and through crop bio fortification using modern tools of biotechnology.

Examples of commercial fortification of foods are fortification of wheat flour with iron and B- vitamins, rice with iron and common salt with iron and iodine. There is now convincing evidence for the efficacy and effectiveness of implementation of fortified foods in improving the status and other health related outcomes among the beneficiaries. In India DFS has become a National programme and its introduction in ICDS, MDM and supply through the PDS is expected to control the twin deficiencies of iron and iodine provided we make it available universally. There is scope for region specific fortification programmes available for implementation across the country. Technologies like ULTRA RICE and Wheat fortification using encapsulation or nano particulated micronutrients are all available to be innovated and tested.

Biofortification

The Green revolution has so far contributed to increased food production, which to a great extent reduced starvation by supplying enough carbohydrates for energy. However this has reduced the food crop diversity and impaired micronutrient access from pulses, fruits and vegetables. Bio fortification of energy rich staple foods uses systematic plant breeding or genetic techniques to develop micronutrient rich staple foods. In contrast to other

strategies of increasing micronutrients this approach avoids post harvest technology of centralized processing. It has the advantage of being low cost and has regional appropriateness.

National and international research network have been created to design and to develop tailor made biotechnological interventions in order to prevent micronutrient deficiency. Currently scientists are focusing on addressing how to increase the level of micronutrients such as iron, zinc and beta carotene in staple crops such as rice, wheat, maize and sweet potato. Using marker assisted breeding one could identify beneficial traits in traditional and non traditional plants and with appropriate breeding, come up with new varieties.

Potential of genetically modified foods to satisfy nutritional requirements needs great deal of concerted efforts. The level of enrichment and the bioavailability of nutrients should be based on the RDA of Indians. This has been revised recently and there is scope for applying this knowledge while designing food fortification strategies. For example the conversion rate of beta carotene to retinol from plant foods is considered to be 8:1 and to achieve the RDA of preschool children from 100g Golden rice the enrichment should be around 32 µg/g. This again depends on the simultaneous intake of adequate fat with beta carotene bio fortified foods. Under such circumstances bio fortification of oil seeds such as ground nut, mustard etc appears to be a better option. In the case of iron, concurrent attempts must be made with respect to enhancing the bioavailability of the bio fortified foods in general to substantially influence the impact. Another strategy that has the potential to increase the zinc in the milk and poultry is by improving bioavailability of zinc by addition of phytase to feed. Thus many technological considerations including nutritional evaluation need to be addressed along with studies on safety.

Safety and regulation

When adopting any new technology there is a need to do a risk- benefit analysis. If the benefits far outweigh the minimal risk or perceived risk, the technology should be adopted. It is also a fact that no activity on earth is risk free, we however continue with such activities since we have no viable alternatives. Genetic modification is a technology which is very much needed in developing countries. If we need to address issues like decreasing crop losses due to pestilence, reduce risk of pesticide exposure, increasing the yield, growing food crops under existing natural calamities like drought or floods or soil salinity or to enhance the nutritional value of staple foods the most rapid technology which is based on sound science is the answer.

Safety issues of GMOs are much better addressed than for Non GM technologies. When hybridisation techniques are used several hundreds of genes move from one plant to the other but never been subjected them through intensive testing simply because the source of the genes was the same plant of a different variety. When we did mutation breeding no such intense testing was done despite several random mutations occurring in the plant.

Safety in GMO is primarily to address

1. Is the product of the modification a new protein and if so is it safe.
2. Since the new protein has never been consumed by humans could it cause allergy. There have been reports of increasing incidence of gluten enteropathy particularly with new varieties of wheat compared to traditional ones. This was never checked during the green revolution.
3. Lastly will the insertion of a gene / genes or the modification of a gene expression also introduce any expression changes of any other gene in the recipient plant genome— unintended effect. This is addressed by using a comparison of the composition of the GM versus the Non GM counterpart. Every aspect is then tested and if they are similar it can be reasonably assumed that there are no unintended effects.
4. Feeding studies are also done in addition to toxicology studies to live stock animals since they also feed on other plant parts

Thus, it can be very confidentially stated that GMOs are the most robustly tested food substances in the world. This is a technology with great promise and with adequate and meaningful safety protocols would greatly benefit our country's food and nutrition security. It can address both quantitative as well as qualitative aspects of agricultural produce.

All this will be possible if we are willing to move out a little bit from the traditional thinking and have the passion to use new science based technologies and innovate.

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SECOND RAJAMMAL P DEVADAS MEMORIAL LECTURE - 2011

THE AWARD

The Rajammal P Devadas Memorial Lecture Award was instituted by the Nutrition Society of India, in association with Avinashilingam Education Trust and Avinashilingam University for Women in the year 2009. Dr. Rajammal P Devadas (lovingly called 'amma' by her colleagues and students) had made significant contributions for the cause of Nutrition Science, Home Science and Women's development in the country. She was the President of the Nutrition Society of India during 1987 to 1991.

Born in Kallikulam in Tirunelveli District of Tamil Nadu, Dr. Devadas had her early education in Chennai and graduated from Women's Christian College. She received her Ph.D. degree from Ohio State University, USA, with copious honours in 1950, and her Post Doctoral D.Sc. degree from the University of Madras in 1978. As a leading nutritionist of international reputation, Dr. Devadas, in her various capacities as Principal, Vice Chancellor and Chancellor, had a stupendous academic record throughout. Dr. Devadas held several celebrated positions such as Chief Home Economist and Joint Director (Home Science), Directorate of Extension, Ministry of Food and Agriculture, Government of India (1955-1961) and Assistant Director General (Nutrition) ICAR (1975-76). She also served with immense merit as the Regional Vice President - International Federation for Women in Agriculture (IFWA), Regional Coordinator for Research-World Alliance for Breast Feeding and the First Vice President of the World Food Conference convened by the FAO in 1970 in The Hague, Holland, besides holding many other memorable advisory positions in National and International Organizations.

Dr. Devadas's major scientific contributions in the area of Home Science and Community Nutrition has resulted in various implementable programmes. To name a few, nutrition consultation in the colossal Statewide Nutritious Noon Meal Programme of the Government of Tamil Nadu, organization of training programmes for thousands of workers involved in nutrition intervention programmes, direction of a project in five states to commence Nutrition/Health Education and Environmental Sanitation in primary schools in which 10,000 teachers from five districts of Tamil Nadu were skilled in nutrition. In the academic year 1991-1992, she integrated NSS into the undergraduate curriculum of the Avinashilingam University giving it credits and an academic status. She toiled hard to educate the community on the significance of nutrition by developing educational materials and conducting research and community outreach programmes. She was the chief editor of the Indian Journal of Nutrition and Dietetics, Research Highlights and the Tamil Science monthly Vignana Chudhar. She has left behind to her credit over 500 research papers and 57 books. She represented India in more than 50 International Nutrition/Home Science Conferences in about 40 countries.

She received many awards from various national and international organizations for her commendable and priceless service in different fields including the Tagore Literacy award (1991), Padma Shri from the Government of India (1992) and Dr. B.C.Guha memorial award (1993). She was awarded the Honorary Degree of Humane Letters from Oregon State University (1993) and Ohio State University (1994), Honorary D.Sc. from Chandrasekar Azad University of Agriculture and Technology, Kanpur (1994), Honorary Degree of D.Sc. from University of Ulster, Northern Ireland (1996), G.D. Birla award (1998), the Malcolm S. Adiseshiah award (2000) and the prestigious International Union of Nutrition Sciences (IUNS) award in 2001 at Vienna, Austria.

The phenomenal growth of the Avinashilingam Institutions to the present heights is only due to the consistent and unstinted efforts of Dr. Devadas. Sri Avinashilingam Home Science College for Women was established in 1957, the Home Science College acquired the Deemed University status in 1988 with Dr. Rajammal P. Devadas as its first Vice Chancellor.

Dr. Rajammal P. Devadas Memorial Lecture Award is given every year to an outstanding women nutrition scientist of Indian origin working in India who has made noteworthy contributions in the field of applied nutritional sciences.

The Nutrition Society of India is proud to announce that the Second Dr. Rajammal P. Devadas Lecture on "Reorganizing Nutrition For A Better Tomorrow" will be delivered by Prof. Rita S Raghuvanshi, Dean, College of Home Science, G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, at the 43rd National Conference of the Nutrition Society of India held at National Institute of Nutrition, Hyderabad, Andhra Pradesh.

THE RECIPIENT

Dr. Rita S Raghuvanshi is presently the Dean at College of Home Science, Govind Ballabh Pant University of Agriculture and Technology (GBPUA&T), Pantnagar, Uttarakhand, India. This is the first Agricultural University of India and the harbinger of green revolution. She is an accomplished academician, researcher and manager and is working in various spheres of nutrition for more than 25 years.

Dr. Raghuvanshi was meticulous and analytical since her school days and a recipient of scholarship from school to post doctorate. She did her Graduation in Home Science and Post-Graduation in Foods and Nutrition from GBPUA&T, Pantnagar. Her industrious efforts took her to the prestigious Banaras Hindu University, Varanasi from where she completed her doctorate. She did her Post-Doctoral research from another prestigious institute, London School of Hygiene and Tropical Medicine, UK.

She started her career in 1983 as a Nutritionist in a research project of UNICEF/NFI. In 1984 she joined as assistant professor in the college of Home Science, GBPUA&T, Pantnagar, where she got the launching pad to show her capabilities as an academician and with her hard work, sincerity and dedication became the Dean in 2002 and till date she is continuing as Dean, College of Home Science, GBPUA&T, Pantnagar. She has also served as founder Dean, College of Home Science at Tura, Meghalaya, a constituent College of Central Agriculture University, Imphal, Manipur, where she got the opportunity to establish the College of Home Science.

In the areas of Food Science her interest has been in evaluation of nutritional and sensory qualities of pulses which helped in the release of good quality pulse varieties. She has identified underutilized plants and their nutritional quality and helped in identifying promising crops and its proper utilization in local foods. She has been studying IDD, IDA and under nutrition in children and women in Uttar Pradesh and Uttarakhand. She has been engaged in generating nutritional awareness in the population through various research and extension projects.

As a research scientist, she has handled many projects at State, National (ICAR, ICMR), International (WHO), Industrial and University level and has guided around 21 masters and PhD students. She is the author of 25 books and has more than 100 publications in national and international journals.

She is an excellent orator, which made her speak for international and national symposiums, conferences and workshops. She is member and office bearer of many scientific organizations and professional societies besides being the recipient of 14 awards, honours and fellowships.

As an excellent academician with her indepth subject knowledge, managerial skills and vision, she is a part of many policy formulation programmes of nutrition at state and national level.

PREVIOUS RECIPIENT

2010 *Dr. Mahtab S Bamji*
Striving for village-level nutrition security - Challenges and opportunities

REORGANIZING NUTRITION FOR A BETTER TOMORROW

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Dean

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Nutrition well being of the population is considered as an economic asset and a prerequisite for national development. The national data suggest that a lot of progress has been made in terms of economic growth in the last few decades. This has led to increase in living standard, quality of living and life expectancy. Agricultural research and technology development in India have dramatically increased food production and aggregate food availability, rendering large scale famine a rarity, yet the crisis of chronic undernutrition persists. The importance of food and nutrition in human development is widely recognized in both high income and middle to low income countries. Nutrition is the science of food and its relationship to health. Functional efficiency, productivity and positive health can be attained by good nutrition. Nutrition is both an input into and an output of development process. A well nourished healthy workforce is a pre-condition for successful economic and social development, and as such, food security, nutrition, health and sanitation are the responsibility of all development sectors and indeed of all citizens. Malnutrition in all its forms amounts to an intolerable burden not only on national health system but entire cultural, social and economic fabric of nations and is the greatest impediment to the fulfilment of human potential.

Despite a vibrant growth in the country's economy, infrastructure development and remarkable increases in food grain production, progress in improving health and nutritional status of the population has been slow and is a cause of concern. Nutrition is important for all round development of a person as it influences normal living conditions and physical well being of the person. Actually good nutrition is a human right. It may not be possible to achieve Millennium Development Goals without having access to good nutrition and health condition by the population. Good nutrition includes children's right to food, health and care as well as survival and development. Nutrition is a major concern at the time of emergencies (like war and national conflict) and natural disasters (like drought and flood situation). Malnutrition manifest in various forms such as poor mental and physical growth, disability, increased susceptibility to infections and may even contribute to mortality. All this later on affect education and economic opportunities thereby minimizing the national growth. Micronutrient deficiencies are risk factors for many diseases. They are wide spread in industrialized and developing countries and adversely influence the productivity and efficiency of the population. It is important that nutrition be given its due in Govt. policy and programmes. In International perspective India is one of the most undernourished countries in the world.

In India, as per NFHS 3 about 43% of children (0-3 yrs) were underweight, 38% were stunted and 19 percent were wasted. Infant mortality rate was 50 and 22% newborns were low birth weight. The results of the NFHS show very high levels of anaemia among young children, women and pregnant women. The results are even more alarming with 39% of rural woman (15-49 yrs), suffer from chronic energy deficiency and 58 percent are anaemic. Only 44% children in 12-23 months are fully vaccinated and 5 percent were not vaccinated at all.

NNMB reveals that consumption of all foods, except roots and tubers is below recommended dietary intake in all age and gender groups. The consumption of protective foods such as pulses, GLV, fruit and milk is the most inadequate. As a result intake of micronutrients such as iron, vitamin A and folic acid is far below the recommended levels. Only 51 percent of households consume adequately iodised salt.

The micronutrient initiative, 2007 reported that:

- World's 35% malnourished children live in India and 42 percent of children in India are stunted.
- India has the largest number of vitamin A deficient children in the world. This deficiency precipitates an excess 330,000 child deaths every year in India.
- Anaemia is present in 79% of children under the age three and 56 percent of women.
- Each year 22,000 people mainly pregnant women die from the most severe form of anaemia.

- The impacts of inadequate folic acid intake during pregnancy have resulted in the birth of 2,00,000 babies with neural tube defects, annually in India. The rate of neural tube defect is 16 times the global average.
- Due to Iodine deficiency, 66 million Indian children are born mentally impaired each year. Intellectual capacity is reduced by an estimated 15% nationally due to iodine deficiency.
- Vitamin A, iron and Zinc deficiency constitute the second largest risk factor in the global burden of disease.
- All these are national averages, situation is far worse in states like Jharkhand, Orissa, Chhattisgarh etc.

Nutrition situation in Uttarakhand: In a study conducted in 87 schools of Uttarakhand comprising 4141 children it was observed that 34% (37.5% in boys and 33.1% in girls) children in primary schools were undernourished and in upper primary school 33% (36.5% boys & 30% girls) children were undernourished. Around 35.7% primary (36.9% boys and 34.4% girls) and 46.5% upper primary school children were stunted and wasting was found in 24.3% boys and 18.3% girls of Uttarakhand. Anaemia was prevalent in 61.6% primary and 54.4% upper primary school children. Sub clinical deficiency was present in 28.5% primary and 14.5% upper primary school children. Anaemia was as high as 85% in women of Uttarakshi district (Dobhal & Raghuvanshi, 2008).

Iodine deficiency has been rampant in hilly district. In Uttarakhand urinary iodine excretion of school children has shown 41.78% of IDD (Mittal & Raghuvanshi, 2002). Vitamin A deficiency among pregnant of Uttarakhand has also been very high (Pathak *et. al.* 2008). The overall prevalence of sub clinical vitamin A deficiency (VAD) was 27% and 30% in primary school children of district Tehri and Nainital. The aggregate prevalence was 7% and 22% in upper primary school children of district Tehri and Nainital respectively (Raghuvanshi *et.al.*, 2009).

Nutrition situation in India is a sort of 'silent emergency'. More concern also arises due to the fact that there is not much improvement in malnutrition rates during the last decade (Table).

Table 1: Some Indicators of Malnutrition (NFHS 2 and NFHS 3)²

Indicators of Malnutrition from NFHS	NFHS 2	NFHS 3
Children under three years who are wasted (%)	15.5	19.1
Children under three years who are underweight (%)	42.0	43.5
Children under three years who are stunted (%)	45.5	38.4
Women whose Body Mass Index (BMI) is below normal (%)	36.2	33
Men whose Body Mass Index (BMI) is below normal (%)	NA	28.1
Children age 6-35 months who are anaemic (%)	74.2	79.2
Ever-married women age 15-49 who are aneimic (%)	51.8	56.2
Pregnant women age 15-49 who are anaemic (%)	49.7	57.9
Ever-married men age 15-49 who are anaemic (%)	NA	24.3
Source: National Family Health Survey (NFHS 3) 2005-06		

In addition to stagnation in under nutrition rates, India is also facing a rising tide of obesity and related metabolic disorders. This double burden raises important challenges with regard to fine tuning agricultural policies to deal simultaneously with issues of deficit and excess dietary intake.

Nutritional deficiencies have devastating consequences for well being and future of the Indian population. Hunger and under nutrition are intrinsic and severely diminish the quality of life. Under nutrition is also associated with reduced learning abilities, greater exposure to disease and other impairments of individual and social opportunities. Malnutrition also has high economic cost productivity losses related to poor nutrition are estimated to be more than 10 percent of life time earnings for individuals and 2-3 percent of GDP to the nation.

Agricultural Development alone cannot Improve Nutrition Situation in India:

The reasons behind the widespread malnutrition mortality rates, micronutrient deficiencies are multiple. The problem of malnutrition is complex & multidimensional in nature. Food production in terms of cereals, fruits, vegetables, fish, and milk has improved drastically, however it is not in tune with the growing needs of the population. The diet has become highly monotonous. Biodiversity in production and consumption level is very important for meeting micronutrient needs. There are several under utilized, uncommon foods available in different localities. These needs to be identified, propagated, produced and consumed to provide variety of nutrients and phyto chemicals. Researches have shown that these foods are having capacity to meet micronutrient requirements (Raghuvanshi *et. al.*, 2001, Verma & Raghuvanshi, 2001, Raghuvanshi & Nandana, 2011).

The main reasons for widespread malnutrition are household food insecurity, illiteracy, lack of awareness especially in women (Upadhyay *et. al.* 2011), poverty, inadequate access to health services, unavailability of safe drinking water, inadequate sanitary facilities, inadequate food distribution etc. These are the factors, which have been discussed for long. Efforts are also made to improve them. Various programmes like Integrated Child Development Services, Nutrition programme for adolescent girls, National food security mission, National iodine deficiency disorders control programme, Rajiv Gandhi drinking water mission etc. have been taken up to control and improve nutrition situation of the teeming millions. But these schemes and programmes have provided limited success to improve nutritional status, nutritional security and health as whole. Therefore finding out other factors responsible for prevailing malnutrition is the utmost need of the hour.

The first cause in the line comes out as state of agriculture or farmer. Most of the farmers do not want to continue with agriculture. There is a shift in attitude towards better earnings in occupations other than agriculture. The situation becomes worse with the parallel slowing of the poverty reduction rates and epidemic of farmer suicides. The other micro causes of grim nutrition situation are:

- Proper identification of micronutrient deficiencies has not been done yet.
- ICDS has not been able to reduce undernutrition and anaemia prevalence mainly because of neglect of the vulnerable.
- Annual nutrition data are not available to enable adequate monitoring.
- NFHS uptakes only anaemia as nutritional problem.
- Iodine fortification is not enforced stringently.
- Nutrition Education Programmes are not taken up countrywide.
- NNMB does not work on a national scale. Therefore the clear picture of nutrition is not available.
- During policy formulation nutrition lags behind, as more emphasis is laid on disease control.
- Nutrition in policy formulation comes under fragmented leadership and coordination, thereby Nutrition becomes nobody's responsibility, e.g.

Ministry of Women and Child Development, Ministry of Human Resource Development, Ministry of Health and Family Welfare, Ministry of Agriculture, Ministry of Rural Development, Ministry of Finance, Ministry of Food Processing Industries, Ministry of Science and Technology, Ministry of Power, Ministry of Petroleum and Natural Gas, Ministry of Information and Broadcasting, Ministry of Labour and Employment, Ministry of Communications and Information Technology, Ministry of Commerce, Ministry of Chemicals and Fertilizers, Ministry of Drinking Water and Sanitation

Due to fragmented responsibilities, services provided are of low quality and accountability for service providers is poor.

How to Handle: In the words of Prime Minister *"we need to identify the critical areas where existing policies and programme are not delivering result and should, therefore be strengthened or even restructured"*. In the present scenario of nutritional status of Indians show that effort should be made to improve nutrition condition. Following steps along with the ongoing programmes need to be adopted for positive results.

Nation wide assessment of micronutrient deficiencies should be taken with the help of various agencies like NGO, PHC, research institutes etc. There are a large number of agricultural universities and under them every district is having a Krishi Vigyan Kendra. Most of the KVKs have a home scientist with major in foods and

nutrition. Through this infrastructure a detailed project can be formulated to assess nutritional status of the population of every district in a routine and regular manner. Simple and frequent monitoring of nutritional status is necessary so that on going programmes can be easily accounted and mistakes rectified.

Efforts to lift the curse of malnutrition must be unified. All nutrition related programmes should be carried out under one leadership. Better and critical evaluation of running programmes should be done. The programme should be made result oriented for better functioning and reaching maximum number of people.

Food fortification programmes to be enforced more precisely and efficiently. Efforts should be made not to allow any amount of uniodized table salt to reach the market. In Indian cooking some amount of iodine is lost (Rana & Raghuvanshi, 2011 & Longvah *et. al.* 2011) therefore provision for that during iodisation should also be considered.

Improvisation in agricultural policies for uptaking farming as profession with the view to provide maximum benefit to farmers especially small land holders are important. Skilled counselling for farmers- for production, crop failure, nutritional produce, sustainable agriculture etc. Developing income generation skills esp. among rural youth, who can simultaneously uptake some work along with farming. Efforts to bridge the gap of unemployment should be addressed. Diversifying dietary intake by practicing home gardening. This helps to improve food and nutritional security. Home gardening increases the availability of fruits and vegetables, thereby eliminating micronutrient deficiencies. It also helps to uptake sustainable diet.

Nutrition Education: making it must for all. Nutrition to be included in curriculum from school level as is environmental science. Education should emphasize about food access, utilization and about choosing the right food. Developing new ways of teaching and doing research on how to improve nutrition. A national nutrition communication campaign linking concerned sectors (gender related issues, health and hygiene practices). Short messages related to nutrition can be propagated through various medium of media.

Supplementation: Efforts and programmes should be made for timely supplementation of nutrients to the deficient.

Promote personal hygiene, environmental sanitation. Safe drinking water and safe food handling during storage, cooking and eating should be taken up on priority basis. The multi-pronged strategies would definitely bring about positive changes in nutrition situation of country.

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ICMR CENTENARY SYMPOSIUM ON “BONE HEALTH AND NUTRITION”

SYM1-01 VITAMIN D AND BONE HEALTH. *S.V.Madhu*, Professor & Head, Department of Medicine and Head, Division of Endocrinology and Metabolism, University College of Medical Sciences, Delhi.

Vitamin D is also known as prohormone because it can be synthesized in human body and acts like a hormone at distant target cells. It is required to maintain normal blood levels of calcium and phosphate, which are in turn needed for the normal mineralization of bone, muscle contraction, nerve conduction, and general cellular function in all cells of the body. Vitamin D achieves this after its conversion to the active form 1,25-dihydroxyvitamin D [1,25-(OH)₂D], or calcitriol. This active form regulates the transcription of a number of vitamin D-dependent genes, which code for calcium-transporting proteins and bone matrix proteins. 90-95% of most people's vitamin D requirement comes from casual exposure to sunlight. Approximately 30 minutes of adequate exposure of arms and face to sunlight can provide the daily adequate requirement of an individual. However, skin synthesis of vitamin D is negatively influenced by the following factors: latitudes > 42°N or >42°S, winter months, thinned skin of elderly, dark pigmented skin (Asian and Africans), clothing and sunscreens use. It is reported that in winter months persons living in latitudes higher than 42° have zero vitamin D synthesis. It is well documented that environmental pollution from industrialisation has led to deleterious consequences of vitamin D deficiency rickets. The food sources rich in vitamin D are fortified dairy products, fortified margarine, fish oils and egg yolk.

Vitamin D deficiencies is widely prevalent in India and in recent studies up to 90% of Indians are found to be having hypovitaminosis D, which may be due to dark skin complexion, poor sun exposure, vegetarian food habits and lack of vitamin D in food fortification program. The vitamin D acts on intestinal cells to increase calcium absorption from gut therefore in its deficiency serum ionized calcium level decreases leading to rickets in children's and osteomalacia and osteoporosis in adults. Optimal vitamin D level of 25(OH)D is >25 ng/mL (37 nmol/L) but the level at which the parathyroid hormone (PTH) increases and bone density decreases is <15ng/mL of vitamin D. The deficiency of vitamin D leads to rickets and osteomalacia in children's and adults respectively.

Vitamin D is essential for the development and maintenance of mineralised skeleton. A combination of high calcium and 1,25(OH)₂ vitamin D could normalize chondrolyte growth. Growth plate development requires co-ordinated calcium and 1,25(OH)₂D₃ actions and VDR, whereas optimal osteoblastic bone formation and osteoclastic bone resorption demand both 1,25(OH)₂D₃ and VDR. Inadequate dietary calcium intake and low 25(OH)D concentrations mobilizes mineral and matrix from the skeleton. This increases the risk of fractures, especially in postmenopausal women and elderly patients.

Vitamin D insufficiency and vitamin D deficiency is now being recognized as a major cause of metabolic bone disease in the elderly. Vitamin D deficiency not only causes osteomalacia but can exacerbate osteoporosis. It is generally accepted that an increase in calcium intake to 1000-1500 mg/d along with an adequate source of vitamin D of at least 400 IU/d is important for maintaining good bone health.

It has been a general belief that rickets and vitamin D deficiency are uncommon problems in India because of abundant sunshine. There is, however, now increasing evidence that this is not true. It all centres round a new emerging global threat called vitamin D deficiency which is not merely rickets or osteomalacia but a huge hidden problem now being unraveled and is reaching epidemic proportions both in the developed and developing world alike.

Nutritional factors play a vital role in the bone homeostasis. Nutrition and bone health is tale of two nutrients: calcium and vitamin D. Adequate calcium intake along with vitamin D helps to maintain bone mineral mass attained at the end of growth period (peak bone mass). During infancy, childhood and adolescence, increasing dietary calcium intake favours bone mineral accrual. Adequate nutrition and sufficient activity provide mechanical impetus for bone development, which may be critical in attaining bone growth potential. Vitamin D and calcium status correlate with increased bone mineral density and have the potential to increase the peak bone mass. Increasing bone mineral content during periods of rapid growth (childhood and adolescence) increases “peak bone mass” and may effectively prevent osteoporosis at later age.

Several studies from our country have shown consistently that the prevalence of vitamin D deficiency is very high in our country. This has been observed in different parts of our country and across all ages – children and adolescents, middle aged adults as well as pregnant women, their new born infants and post-menopausal women. Vitamin D status of urban population is lower than the rural population. This is attributable to dress code and occupation, longer duration of exposure to sunlight.

Low vitamin D has been related to low vitamin D status of our population. Genetic factors also influence the BMD status. It has been shown in cultured fibroblasts that the 25(OH)D-24-hydroxylase activity is markedly increased in Asian Indians and are at increased risk of developing vitamin D deficiency.

Adequate calcium and vitamin D nutrition is important in people of all ages, especially in children and the elderly.. In the latter group, for example, the administration of calcium and vitamin D reduces the rate of bone loss and may decrease fracture risk. It is important to ensure sufficiency of vitamin D among children and adults to prevent osteoporosis. Most “healthy” adults have serum 25(OH)D levels that are lower than desirable. Many experts now believe that these recommendations are too low. For adults 50 years old or older, the National Osteoporosis Foundation recommends 800 to 1,000 IU of vitamin D per day, but many experts recommend more–1,000 to 2,000 IU per day — and some patients require considerably more supplementation to achieve desirable levels. The currently accepted minimal level for 25(OH)D adequacy is 30 to 32 ng/mL, on the basis of a growing body of evidence indicating that secondary hyperparathyroidism is increasingly common as 25(OH)D levels decline below 30 ng/mL and that fractional calcium absorption improves with vitamin D supplementation in patients with levels below 30 ng/mL but not in patients with levels above 30 ng/mL. A meta-analysis of studies in postmenopausal women found a significant reduction in hip and non-vertebral fractures with vitamin D supplementation at doses of 700 to 800 IU/d or more. The Women’s Health Initiative (WHI) study showed a small but significant increase in hip BMD (1%) in the group of patients who received 1,000 mg of calcium and 400 IU of vitamin D per day.

Recommended daily intake of 800IU of vitamin D is associated with decrease in risk of hip fracture in elderly. The cause of vitamin D deficiency should be treated first before vitamin D and calcium correction. In patient with chronic renal function or 1 α -hydroxylation defect the treatment should be with 0.25-0.5 μ g/day of calcitriol [1,25(OH)₂D₃]. Patients with intact vitamin d hydroxylation should be treated with 60,000 IU of cholecalciferol sachet/ week for 4-12 weeks followed by maintenance therapy of once monthly sachet or 800 IU daily. In patients with fat malabsorption, intramuscular vitamin D should be used in the dose of 2.4 lac IU/ 6 months. There are new recommendations that have come out recently that recommend higher daily vitamin D replacements and higher daily requirements of vitamin D in most individuals.

SYM1-02 BONE HEALTH & NUTRITION. *Bharati Kulkarni.* Scientist E, National Institute of Nutrition, Indian Council of Medical Research, Hyderabad.

Osteoporosis, which means ‘porous bones’, is characterized by low bone mass with micro-architectural deterioration of bone tissue leading to increased bone fragility and higher risk of fractures. Osteoporotic fractures, especially hip fractures are associated with considerable morbidity and mortality and increasingly high economic and social costs. Osteoporosis is called a ‘silent killer’ because it is usually asymptomatic till a fracture occurs and can be detected only by the measurement of bone mineral density (BMD). Women are more prone to osteoporosis and the rate of hip fractures is two to three times higher in women than men. With increased life expectancy in India, it is predicted that the burden of osteoporosis related morbidity and mortality will increase. Though the precise estimates of prevalence of osteoporosis in the country are not available, the most conservative estimates suggest that at least 20% women and 10-15% men above 50 years suffer from osteoporosis and thus about 25 million people may be affected (1). Nutrition is an important determinant of bone health and studies carried out at the National Institute of Nutrition (NIN) have made an important contribution to the understanding of the link between nutritional status and bone health in the Indian population. It would be pertinent to review this contribution as ICMR celebrates its centenary.

Early onset of osteoporosis

Hospital based data from India and studies from NIN suggest that osteoporotic hip fractures occur at least 15 years earlier in men and women from the low income groups in India than the western reports where fractures usually occur after 75 years. Nutritional status of women with osteoporotic fractures was found to be poor as indicated by lower mid arm circumference, skin fold thickness at triceps, lower serum protein, albumin and

haemoglobin levels. However, well nourished high-income group residents did not show the early age of fracture as indicated by studies from NIN (2). Subsequent studies from NIN that assessed BMD, using a precise technique of Dual Energy X-ray Absorptiometry (DXA) in different population groups, showed that the onset of osteoporosis as early as 40 years of age in women from the low income group. The prevalence of osteoporosis at the hip and lumbar spine regions in this study was almost 30% and 43%, respectively, in women in the age group of 30-60 years (3).

Determinants of bone health

Optimal Peak Bone Mass development

The development of osteoporosis is the end result of an inadequate peak bone mass (maximum accretion of bone mass observed usually during 20-35 years of age) or a rapid bone loss at a later age or both. It is well known that adequate intakes of calcium along with other minerals as well energy, protein and other nutrients are necessary for bone formation and calcium accretion during this growth phase. It is possible that in the absence of adequate nutrition, peak bone mass may be compromised in Indians as evidenced by their short stature, a feature of skeletal growth retardation. A recent analysis of nationally representative data from the National Family Health Survey (NFHS-3) indicated only a modest secular increase in height of men and women. Interestingly, the consumption patterns of milk were related to the regional differences in height in this study (4). The growth retardation in childhood and resultant shorter height during adulthood is possibly related to the reduced peak bone mass and lower bone densities in the low income Indian population groups.

Role of Nutrition

Nutrition is one of the major modifiable determinants of bone mineral density. Especially calcium and vitamin D are important due to their influence on bone metabolism along with a range of other macro and micronutrients. Recent evidence indicates that the quality and quantity of protein intake affects bone mass in several ways and increased essential amino acid or protein availability can improve bone health. A number of studies from NIN & other centers in India have indicated that calcium intakes in the low income group individuals are only about 300-400 mg/day which are far lower than the Western data. In addition, a number of studies from different parts of the country have demonstrated a high prevalence of vitamin D deficiency in different subgroups of Indian population, despite the availability of abundant sunshine (5). Recent evidence indicates that vitamin D deficiency may also be related to some of the non-skeletal disorders like type 2 diabetes, cardiovascular disease, immune disorders.

Recent NIN studies on nutrition and bone health

A double blind randomised controlled trial in children (age 6-16 years) was conducted to assess the efficacy of a micronutrient-enriched beverage on body composition and bone mass at various skeletal sites. The results indicated that in this group of children consuming adequate energy, supplementation of micronutrients resulted in increased heights and weights as well as bone mineral content and bone area of the whole body (6). The supplement, however, did not result in significant increase in the site specific BMD, probably because the amounts of calcium and other nutrients contained in the supplement were inadequate for tissue growth with density increases.

Another study in low income women from Hyderabad highlighted the importance of nutritional status as a determinant of bone health. Among the women in the age group of 30-60 years, it was observed that with increase in body weight, mean bone mineral densities and T scores at all the skeletal sites increased thereby reducing the prevalence of osteoporosis. Women in the chronic energy deficiency category (BMI <18.5) had T-scores near to osteoporotic range at all the sites, indicating high fracture risk (3).

Nutrition was also found to be an important determinant of bone changes during lactation in a recent study. It is well known that breast feeding women lose about 200 mg/day of calcium every day and a substantial part of the increased calcium demand is mobilized from maternal skeleton. Western studies have shown that lactation is associated with transient decrease of about 3-5% in BMD at hip and spine with recovery after cessation of lactation. A study from NIN prospectively assessed the BMD changes in under nourished lactating women from the low income group for 18 months postpartum and demonstrated that the pattern of BMD changes was different from that reported in western studies due to young maternal age. In addition, higher maternal weight and lean body mass appeared to protect from the lactation related bone loss (7). A community based trial was, therefore, conducted subsequently to assess the impact of an energy-dense calcium rich food supplement on the lactation related bone changes in young under nourished women from the low income group. The intervention group received a food supplement which provided 700 mg of Calcium and 500 Kcal of energy whereas the control group

received a food preparation with equivalent amount of energy with little calcium, for a period of 1 year. The preliminary analyses of the data indicate a beneficial role of supplementation in prevention of lactation related loss at the hip region.

Socio-economic gradient in bone health

A multi-centric population based study was conducted at NIN with 3 other centres to assess the prevalence of osteoporosis (using BMD estimates by DXA) in the low, middle and high income group adults. The study demonstrated a marked socio-economic gradient in the BMD values and the prevalence of osteoporosis. Well-nourished men and women from the high income group were found to have significantly higher bone densities and lower prevalence of osteoporosis than those from the low income group in spite of their low vitamin D status. Higher body weight and better calcium intakes were the most important determinants of BMD in this study. In addition, the study also estimated the peak bone mass in well nourished young men and women from the high income group and indicated that these young adults with optimal calcium intake may have bone density values only marginally lower than the American youth. Therefore, the estimates of high osteoporosis prevalence cannot be explained completely by the use of western peak bone mass reference standards.

Physical activity

In addition to nutrition, physical activity is also an important modifiable determinant of bone health. Especially, weight bearing physical activity is known to have a stimulating effect on osteogenesis. Though a large number of studies have documented the beneficial effect of sports related physical activity on the bone health, the role of occupational physical activity in bone health has not been assessed adequately. A study from NIN, therefore, examined the relationship of occupational activities with the BMDs of women from an urban slum in Hyderabad. The results indicated that, in under nourished women, occupation related strenuous physical activity may in fact reduce the bone densities in the absence of adequate calcium and proteins in the diet (8).

Lacunae in the present data & need for further research

Precise estimates of the prevalence of osteoporosis and vitamin D deficiency are not available from different parts of the country. In addition, important knowledge gaps exist in the area of calcium and vitamin D requirements for acquisition of optimal peak bone mass and maintenance of BMD in the elderly population. Further research is crucial to explore novel calcium rich food sources and to assess their effectiveness in enhancing bone density in different age groups. In addition, studies are needed to elucidate the relevance of vitamin D deficiency in the skeletal as well as non-skeletal disorders in the Indian population.

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SYM1-03 EVALUATION OF THRESHOLD VALUE OF 25 (OH) D₃ (VITAMIN D) BELOW WHICH PARATHYROID HORMONE (PTH) LEVELS START RISING. A. Mukherjee and A. Mathur, Division of RHN, Indian Council of Medical Research, New Delhi, India

Parathyroid Hormone (PTH) is important for the regulation of calcium and Vitamin D in the human body. PTH also plays a pivotal role in bone remodelling. In the recently published technical report of ICMR, significant negative correlations between serum vitamin D and log PTH levels in both males ($r=-0.335$, $p<0.0001$) and females ($r=-0.409$, $p<0.0001$) were observed. Further, Bone Mineral Density (BMD) at hip in females was found to be significantly correlated with both serum vitamin D ($r=0.204$, $p<0.0001$) and serum log PTH levels ($r=-0.283$, $p<0.0001$). It was also observed that sufficient intake of vitamin D might ensure rise in BMD at hip even at low levels of dietary Ca. It is therefore important to study the intricate relationship between dietary calcium, vitamin D and PTH to understand the bone mineral mechanism so that optimum bone health could be achieved. The objective of the present investigation was to determine a threshold value of vitamin D below which PTH levels start rising?

The data for the present work were extracted from an ICMR study carried out during the period 2001-2006 (Population based reference standards of peak bone mineral density of Indian males and females, An ICMR multicentric task-force study, Indian council of medical research, New Delhi, 2010). Various models of curve fitting were tried using PTH as the dependent and vitamin D as independent variable. Cubic model was found to be the most appropriate model. Adopting principle of determining minima of a curve, a first order derivative and if needed, a second order derivative of the function was taken and different threshold values were determined on the pooled data as well as on the data segregated by different categories of dietary calcium.

Analysis of pooled data of the males yielded a threshold value of 21.3 ng/ml. Whereas, analysis of pooled data of females yielded a threshold value of 24.1 ng/ml. Further, considering three categories of dietary calcium namely <1000, 1000-1199 and ≥ 1200 mg and proceeding similarly as before we obtained 19.8, 30.8 and 33.3 ng/ml respectively in males and 24.7, 47.5 and 39.6 ng/ml respectively in females as the threshold values. Thus if one has to suggest a single threshold value of vitamin D, 20 ng/ml should safely be adopted both for males and females. Our finding is also in accordance with many of the results obtained in the recent past.

SYMPOSIUM ON CHEMICAL BASIS OF NUTRIENT FUNCTION

SYM2-01 POLY UNSATURATED FATTY ACIDS IN HEALTH AND DISEASE. *P. Reddanna*, Department of Animal Sciences, School of Life Sciences, University of Hyderabad, Hyderabad, India. E-mail: prsl@uohyd.ernet.in

Poly unsaturated fatty acids (PUFAs) and their oxygenated metabolites by enzymatic and non-enzymatic reactions, have long been recognized as key signaling molecules in various patho-physiological processes in plants and animals. In animal systems oxygenation of PUFAs by lipoxygenase (LOX), cyclooxygenase (COX) and epoxygenase (EPOX) pathways, occurring positional and stereo-specifically, gives rise to a wide variety of oxylipins. In the world of oxylipins, oxygen is the currency of information. The critical difference in the biological properties of each of these molecules is the number, position and stereochemistry of oxygen insertion. Living cells regulate the balance of each of these molecules to respond appropriately to the internal/external stimuli and maintain homeostasis. The structural and functional diversity of oxylipins is further amplified by the action of an array of secondary reactions on the primary lipid hydroperoxides and tissue specific expression of divergent G-protein coupled receptors (GPCRs). In view of their localized action, these oxylipins are termed as local hormones or autacoids.

Arachidonic acid (AA, 20:4, ω -6), the major PUFA in animal systems, is majorly oxygenated by LOX, COX and EPOX pathways and generate bioactive molecules such as hydroperoxides, leukotrienes, lipoxins, prostaglandins, and epoxy fatty acids, collectively termed as eicosanoids (Fig.1). These are extremely potent biologically active molecules with bewildering variety of actions on divergent processes. Their uncontrolled production, however, is associated with many inflammatory and neuro-degenerative diseases. As a result the enzymes involved in the production of these eicosanoids have become the targets for the development of anti-inflammatory drugs.

Cyclooxygenase Pathway: Role in Patho-Physiological Processes

Cyclooxygenase pathway leads to the formation of cyclisation products of AA, including prostaglandins, prostacyclin and thromboxanes. The COX is a bifunctional heme containing enzyme that exhibits cyclooxygenase and peroxidase activities. The COX activity introduces two molecules of oxygen into AA to form the cyclic hydroperoxy endoperoxide PGG₂, which is subsequently reduced by the peroxidase activity of the enzyme to the hydroxy endoperoxide, PGH₂. PGH₂ is then converted to bioactive prostanoids such as PGD₂, PGE₂, PGF_{2 α} , TXA₂ and PGI₂ by terminal synthases, whose expression profiles exhibit cell type specificity. Prostanoids exert their actions *via* GPCRs on the surface of target cells. While PGE₂ is pro-inflammatory in nature, PGD₂ exerts anti-inflammatory effects. TXA₂ promotes platelet aggregation and is vasoconstrictor in nature but PGI₂ is anti-platelet aggregator with vasodilator functions. PGE₂ relaxes smooth muscle but PGF_{2 α} promotes smooth muscle contraction. Despite the varied effects of prostanoids, COX-2 coupled with PGE₂ formation has astonishing array of biological effects and is implicated practically in all vital functions including gastrointestinal, cardiovascular, central and peripheral nervous and renal systems and reproductive organs. However, the most significant and best characterized action of PGs is their role in inflammation of variety of cells and tissues.

There are three COX isoforms- COX-1, COX-2 and COX-3. COX-1, constitutively expressed in most tissues and synthesizes PGs at low levels, is presumed to function primarily in the maintenance of physiological functions. COX-2 is the inducible isoform, induced by several mutagenic and pro-inflammatory stimuli including basic fibroblast and epidermal growth factor, transforming growth factor β 1, VEGF, TNF α , LPS, and interleukins 1 α and 1 β . Recent studies, however, indicate that COX-2 is also constitutively expressed in several tissues, such as brain, kidney, pancreatic β -cells, spinal cord, vas deferens and testis (*Reviewed by Agarwal et al., 2009*). Finally COX-3, a splice variant of COX-1 that is inhibited by acetaminophen, has been reported recently and thought to mediate the pyretic and analgesic effects (*Ayoub et al., 2004*).

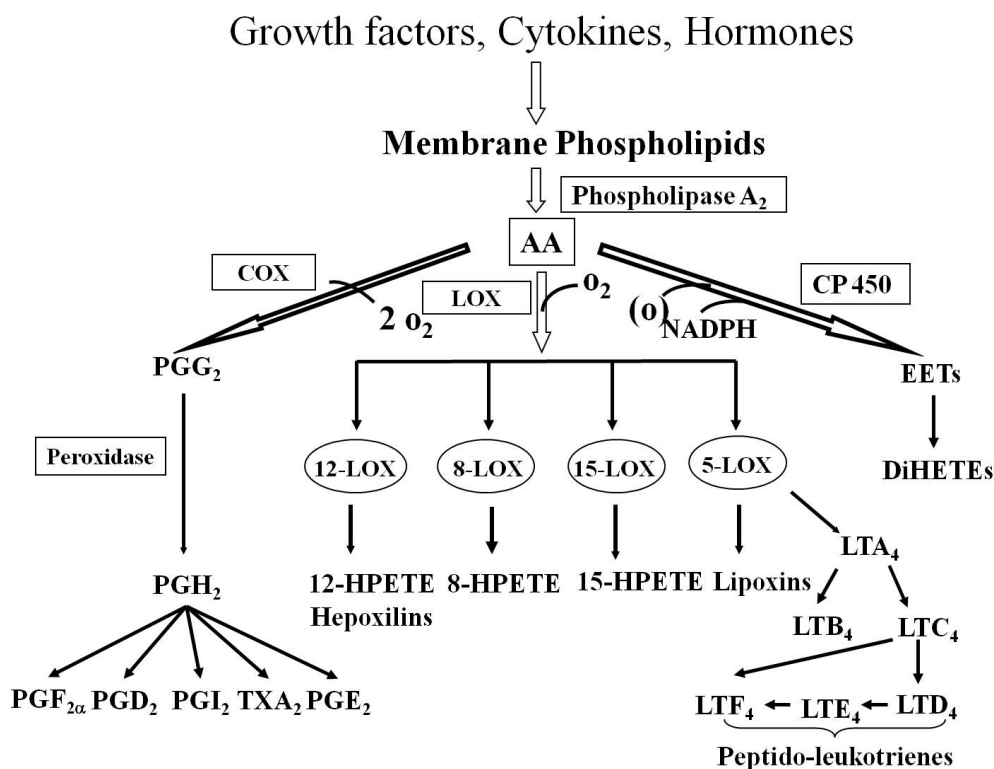


Fig.1: Oxygenation of PUFAs via COX, LOX and EPOX pathways

The two isoforms, COX-1 and COX-2, are the targets for the non-steroidal anti-inflammatory drugs (NSAIDs), such as aspirin, indomethacin and ibuprofen. This type of non specific inhibition of cyto-protective COX-1 was attributed to the widely observed gastric and renal side effects of NSAIDs. The discovery of COX-2 in 1990 led to the development of COX-2 specific inhibitors (COXIBs) in 1999, which are devoid of the side effects of conventional NSAIDs. COXIBs, however, were recently shown to have cardiac side effects on long-term use, the extent of which varied basing on the selectivity towards COX-2 (Dogne *et al.*, 2006). The focus of pharmaceutical companies now is towards development of anti-inflammatory drugs without gastric and cardiac side effects. Towards this the COX-2 and 5-LOX dual inhibitors (CLOXIBs) are the front runners, which are at different stages of clinical trials.

Lipoxygenase Pathways: Role in Patho-Physiological Processes

Lipoxygenases produce fatty acid hydroperoxides that are rapidly reduced to the corresponding hydroxy derivatives by glutathione peroxidases. LOXs contain one mole non-heme iron per mole enzyme and this transition metal is involved in the rate-limiting step of the LOX reaction, the initial hydrogen abstraction. Following hydrogen abstraction LOXs introduce molecular oxygen in a positional and stereo specific manner. Depending on the positional specificity, LOXs have been classified as arachidonate 5-, 8-, 12- and 15-lipoxygenases. The primary products are 5-, 8-, 12-, or 15- hydroperoxy eicosatetraenoic acids (5-, 8-, 12-, or 15-HPETE), which are reduced by peroxidases to the corresponding hydroxy forms (5-, 8-, 12- or 15-HETE). The 5-LOX pathway has received much attention because of its involvement in pro-inflammatory leukotriene synthesis and its potential as a therapeutic target. It has been associated with a variety of inflammatory diseases including asthma, atherosclerosis, rheumatoid arthritis, pain, cancer and liver fibrosis (Montuschi, 2008). Zileuton, a 5-LOX inhibitor, has been approved for the treatment of asthma. Our group has developed BroncoT in collaboration with Surya Pharmaceuticals, as an Ayurvedic formulation inhibiting 5-LOX. Leukotriene A₄, the biologically most important LT

intermediate formed from 5-HPETE, is converted either to leukotriene C₄ (LTC₄) by the action of glutathione S-transferase/LTC₄ synthase or to leukotriene B₄ (LTB₄), a potent chemotactic agent, by LTA₄-hydrolase. γ -glutamyl transpeptidase and dipeptidase convert LTC₄ to LTD₄ and then to LTE₄ and LTF₄. LTC₄, LTD₄ and LTE₄, the cysteinyl leukotrienes, were known for their slow and sustained smooth muscle contracting and thus involved in potent broncho constricting activities in asthmatic subjects (Funk, 2001). We have identified a new pathway for direct conversion of highly potent LTC₄ to least active LTF₄ by carboxy peptidases (Reddanna *et al.*, 2003). The cysteinyl leukotriene receptor antagonists, montelukast and zafirlukast, are in the market for treatment of asthma. Accumulating evidence suggests that the 5-LOX pathway has profound influence on the development and progression of human cancers.

Within the mammalian LOX family, a distinct subclass of epidermis-type LOX has been characterized that is preferentially expressed in skin and few other epithelial tissues. They include the human 15-LOX-2 and its mouse orthologue 8-LOX, 12R-LOX, and eLOX-3. The LOXs were shown to play a key role in tumor cell proliferation, angiogenesis, metastasis and immune responses.

Beneficial Effects of ω -3-PUFAs

Arachidonic acid, the predominant substrate for LOXs and COXs and thus responsible for inflammatory disorders, is derived from linoleic acid (LA; 18:2 ω -6), the predominant essential fatty acid present in today's diet. Many of the recent studies have clearly indicated that ω -3-PUFAs (α -linoleic acid – ALA; 18:3, ω -3 and its long chain derivatives- eicosapentaenoic acid –EPA; 20:5 and docosahexaenoic acid-DHA; 22:6) are essential for normal growth and development and also in the prevention and treatment of coronary heart disease, hypertension, diabetes, arthritis, inflammatory and auto immune disorders, Alzheimer's disease and cancer (Reviewed by Simopoulos, 1999). DHA, the most abundant omega-3 fatty acid in the brain and retina, modulates the carrier-mediated transport of choline, glycine, and taurine. DHA deficiency has been associated with cognitive decline and increased neuronal cell death. Severely depressed patients have been associated with reduced levels of DHA in their brain tissues (Das, 2008). These studies have led to the active promotion of DHA by pharma companies as a food additive in infant formulae and fortification in dairy items. As DHA is primarily derived from fish oils, ALA is being promoted for the enrichment of ω -3 PUFAs for vegetarians.

On the basis of estimation from studies on the nutrition of paleolithic and modern-day population, it appears that humans have evolved consuming diet that contained LA and ALA in 1:1 ratio. This however is altered over the years and the ratio of ω -6 to ω -3 PUFAs in the modern diet ranges from ~20-30:1. This shift in the balance towards ω -6 PUFAs enriched diet appears to be responsible for enhanced rate of inflammatory disorders in the present population (Simopoulos, 1999). A number of dietary intervention studies with ω -3PUFAs involving either EPA or DHA directly or their precursor-ALA, have been shown in the secondary prevention of coronary heart disease, hypertension, type-2 diabetes, rheumatoid arthritis, ulcerative colitis, Crohn's and renal disease (Fig.2).

Health Benefits of ω -3 PUFAs: Potential Mechanisms

As the major PUFA in our diet is LA, an ω -6 PUFA, it is converted to AA by chain elongation and desaturation in the body, gets incorporated to tissue phospholipids and becomes the precursor for pro-inflammatory prostanoids of 2 series (PGD₂, PGE₂, PGF₂ α , TXA₂ and PGI₂) and 4 series of leukotrienes (LTB₄, LTC₄, LTD₄ and LTE₄). Dietary supplementation of ALA, ω -3 PUFA, on the other hand leads to the formation of EPA and DHA by chain elongation and desaturation and get incorporated to membrane phospholipids. While EPA is the precursor for 3 series of prostaglandins and 5 series of leukotrienes, DHA forms the precursor for 4 series of prostaglandins and 6 series of leukotrienes (Fig.3). The enriched EPA and DHA compete with AA, as substrates for LOX and COX enzymes, and essentially decrease the formation of pro-inflammatory eicosanoids and increase the formation of anti-inflammatory products (Fig.3).

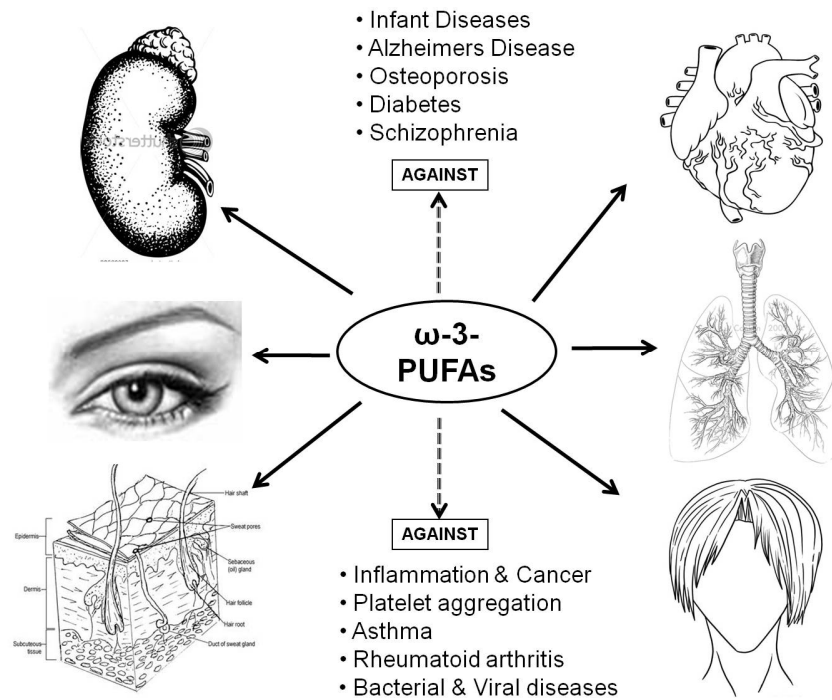


Fig.2: Beneficial effects of ω-3-PUFAs on different organs and against varied diseases

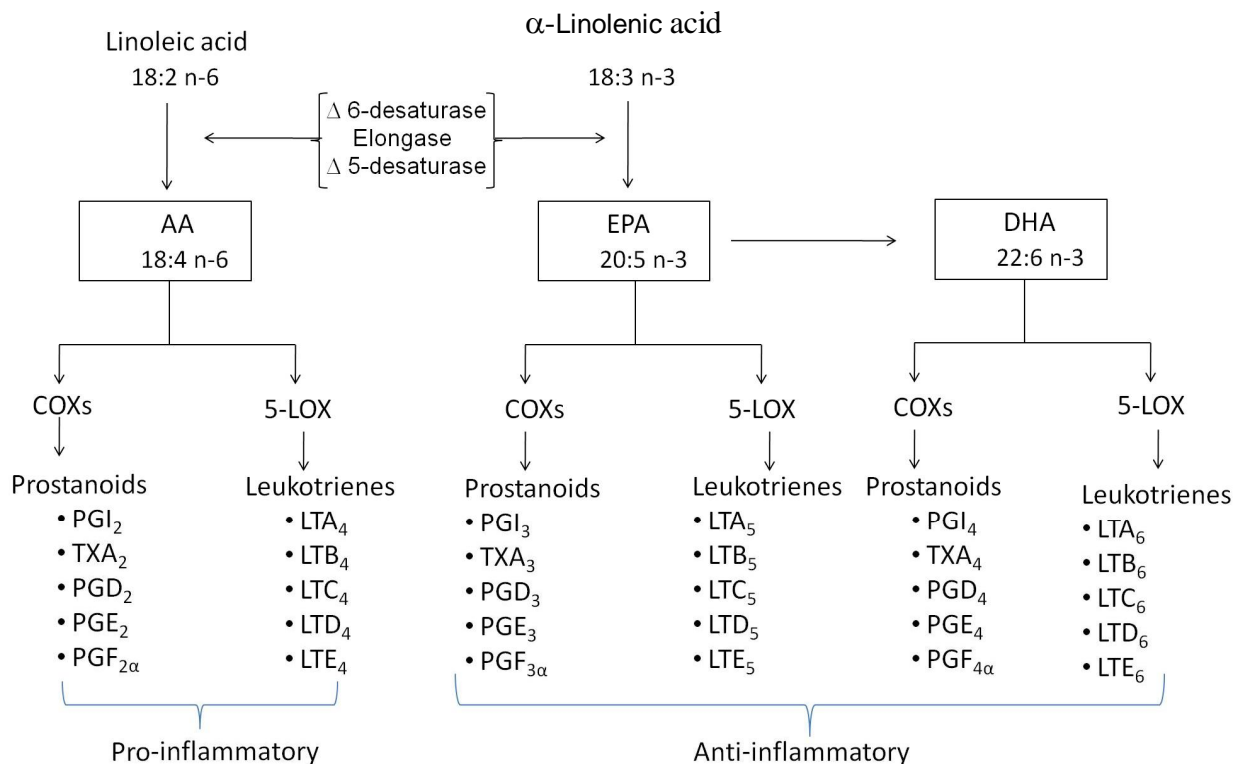


Fig. 3: Metabolism of omega-6 (Linoleic acid) and omega-3 (α- Linolenic acid) PUFAs.

Dietary Supplementation of ω -3/ ω -6 PUFAs: Relative preferences

Dietary amounts of LA as well as the ratio of LA to ALA appear to be important for the metabolism of ALA to long-chain ω -3 PUFAs. Without altering triacylglycerol concentrations, ALA supplementation increases long-chain ω -3 PUFAs such as EPA/DHA in plasma and platelet phospholipids. Antithrombotic effects were observed by reducing the ratio of ω -6 to ω -3 fatty acids with ALA-rich vegetable oil. EPA and DHA, however, are more rapidly incorporated into plasma and membrane lipids and produce more rapid effects than does ALA (Indus and Ghafoorunissa, 1992). In general ALA supplementation may be required for long periods to have the beneficial effects of ω -3 PUFAs in comparison to the rapid effects with dietary supplementation of EPA/DHA.

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SYM2-02 IRON HOMEOSTASIS AND METABOLIC DISORDERS. *Chinmay K. Mukhopadhyay.* Special Centre for Molecular Medicine, Jawaharlal Nehru University, New Delhi, India. E. mail: ckm2300@mail.jnu.ac.in

Iron is essential micronutrient for all the organisms because of its ability to function as a protein bound red-ox element. Due to its red-ox nature it may participate in many enzymic electron transfer reactions. At the same time it may generate potentially dangerous hydroxyl radical in presence of reactive oxygen species (ROS). Thus, regulation of iron homeostasis genes is highly coordinated mostly at the posttranscriptional level. Defective regulation of iron homeostasis genes lead to either, iron excess and related tissue injuries due to iron-stimulated oxidative damage or iron deficiency disorders. Resultant alterations of iron pool are implicated in several metabolic disorders including hepatic injury related cancers, neurodegenerative diseases, ageing, as well as microbial infections. Here we provide evidences that may explain iron overload in hepatic cell during insulin resistance (NIDDM) and iron accumulation in neurodegenerative diseases like Parkinson's and Alzheimer's.

Patients with insulin resistance (IR) are often detected with hepatic iron overload (HIO), mechanism of which is not understood so far. The resultant iron-mediated hepatic damage may lead to steatohepatitis and abnormal lipid metabolism. Hereditary hemochromatosis or genetic iron overload is result of various mutations in HFE, a regulator of transferrin receptor-1(TfR1) mediated iron uptake pathway. Several evidences presented in the literature indicated HFE does not play any role during hyperinsulinemia or insulin resistance mediated HIO. Hepatocyte plays an important role for maintaining body iron homeostasis and takes up both transferrin-bound (TBI) and non transferrin-bound iron (NTBI). Transferrin receptor-1 binds iron saturated transferrin (Tf) for cellular iron uptake in almost all types of cell including hepatocyte ; whereas, mechanism of iron uptake from NTBI has not been completely understood so far but involvement of Zip 14 is recently established. We hypothesized that insulin may directly regulate iron uptake in hepatic cells. To test the hypothesis human hepatic HepG2 cells were treated with physiological concentrations of insulin and iron uptake was measured. There was two-fold increase in radio-labeled iron uptake by TBI dependent pathway, whereas, no change was detected in NTBI uptake. Since, TBI uptake depends on TfR1 we tested its expression in response to insulin. More than 2- fold increase in TfR synthesis by insulin was detected as found by protein and mRNA status. Increased promoter activity and unaltered mRNA stability by insulin showed the regulation at the transcription level. Deletion and point mutation analyses with lfr1 promoter-luciferase chimera indicated involvement of oxygen sensing transcription factor

hypoxia-inducible factor-1 (HIF-1) in insulin-induced TfR1 regulation that was confirmed by electrophoretic mobility shift assay and HIF-1 \square SiRNA transfection. Further evidences were provided to demonstrate that insulin induced NADPH-oxidase mediated ROS generation and resultant activation of phosphoinositol 3-kinase pathway were involved for HIF-1 activation. Our findings not only established a direct and novel link between iron and energy metabolism in liver cell in response to insulin but also may explain HIO during hyperinsulinemia/IR pathophysiology. Hyperinsulinemia is a condition usually happens when peripheral tissues like muscle or adipocyte start showing resistance to insulin action. In a feedback, body tries to compensate the ineffectiveness of insulin by increasing synthesis and secretion of more insulin and leads to hyperinsulinemia condition. Thus, physiological concentration of insulin becomes higher than normal. In early stage of hyperinsulinemia although peripheral tissues become insensitive to insulin but hepatocyte may still continue to remain sensitive. In this condition, increased concentration of insulin would further increase TfR1 synthesis and subsequent increase in hepatic iron uptake. Increased cellular iron can induce ferritin synthesis as we detected and apparently may protect cells from iron-mediated damage; but in a chronic condition like hyperinsulinemia there might be excess of ferritin synthesis and iron-storage capacity of ferritin might be a limiting factor to sequester continuously available iron. One ferritin molecule has a capacity to bind up to 4500 iron atoms but it was suggested that individual containing ferritin with higher iron load has a higher risk of iron mediated hepatocellular injury, leading to fibrosis, cirrhosis and hepatoma, the pathophysiology often reported during IR.

The cellular oxidation and reduction (redox) environment is influenced by the transition metals mainly iron and copper. They are also part of the regimen responsible for production and removal of reactive oxygen species (ROS). Interestingly, most of the neurodegenerative disorders include increased ROS generation and iron deposition. However, their intrinsic relations either to cause the pathogenic condition found in neurodegenerative diseases or they produced as a result of the condition is not clear yet. The brain comprises only 2% of the total body weight, yet it is especially prone to ROS generation as it consumes about 20% of the resting total body oxygen. Similarly, need of glucose is also higher in active brain. Both the oxygen metabolism and glucose metabolism to gain energy are highly dependent on cellular iron metabolism. However, brain iron metabolism is so far less understood compare to the other organs. Glial cells play important role in movements of nutrients including essential metals like iron and copper to neurons as well as controlling ROS generation. Thus, it is important to understand the iron homeostasis components of glial cells in order to understand the role of redox/ROS in neurodegeneration. Ceruloplasmin (Cp) is a multicopper protein having ferroxidase activity thus performing a central role in body iron homeostasis. In mammals, astroglia contains specialized membrane bound glycosyl-phosphatidyl-inositol (GPI)- anchored form of Cp and plays an important role in iron metabolism in central nervous system (CNS) by regulating iron release by maintaining stability of ferroportin. Mutation in Cp leads to iron deposition in various regions of CNS. All these evidences show a crucial role of Cp in maintaining body iron homeostasis including CNS. Here, we discuss the regulation of GPI-Cp by ROS that may be one of the mechanisms of iron deposition in glial cells.

Our data showed that in response to ROS generation both at extracellular and intracellular level Cp expression was decreased due to promotion of a novel Cp mRNA decay mechanism. Role of 3'untranslated region (3'UTR) in Cp mRNA decay has been established by transfecting chimera of chloramphenicol acetyl transferase (CAT) gene with Cp 3'UTR. RNA gel shift assay showed significant reduction in 3'UTR binding protein complex in similar condition. Decreased CAT expression and RNA-protein complex binding were reversed by pretreatment with antioxidant supporting the involvement of ROS. This unique regulation of Cp by ROS generation provides a mechanism of iron accumulation in neurodegenerative diseases like Parkinson's and Alzheimer's. Generations of ROS in neuronal and glial cells by inflammation, injury or by environmental toxins like pesticides (like rotenone) are implicated in developing these neurodegenerative diseases. Considering the role of GPI-Cp in iron efflux in astroglial cells, our finding of ROS mediated decrease of Cp synthesis in glial cells could well explain the mechanism of accumulated iron in neurodegenerative diseases. In a condition, when ROS generation is increased either by environmental toxins like pesticides or by inflammation, concomitant decrease in GPI-Cp synthesis in glial cells would result into accumulation of iron within the cell by simultaneous decrease of ferrous iron transporter ferroportin. Thus, generated ROS and resultant accumulated iron can form highly reactive hydroxyl radical by Fenton reaction and damage the glial cells. The role of glial cells is well appreciated in neuroprotection. Then, any damage in glial cells may lead into damages of associated neurons. Thus, our finding could explain how neuronal damage might happen by increased ROS generation in glial cells during exposure to environmental toxins or other pathological conditions, a likely scenario in neurodegenerative diseases like PD.

SYM2-03 MUTATIONS, RETINAL DYSTROPHIES AND PHYTONUTRIENTS. G. Bhanuprakash Reddy, National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, India. Email: geereddy@yahoo.com

Retinal degenerations are a group of heterogeneous diseases of the retina, which result in irreversible blindness. Diabetic retinopathy (DR), age-related macular degeneration (AMD) and retinitis pigmentosa (RP) are the most common degenerative diseases of the retina (1). The alarming increase in the prevalence of diabetes and obesity further exacerbates the concern about retinal dystrophies. The molecular events that contribute to retinal degeneration are highly complex because of the involvement of different retinal cell types. Mutations in approximately 150 genes have been implicated in retinal degeneration. The interplay between multiple genetic and environmental factors could add to the complexity of the pathogenesis of retinal dystrophies.

Mutations in rhodopsin, most abundant protein in rod photoreceptor cells, are the most common cause of retinal degeneration (2). The P23H missense mutation, linked to RP, accounts for the largest fraction of cases in the world due to rhodopsin mutations. Expression of P23H mutant rhodopsin in cells demonstrated that the mutant rhodopsin is retained in the endoplasmic reticulum (ER) and forms perinuclear aggresome-like structures. Rodent models with P23H rhodopsin mutation developed photoreceptor degeneration due to defective trafficking of rhodopsin and suggest that a potential dominant negative effect exerted by P23H mutant leading to aggregation and mislocalization of rhodopsin. Similarly, mutations in a newly discovered gene, Elongation of very long-chain fatty acids-4 (ELOVL4), have been shown to be associated with a particular form of retinal dystrophy (3). ELOVL4 is expressed in photoreceptors and encodes a putative transmembrane protein of 314 amino acids with an ER retention signal. Mutations in ELOVL4 gene result in premature termination of protein translation and loss of the ER retention signal. Heterologous expression of mutant *ELOVL4* in cells demonstrated that the mutant protein was misrouted and that it recruits the wild-type protein in the formation of aggresomes. Knock-in mouse model carrying the *Elovl4* 5-bp deletion in the heterozygous state developed progressive photoreceptor degeneration supporting the dominant negative effect the mutation in causing the phenotype.

If the formation of protein aggregates due to mutations is one of the mechanisms for some forms of retinal dystrophies, preventing the formation of aggregates could be a viable approach to prevent and/ or treat the retinal diseases associated with protein aggregation. Recent research developments indicate that protein aggregation/ conformational disorders can be prevented and treated by small molecules including those present in dietary sources. We have screened a few phytochemicals known to present in many dietary sources for their anti-protein aggregating activity using cell lines that express these mutant retinal proteins. From these studies we identified a few molecules that have the anti-aggregatory potential. One such compound is curcumin (1,7-bis(4-hydroxy-3-methoxyphenyl)1,6-heptadiene-3,5-dione), an active ingredient of the yellow spice turmeric. In order to determine whether curcumin prevents the formation or disrupts the protein aggregates in the retina and rescue photoreceptors from degeneration due to misfolded rhodopsin, we administered curcumin to the rats expressing the P23H rhodopsin. Our studies demonstrated that curcumin could inhibit the formation of mutant rhodopsin protein aggregates, helps in rhodopsin localization, improve retinal morphology and function (4). These results establish the potential therapeutic use of curcumin in treating retinal degenerations caused by misfolded or aggregated rhodopsin. This data also suggest that curcumin may serve as a potential therapeutic agent in treating other degenerative diseases caused by protein trafficking defects.

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YOUNG SCIENTISTS' AWARDS SESSION - 1

SENIOR AND JUNIOR AWARDS IN EXPERIMENTAL NUTRITION

Date :11th November 2011

Time: 1.30 p.m. – 4.10 p.m.

Code No.	Name and Address	Title of Presentation
SENIOR AWARD – EXPERIMENTAL NUTRITION		
SAEN-01	Ms. Smriti Nanda Kumar Department of Foods and Nutrition WHO Collaborating Centre, The M. S. University of Baroda Vadodara, Gujarat	E-Counselling: New Era of Nutrition Health Promotion Programme? (Dear Study Stage II)
SAEN-02	Dr. Komal Chauhan Department of Food Science & Nutrition Banasthali University Banasthali Vidyapith, Rajasthan	Comparative Study of Anti-hyperlipidemic and Antioxidative Efficacy of Nutraceuticals in Albino Rats
SAEN-03	Dr. Shanmugam M Jeyakumar Division of Lipid Biochemistry National Institute of Nutrition Hyderabad, Andhra Pradesh	Vitamin A Improves Hyperglycemia and Glucose Tolerance but Aggravates Hepatic Steatosis in Glucose-Intolerant Obese Rats of WNIN/Ob Strain
SAEN-04	Dr.R.Sujatha Assistant Professor of Nutrition and Dietetics Government Arts and Science College for Women, Bargur, Krishnagiri District, Tamil Nadu.	A Study on Prevalence of Constipation and Supplementation of Senna (<i>Cassia Angustifolia Vahl</i>) In Selected Working Women Group
SAEN-05	Ms. Anu Joseph Dept. of Home Science St.Teresa's College Ernakulam, Kerala	Body Composition Measures among Adults In Coastal and Urban Areas of Ernakulam District, Kerala
JUNIOR AWARD – EXPERIMENTAL NUTRITION		
JAEN-01	Ms. Anupriya Singh Department of Food and Nutrition College of Home Science Punjab Agricultural University Ludhiana	Impact of Supplementation of Functional Beverage on the Haematological Profile, Blood Glucose and Serum Retinol Level of Sportswomen
JAEN-02	Ms. Shalini Kushwaha Department of Food and Nutrition College of Home Science Punjab Agricultural University Ludhiana, India	Effect of Supplementation of Drumstick (<i>Moringa oleifera</i>) and Amaranth (<i>Amaranthus tricolor</i>) Leaves Powder on Antioxidant Profile and Oxidative Status among Postmenopausal Women

Code No.	Name and Address	Title of Presentation
JAEN-03	Ms. Mann H.K. Department of Food and Nutrition Punjab Agricultural University Ludhiana, India	Hypocholesterolemic And Hypotensive Effects Of Probiotic Yogurt Containing Lactobacillus Acidophilus; Streptococcus Thermophilus on at Risk Coronary Heart Diseased Males
JAEN-04	Ms. Amrita A. Khaire Rajiv Gandhi Institute of IT and Biotechnology Bharati Vidyapeeth University Pune.	Prevention of Potential Molecular Targets In Diabetes by Spices and Dietary Agents: Proficient Combination Therapy for Alleviating Oxidative and Carbonyl Stress
JAEN-05	Ms. Ramya Siva Selvi M Department of Food Science and Nutrition, Avinashilingam Institute for Home Science and Higher Education for Women (University), Coimbatore, Tamil Nadu	Nutraceutical Potentials of Carotino Oil
JAEN-06	Ms. S.Sindhu Department of Food Science and Nutrition, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu	Impact of Supplementation of Heart Friendly Mix on the Lipid Profile of Cardiovascular Patients
JAEN-07	Ms. J. Sridevi Department of Nutrition and Dietetics, PSG College of Arts and Science, Coimbatore, Tamil Nadu.	Antioxidant Properties of Raw and Cooked Coloured Rice Varieties (<i>Oryza Sativa</i>)
JAEN-08	Ms. Nitya Elayath Department of Foods and Nutrition Faculty of Family and Community Sciences M S University of Baroda. Vadodhara	Need for Evolving Non-Invasive and Low-Cost Screening Strategies at Population Level
JAEN-09	Ms. Vandita D'Souza Department of Nutritional Medicine Interactive Research School for Health Affairs, Bharati Vidyapeeth University Pune, India.	Differential Regulation of Cord Brain Derived Neurotrophic Factor Levels in Term and Pre-term Pre-eclampsia
JAEN-10	Ms. Nisha S. Wadhvani Interactive Research School for Health Affairs, Bharati Vidyapeeth University Pune, Maharashtra.	Maternal Omega 3 Fatty Acids and Micronutrients Affect Placental Fatty Acid Desaturases and Transport Proteins In Wistar Rats
JAEN-11	Ms. Deepali P. Sundrani Department of Nutritional Medicine Interactive Research School for Health Affairs Bharati Vidyapeeth University Pune, India.	Matrix Metalloproteinase - 1 and Matrix Metalloproteinase - 9 in Human Placenta During Spontaneous Vaginal Delivery and Caesarean Sectioning in Pre-term Pregnancy

SENIOR AWARD IN EXPERIMENTAL NUTRITION

SAEN-01 E-COUNSELLING: NEW ERA OF NUTRITION HEALTH PROMOTION PROGRAM? (DEAR Study Stage II). *Smriti Nanda Kumar**, Uliyar V Mani and Indirani Mani. Department of Foods and Nutrition, WHO Collaborating Centre, The M. S. University of Baroda, Vadodara, Gujarat, India. *Email: smriti.nutrition@gmail.com

Nutritional, demographic and epidemiological transition has fuelled the rise of Non Communicable Diseases (NCDs) especially in the developing countries. Heavy health and economic burden is the rationale to promote early primary and secondary prevention strategies for NCDs. Thus, an exploratory Health Promotion Program (HPP) to improve dietary, physical activity and lifestyle pattern was designed for the executive staff of an industrial set up, as there is a higher prevalence of risk factors of metabolic syndrome in the industrial setting. It is an era of modern technology and access to the internet has made transfer of knowledge easier. Hence, the mode of counselling used was a custom made website. The anthropometric, biophysical, biochemical parameters of the subjects enrolled along with Knowledge, Attitude and Practices were assessed before and after intervention (duration 3 months). The HPP was well received and appreciated by the participants of the intervention and was found to have an extremely favourable effect on the personal habits and attitudes of the subjects. This observation was corroborated with trends of favourable changes in the nutrient intake especially in the fat intake, physical activity pattern, anthropometry, biophysical and biochemical data. Web-based intervention was found to bring about favourable changes in anthropometric, biophysical and biochemical profile of the subjects. The favourable response to this mode of intervention was due to its convenience and easy accessibility. Thus, this novel intervention can be used to reach out to the masses and spread awareness about health and nutrition.

SAEN-02 COMPARATIVE STUDY OF ANTIHYPERLIPIDEMIC AND ANTIOXIDATIVE EFFICACY OF NEUTRACEUTICALS IN ALBINO RATS. *Komal Chauhan* and Sheel Sharma. Department of Food Science & Nutrition, Banasthali University, Banasthali Vidyapith, Rajasthan, India. Email: shivam_kim@yahoo.com

Plant based foods provide bioactive substances that act as prophylactic and therapeutic agents. They attenuate free radicals to quell oxidative stress build ups; one of the prime causes for the initiation and progression of chronic diseases. Aerobic cells are constantly exposed to free radicals due to radiation exposure, environmental pollutants, indiscrete lifestyles and body's normal metabolic activities within the cells. In the turnover of oxidants and antioxidants the main aim is to maintain a steady state of equilibrium that spells health. Overproduction of oxidants can shift the balance resulting in oxidative damage to cellular structures. Though human cellular system is equipped with *antioxidant defense system* that redresses oxidative damage; yet it cannot stretch cent per cent itself beyond a limit. Of late, reports have been galore that adequate consumption of food substances having affects as antioxidants and hypolipidemic agents can protect the cellular systems from oxidative damage and functional impairment associated with aging and chronic or degenerative diseases. The present study examined the effects of high-fat high-cholesterol diet and the efficacy of neutraceuticals (lycopene, green tea, rice bran oil and policosanol) singly and in blends on lipid profile and endogenous oxidative damage and defences. Results revealed that the neutraceuticals acted as hypolipidemic and oxidative stress lowering agents through the levels of blood and liver lipid-lipoprotein and oxidative stress markers. To sum up, the study pointed towards these neutraceuticals as the lipid and oxidative stress lowering agents. Consumption of the foods rich in these neutraceuticals could become an effective strategy for the treatment and prevention of chronic and degenerative diseases.

SAEN-03 VITAMIN A IMPROVES HYPERGLYCEMIA AND GLUCOSE TOLERANCE BUT AGGRAVATES HEPATIC STEATOSIS IN GLUCOSE-INTOLERANT OBESE RATS OF WNIN/GR-OB STRAIN.

*Shanmugam M Jeyakumar*¹, Alex Sheril¹, Putcha Uday Kumar², Nappan V Giridharan³ and Ayyalasomayajula Vajreswari¹. ¹Division of Lipid Biochemistry, ²Pathology Division and ³National Centre for Laboratory Animal Sciences, National Institute of Nutrition, Hyderabad, India. Email: smjkumar@yahoo.com

Vitamin A and its metabolites are known as potent regulators of adipogenesis/obesity and insulin sensitivity. However, impact of long term feeding of vitamin A on liver physiology is poorly addressed; particularly under obese condition. To address this, 30weeks old male lean and obese (with impaired glucose-tolerance trait) rats of WNIN/GR-Ob strain were divided into two groups and received either stock diet or vitamin A-enriched diet (2.6mg or 129mg vitamin A/kg diet respectively) for 14 weeks. Compared to stock diet, consumption of vitamin A-enriched diet ameliorated hyperglycemia, hypertriglyceridemia and improved glucose tolerance in obese rats. Further, vitamin A-enriched diet-fed rats augmented the expression of hepatic insulin signaling pathway genes (insulin receptor (IR), IR substrate 1, 2, AKT, glycogen synthase and glucokinase); however, glycogen accumulation was seen only in obese. On the contrary, despite, decreased expression of various major lipogenic pathway genes such as sterol regulatory element binding protein 1c (SREBP1c), fatty acid synthase (FAS), stearoyl CoA desaturase1 (SCD1) and carbohydrate response element binding protein (ChREBP), vitamin A-feeding resulted in increased hepatic triglycerides (TG) accumulation and steatosis with concomitant decrease in plasma free fatty acid levels of both lean and obese rats. Also, dietary vitamin A supplementation ameliorated hypercholesterolemia, possibly through increased esterification and LDL-receptor-mediated HDL-cholesterol uptake by liver in obese rats. However, it increased hepatic cholesterol levels. Chronic vitamin A-enriched diet feeding improved the hyperglycemias and glucose tolerance by regulating hepatic insulin signaling and glycogenesis. However, it resulted in accumulation of hepatic lipids and aggravated steatosis in glucose-intolerant obese rats of WNIN/GR-Ob strain.

SAEN-04 A STUDY ON PREVALANCE OF CONSTIPATION AND SUPPLEMENTATION OF SENNA (*CASSIA ANGUSTIFOLIA VAHL*) IN SELECTED WORKING WOMEN GROUP.

*R.Sujatha**, Jemima Beryl Mohankumar, P.Shanmugasundaram and M.Vijey Aanandhi. *Department of Nutrition and Dietetics, Government Arts and Science College for Women, Bargur, Krishnagiri District, Tamil Nadu. Email id: ramasamsujatha@yahoo.co.in

This study shows that the senna incorporated food products especially senna vegetable soup helps to relieve constipation in middle age adult women constipated patients. Constipation is a common problem and affects between 2% and 20% of the general population. It is thought to affect more women than men. The severity of constipation is variable and it can be an acute or chronic condition. Often, it requires frequent interventions that may produce mixed or even unsatisfactory results. Knowledge of potential gender and age related differences in constipation would be useful to identify high risk patients. The herbal products today symbolize safety in contrast to the synthetics that are regarded as unsafe to human life and environment. The *Cassia Angustifolia Vahl*. (Tinnevely Senna) has great medical value because of sennosides, in leaves and pods, which are used as purgatives. India is the largest supplier of Senna leaves and pods to the world market. The use of non-standardised preparations of senna must be avoided because their pharmacological effect could be unpredictable. In the present study nutrition and health surveys to determine incidence of constipation was carried out among 750 subjects in the age group of 35-45 years. 200 sub-samples were selected by convenient sampling method to assess by 24 hours recall method for three days and food consumption pattern. A separate questionnaire for identification of constipation in the selected subjects was prepared and the data obtained from this study were statistically analysed. Nutrient analysis was carried out for the collected senna leaves and the active principles sennoside A and sennoside B were isolated and identified. Analysis for heavy metals and pesticides also carried out for the senna leaves. Acute oral toxicity studies and screening of laxative activity were done based on animal model for the senna leaves. The selected constipated subjects defined by the Rome II diagnostic criteria were supplemented with 10 g vegetable soup which contained 3 g senna powder during bed time. The Bristol Stool Chart was used to find out the type of stool after supplementation of senna incorporated vegetable soup for the constipated subjects. The results of the study revealed that the percentage of constipated subjects in the higher age group (41-45) was comparatively high. From Chi-square test for each life style habit, it was concluded that a single life style habit induces constipation. Toxic effect study of senna showed that the

higher doses of senna powder (100, 200 and 400 mg/kg,p.o.) were found to be non-toxic and showed significant increase of faecal output. Based on the results of the supplementation study it was found that vegetable soup incorporated with senna was effective in relieving constipation.

SAEN-05 BODY COMPOSITION MEASURES AMONG ADULTS IN COASTAL AND URBAN AREAS OF ERNAKULAM DISTRICT, KERALA. *Anu Joseph*¹ and Kowsalya S². ¹Dept. of Home Science, St.Teresa's College, Ernakulam ²Dept. of Foods and Nutrition, Avinashilingam Deemed University for Women, Coimbatore. anuisaac_2000@yahoo.com

Obesity may not be as high in India as in the west, but the body composition and metabolism of Indians (and Asians in general) make them especially prone to adiposity and its consequences. The study was undertaken in Ernakulam district, Kerala State, to determine the prevalence of obesity among different age groups of population (8576 subjects constituting preschool, school going, adolescents and adults), associated risk factors of obesity and body composition among normal, overweight and obese adults (904) in the coastal and urban areas. Impact of educational intervention on knowledge and practices of obesity and BMI in adults was also studied. The results of the study indicated that prevalence of overweight and obesity increased with age from 5.4 per cent in the preschool age to 30 per cent in adults (more than five fold) while obesity increased from 4 per cent to 6.7 per cent ($p < 0.01$). By factor analysis, the four important factors that influenced obesity were heredity, food habits, life style and physical activity. With increase in BMI, there was a significant increase in mean of all anthropometric and body composition parameters except stature and body water ($p < 0.01$). Increasing waistline and central obesity was seen to be a characteristic feature of majority of subjects in both areas and higher among females. Regression analysis indicated that for every unit increase in body fat, BMI increases by 0.354. There was a significant decrease in weight and BMI and significant increase in scores on knowledge and practices among subjects on intervention.

JUNIOR AWARD IN EXPERIMENTAL NUTRITION

JAEN-01 IMPACT OF SUPPLEMENTATION OF FUNCTIONAL BEVERAGE ON THE HAEMATOLOGICAL PROFILE, BLOOD GLUCOSE AND SERUM RETINOL LEVEL OF SPORTSWOMEN. *Anupriya Singh*¹, Anita Kochhar and Rajbir Sachdeva, Department of Food and Nutrition, College of Home Science, Punjab Agricultural University, Ludhiana. ¹Email: jasrotia.anu5@gmail.com

Sports drinks are much relevant to the Indian sports scenario because of the fact that many of the Indian sports persons are undernourished and anaemic. Functional beverage was prepared by using whey water, pearl millet, cauliflower leaf powder, banana and jaggery at three different levels i.e. S₁, S₂ and S₃. The developed functional beverage was organoleptically evaluated by a panel of judges and students by using nine-point hedonic scale. Both the panels gave the highest overall acceptability scores to the S₁ level which was prepared by using 2.5 g cauliflower leaf powder, 5 g pearl millet, 10 g jaggery, 20 g banana and 63 ml whey water per 100 ml. The most acceptable level was chemically analyzed. Thirty sportswomen in the age group of 16 to 18 years were selected from Punjab Agricultural University, Ludhiana. The study was divided into two periods i.e. control and experimental. In control period supplementation was not done. In experimental period supplementation of 200 ml developed functional beverage was done for 3 months. The haematological profile, blood glucose and serum retinol level of the subjects were analysed. Significant ($p < 0.01$) improvement was seen in haemoglobin, packed cell volume and mean corpuscular volume after the experimental period i.e. 9.42, 3.19 and 2.08 %, respectively. Seventy seven percent subjects were anaemic before the study which was reduced to fifty percent after 3 months. Significant ($p \leq 0.01$) improvement was also observed in blood glucose and serum retinol level i.e. 12.7 and 5.46 % in the subjects after the experimental period. Hence, it can be inferred from the results that supplementation of functional beverage before the sports training improved the nutritional status of the sportswomen.

JAEN-02 EFFECT OF SUPPLEMENTATION OF DRUMSTICK (*MORINGA OLEIFERA*) AND AMARANTH (*AMARANTHUS TRICOLOR*) LEAVES POWDER ON ANTIOXIDANT PROFILE AND OXIDATIVE STATUS AMONG POSTMENOPAUSAL WOMEN. *Shalini Kushwaha* and Paramjit Chawla. Department of Food and Nutrition, Punjab Agricultural University, Ludhiana, India. Email: shalinikushwaha72@gmail.com

Menopause is a gradual three-stage process that concludes with the end of periods and reproductive life. The antioxidant enzyme system seems to be affected in post-menopause due to deficiency of estrogen, which has got antioxidant properties. The objective of the present study was therefore, to analyze the effect of supplementation of drumstick and amaranth leaves powder on blood levels of antioxidant and marker of oxidative stress. Ninety postmenopausal women aged 45-60 years were selected and divided into three groups viz. Group I, II and III having thirty subjects in each group. The subjects of group II and III were supplemented daily with 7g drumstick leaves powder (DLP) and 9g amaranth leaves powder (ALP), respectively for a period of three months in their diet. The subjects of group I was not given supplementation. Serum retinol, serum ascorbic acid, glutathione peroxidase, superoxide dismutase and malondialdehyde were analysed before and after supplementation. Fasting blood glucose and haemoglobin level of the subjects were also analysed. The data revealed that supplementation of DLP and ALP significantly increased serum retinol (8.8% and 5.0%), serum ascorbic acid (44.4% and 5.9%), glutathione peroxidase (18.0% and 11.9%), superoxide dismutase (10.4% and 10.8) whereas decrease in marker of oxidative stress i.e. malondialdehyde (16.3% and 9.6%) in postmenopausal women of group II and group III, respectively. A significant ($p \leq 0.01$) decrease was also observed in fasting blood glucose level (13.5% and 10.4%) and increase in haemoglobin (17.5% and 5.3%) in group II and group III, respectively. The results indicated that these plants possess antioxidant property and have therapeutic potential for the prevention of complications during postmenopause.

JAEN-03 HYPOCHOLESTEROLEMIC AND HYPOTENSIVE EFFECTS OF PROBIOTIC YOGURT CONTAINING *LACTOBACILLUS ACIDOPHILUS*; *STREPTOCOCCUS THERMOPHILUS* ON AT RISK CORONARY HEART DISEASED MALES. *Mann HK^{*1}*, *Sachdeva R¹* and *Kochhar A¹*. Department of Food and Nutrition¹, Punjab Agricultural University, Ludhiana, Punjab, India Email*. harjotkaurmann@gmail.com

Ninety at risk coronary heart diseased males aged 40 - 50 years, free from serious complications were selected and equally divided into three groups viz. E₁, E₂ and C. Subjects of group E₁ were provided 150 ml of probiotic yoghurt containing *Lactobacillus acidophilus* (MTCC-447) in the inoculum rate of 1.0% and E₂ with 150 ml probiotic yoghurt containing *Lactobacillus acidophilus* (MTCC-447) and *Streptococcus thermophilus* (MTCC-1938) in the inoculum rate of 1.5% for a period of two months respectively, while group C was not given any supplementation. Nutrient intake, blood lipid levels and blood pressure of all the subjects were recorded before and after the supplementation period. It was observed that significant ($p \leq 0.01$) increase in calcium, phosphorus and riboflavin intake was reported in both the experimental groups. After supplementation, it was seen that Total cholesterol decreased from 209.33±5.12mg/dl to 180.06±4.46mg/dl and 212.90±5.61mg/dl to 178.36±4.54mg/dl and Low density lipoprotein Cholesterol level decreased from 127.04±5.25mg/dl to 108.88±4.92mg/dl and 128.44±5.72mg/dl to 106.44±4.94mg/dl in the subjects of group E₁ and E₂ respectively. It was also observed that systolic blood pressure (SBP) also decreased from 131.46±1.62mmHg to 124.16±1.50mm Hg and 132.42±2.10mm Hg to 124.12±2.25mm Hg whereas diastolic blood pressure (DBP) decreased from 86.42±1.24mm Hg to 82.32±1.25mm Hg and 88.24±1.98mm Hg to 83.34±1.68mm Hg in the subjects of group E₁ and E₂ respectively. The improvement was more in E₂ group as compared to E₁ subjects. Any added effect, therefore, is due to the consumption of fermented milk products. The hypocholesterolemic effect of the probiotics has been attributed to their ability to bind cholesterol in the small intestine. Cholesterol can also be converted in the intestines to coprostanol, which is directly excreted in feces. This decreases the amount of cholesterol being absorbed, leading to a reduced concentration in the physiological cholesterol pool. Hence can be a panacea in counteracting the problems of Coronary Heart diseases.

JAEN-04 PREVENTION OF POTENTIAL MOLECULAR TARGETS IN DIABETES BY SPICES AND DIETARY AGENTS: PROFICIENT COMBINATION THERAPY FOR ALLEVIATING OXIDATIVE AND CARBONYL STRESS. Amrita A. Khaire, Nisha G Kemse, Rashmi S Tupe. Rajiv Gandhi Institute of IT and Biotechnology, Bharati Vidyapeeth University, Pune, India. Email: rashmitupe@gmail.com

Glycation and Advanced glycation end products (AGEs) are known to be associated with increased free radical production in diabetes. Many spices and dietary agents have been practiced to control diabetes and complications. In present study, we analysed 26 antidiabetic plants to evaluate *in vitro* protein glycation inhibitory activity using the model system of bovine serum albumin-fructose and were further tested by 5 different *in vitro* antiglycation assays such as estimations of protein carbonyl groups, thiols, binding of Congo red, AGEs and Thioflavin T fluorescence. These same plants were assayed for *in vitro* antioxidant activity using 7 estimations like phenol content, reducing power and scavenging ability for radicals like 2,2'-diphenyl-1-picrylhydrazyl (DPPH), 2, 2'-azinobis (3 ethyl-benzothiazoline 6 sulphonic acid) (ABTS), nitric oxide, hydrogen peroxide, lipid peroxidation inhibition. Overall results indicated that among spices *T. foenum graecum*, *A. graveolens*, *L. nobilis*, *C. cyminum*, *C. sativum* were having significant antiglycation potential. Whereas *P. vulgaris*, *C. grandis*, *A. catechu*, *M. charantia*, *L. usitatissimum* were found to be most promising among dietary agents. Antioxidant studies revealed that *C. burmannii* exhibited high antioxidant potential followed by *S. aromaticum*, *L. nobilis*, *S. alternifolium*, *M. koenigii* in spices. Among dietary agents, *C. sinensis*, *A. catechu*, *M. arvensis*, *P. vulgaris* and *L. officinale* were most prominent antioxidants. *A. graveolens*, *L. nobilis*, *P. vulgaris*, *A. catechu* showed good antiglycation as well as the antioxidative potential. The antiglycation and antioxidative activities of these plants might suggest a possible role in preventing further diabetic complications by targeting oxidative and carbonyl stress conditions.

JAEN-05 NUTRACEUTICAL POTENTIALS OF CAROTINO OIL. Ramya Siva Selvi M¹, Kowsalya S¹, Ramalingam S², Vijaya D², Ramanathan M² and Sudha Ramalingam². ¹Department of Food Science and Nutrition, Avinashilingam Institute for Home Science and Higher Education for Women (University), ²PSG Institute of Medical Science and Research and PSG College of Pharmacy, Coimbatore, Tamil Nadu, India. Email – ID: manorani87@gmail.com

Carotino oil, a blend of canola oil (80%) and red palm fruit (20%) is rich in nutraceuticals. It is highly nutritious and 100 per cent natural oil. Carotino is recently introduced in India. Hence, the study aimed at evaluating the nutrient and nutraceutical potentials of carotino oil, to study the effect of carotino oil supplementation on blood glucose and antioxidant enzymes in streptozotocin induced diabetic rats and to study the impact of supplementation of carotino oil on blood glucose, lipid profile and antioxidant status in healthy subjects. The results proved that carotino oil is rich in nutrient and nutraceuticals. Low dose of carotino oil in streptozotocin induced diabetic rats brought about significant improvement in antioxidant enzymes and maintained blood glucose level. Further study in healthy volunteers proved that carotino oil maintained blood glucose level, reduced blood lipid profile and improved antioxidant status. Hence, carotino can be recommended for degenerative disorder namely, type II diabetes mellitus and this study is a novel one and the results assumes significance in Indian Context.

JAEN-06 IMPACT OF SUPPLEMENTATION OF HEART FRIENDLY MIX ON THE LIPID PROFILE OF CARDIOVASCULAR PATIENTS. S Sindhu*, N Bhooma, P Vidya, Department of Food Science and Nutrition, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu, India. *E-mail – sindhufsn@gmail.com

Cardiovascular diseases (CVD) are life threatening which accounts for 25 per cent of all deaths in India. It is therefore necessary to consider the pathogenesis of CVD and examine their relationship to the existing dietary habits. A special food supplement was formulated and standardized by combining barley, soy flour, amla, curry leaves, pumpkin, onion, garlic, almond and flaxseed in varying different proportions. The active components present in the selected heart friendly foods were having special benefits on the lipid profile of the cardiovascular patients. The standardized heart friendly mix was analyzed for the nutrients like total carbohydrates, total protein, fat, crude fibre,

iron, vitamin A, vitamin C, sodium and potassium using standardized procedures. In Coimbatore city, 20 cardiovascular patients (experimental group-10 and control group-10) were interviewed to elicit their socio-economic background, lifestyle patterns, dietary habits and health condition. Their nutritional status was assessed using anthropometric measurements (height, weight, BMI, Waist-Hip Ratio), biochemical estimation (haemoglobin and lipid profile) and dietary survey (three day recall method). The experimental group received 100g of the standardized heart friendly mix for a period of two months where as the control group received no supplements. After the period of supplementation, the effect of supplementation of heart friendly mix was analysed using the parameters such as anthropometric measurements and biochemical estimation. The results revealed that the formulated and standardized heart friendly mix has got significant cholesterol lowering effect thus reduces the risk for cardiovascular diseases.

JAEN-07 ANTIOXIDANT PROPERTIES OF RAW AND COOKED COLORED RICE VARIETIES (*Oryza sativa*). *J Sridevi and Jemima Beryl Mohankumar, Department of Nutrition and Dietetics, PSG College of Arts and Science, Coimbatore, Tamil Nadu, India. *Email: sridevij86@gmail.com

Black and red rice varieties contain bioactive components, which plays an effective role in preventing various degenerative diseases. However, the available information with regard to the total antioxidant activity (TAC) and radical scavenging activity (RSA) of these rice varieties were found to be meagre. Therefore, the present work has been carried out to study the total antioxidant content of raw, pressure cooked and conventionally cooked rice varieties. The methanolic and water extracts were prepared for the estimation of the total phenolics content (TPC) and flavonoids, RSA by Hydroxyl radical scavenging activity and reducing power assay and TAC by ABTS and DPPH assay. The methanolic extract of uncooked black rice and red rice exhibited higher phenolic (489.94±0.881mg/100g, 487.87±0.453mg/100g) and flavonoid content (195±0.881mg/100g, 184±0.881mg/100g), hydroxyl radical scavenging activity (79.56%, 71.21%(pressure cooked sample of red rice)) and reducing power activity (1.89 OD₇₀₀, 2.357 OD₇₀₀). TAC measured using DPPH assay was 74.59%, 88.82% (concentration level of 600µg and 700µg) and ABTS assay was 89.62%, 86.6% in uncooked black rice and the red rice sample extract. Consequently we found that the pressure cooked and conventionally cooked samples of black rice, red rice and white rice reported less DPPH and ABTS contents than the raw samples followed by conventionally cooked samples. Hence it may be concluded that in population using rice as staple food, may substitute black rice or red rice varieties for the commonly used white rice.

JAEN-08 NEED FOR EVOLVING NON-INVASIVE AND LOW-COST SCREENING STRATEGIES AT POPULATION LEVEL. Nitya Elayath, Uma Iyer, Swati Dhruv and Annupreet Kaur Khalsa, Department of Foods and Nutrition, Faculty of Family and Community Sciences, M S University of Baroda. E-mail: nits_e@yahoo.co.in

Aim: To examine the clinico-biochemical changes in the middle-aged adults attending a health check up facility. *Design & Sample:* Cross-sectional study of 422 middle aged subjects (213 females and 209 males). *Methods and Materials:* Information on socioeconomic background, medical history, dietary and lifestyle behaviours were elicited through a semi structured pre-tested questionnaire. Anthropometric measurements, blood pressure and parameters in blood & serum were assessed using the standard protocols. *Results:* Significant percentage of the study population was found to be overweight (16.1%), obese (66.5%); and abdominal obese as well (93.8%). Hypertension was diagnosed in 68% of the participants. Nearly 41.1% had sub-optimal glucose level & half of them had metabolic syndrome. Almost 71.1% had high Low Density Lipoprotein levels. As high as 40% of the subjects had high frequency of eating fried snacks and almost 16% never had fruits. Hypertension was associated with metabolic derangements with hypertensive subjects having significantly (p<0.001) higher fasting blood sugar (FBS) values than the normotensive subjects. Waist stature ratio was found to explain a significant amount of variation in systolic blood pressure and FBS through multiple linear regression analysis. *Conclusions:* Monitoring with the simple, non-invasive, cost effective anthropometric tools WC & WSR and blood pressure on routine basis should be done as they are major contributing factors for the development of chronic diseases.

JAEN-09 DIFFERENTIAL REGULATION OF CORD BRAIN DERIVED NEUROTROPHIC FACTOR LEVELS IN TERM AND PRETERM PREECLAMPSIA. Vandita D'Souza¹, Anitha Kilari¹, Asmita Kulkarni¹, Savita Mehendale², Hemlata Pisal¹ and Sadhana Joshi¹. ¹Department of Nutritional Medicine, Interactive Research School for Health Affairs, ²Department of Obstetrics and Gynecology, Bharati Medical College and Hospital, Bharati Vidyapeeth University, Pune, India. Email: srjoshi62@gmail.com

Preeclampsia is a unique hypertensive disorder in pregnancy leading to maternal and fetal morbidity. Our earlier studies in preeclampsia suggest a causal relationship between altered angiogenic factors and birth outcome. Recent studies suggest that brain derived neurotrophic factor can stimulate angiogenesis. The present study for the first time compares the levels of brain derived neurotrophic factor both in maternal and cord samples in women with preeclampsia (n=106) [delivering at full term (n=60) and preterm (n=46)] and normotensive women (n=95) (control) delivering at term. Maternal brain derived neurotrophic factor levels were reduced in women with preeclampsia delivering term (p<0.01) and preterm (p<0.01) as compared to normotensive women. Cord brain derived neurotrophic factor levels were higher (p<0.01) in women with preeclampsia delivering at term while it was lower (p<0.01) in women delivering preterm. Maternal brain derived neurotrophic factor levels were negatively correlated with both systolic (p < 0.01) and diastolic blood pressure (p<0.01). Our data for the first time suggests a possible role for BDNF in the pathophysiology of preeclampsia. Differential regulation of cord brain derived neurotrophic factor levels in preterm preeclampsia as compared to term preeclampsia suggest that children born to such mothers may show differential neurodevelopmental effects in later life.

JAEN-10 MATERNAL OMEGA 3 FATTY ACIDS AND MICRONUTRIENTS AFFECT PLACENTAL FATTY ACID DESATURASES AND TRANSPORT PROTEINS IN WISTAR RATS. Nisha S Wadhvani, Kamini D Dangat, Asmita V Kulkarni, Sadhana R Joshi* Interactive Research School for Health Affairs (IRSHA), Bharati Vidyapeeth University, Pune. *E-mail: srjoshi62@gmail.com

Adequate supply of some LCPUFA from the maternal plasma by placental transport proteins with their further optimization by desaturases is crucial for fetal normal growth and development, since their synthesis is known to be very low in fetus. This present study examines the effect of maternal micronutrients (folic acid and vitamin B12) and omega 3 fatty acids on mRNA levels of fatty acid desaturases and transport proteins in the placenta. Pregnant female rats were divided into 6 groups at 2 levels of folic acid both in the presence and absence of vitamin B₁₂. Both the vitamin B₁₂ deficient groups were supplemented with omega 3 fatty acid. Maternal vitamin B12 deficiency reduced placental mRNA levels of Δ 5 desaturase (p<0.05) but not Δ 6 desaturase as compared to control. Omega 3 fatty acid supplementation to these deficient diets improved mRNA level of Δ 5 desaturase. mRNA levels of FATP1(Fatty acid transport protein-1) were lower in the vitamin B12 deficient groups and they reverted back to control levels as a result of omega 3 fatty acid supplementation. There was however no change in FABP3 (Fatty acid binding protein-3) mRNA levels as compared to control. Our data for the first time indicates that altered maternal micronutrients and omega 3 fatty acids play a key role in regulating fatty acid transport and desaturase protein expression in the placenta.

JAEN-11 MATRIX METALLOPROTEINASE-1 AND MATRIX METALLOPROTEINASE-9 IN HUMAN PLACENTA DURING SPONTANEOUS VAGINAL DELIVERY AND CAESAREAN SECTIONING IN PRETERM PREGNANCY. Deepali P Sundrani¹, Preeti M Chavan Gautam¹, Madhavi V Dhobale¹, Hemlata R Pisal¹, Savita S Mehendale², Sadhana R Joshi^{1*}. ¹Department of Nutritional Medicine, Interactive Research School for Health Affairs, Bharati Vidyapeeth University, Pune, India. ²Dept of Obstetrics and Gynecology, Bharati Medical College and Hospital, Bharati Vidyapeeth University, Pune, India. *E-mail: srjoshi62@gmail.com

Pre-term birth is a major public health problem in terms of loss of life, long-term and short-term disabilities both in the developing and developed countries. The process of parturition (both term and preterm) involves intensive remodelling of the extracellular matrix (ECM) in the placenta and fetal membranes by matrix metalloproteinases (MMPs). The present study examines the placental levels of MMP-1 and MMP-9 and their association with placental docosahexaenoic acid (DHA) in 74 women delivering preterm (52 by spontaneous

vaginal delivery and 22 by caesarean sectioning) and 75 women delivering at term (59 by spontaneous vaginal delivery and 16 by caesarean sectioning). Placental MMP-1 levels were higher in women delivering preterm (both by spontaneous vaginal delivery ($p < 0.05$) and caesarean sectioning) as compared to those delivering at term. In contrast, placental MMP-9 levels in preterm pregnancies was higher ($p < 0.05$) in women with spontaneous vaginal delivery while lower ($p < 0.05$) in women delivering by caesarean sectioning. Low placental DHA was associated with higher placental MMP-9 levels. Our study suggests a differential effect on the levels of MMPs from placenta, which is dependant on the mode of delivery. Our study for the first time indicates a causal association of DHA and the levels of MMP in human placenta although the mechanisms need further study.

YOUNG SCIENTISTS' AWARDS SESSION - II

JUNIOR AWARD – COMMUNITY NUTRITION

Date :12th November 2011

Time: 1.30 p.m. – 3.20 p.m.

Code No.	Name and Address	Title of Presentation
JACN-01	Ms. Snehasree Saha Participant, M.Sc (Applied Nutrition) Course National Institute of Nutrition (ICMR) Hyderabad	Knowledge and Practices of Using Food Label Information Among School-Going Adolescents In Kolkata, India
JACN-02	Ms. J. Anu Bhushani Avinashilingam University for Women, Coimbatore, Tamil Nadu, India	Body Composition Measures of Overweight and Obese Adolescent Girls of 15 – 19 Years Age
JACN-03	Ms. Priya Singla Department of Food and Nutrition College of Home Science Punjab Agricultural University Ludhiana	Efficacy of Nutrition Counselling on Haematological Profile, Clinical and Morbidity Status Related to Junk Foods among Adolescent Girls of Working Mothers
JACN-04	Ms.. Uttara Singh Dept. Food and Nutrition College of Home Science Punjab Agricultural University, Ludhiana	Effect of Supplementation of Bael (<i>Aegle Marmelos L.</i>) and Nutrition Counselling on Blood Glucose, Lipid Profile and Blood Pressure of Non-Insulin Dependent Diabetics
JACN-05	Ms. Richa Pritwani Department of Food and Nutrition Lady Irwin College, University of Delhi New Delhi, India	Evaluation of Food Safety Aspects of Meals Served Under A Scheme for Urban Poor
JACN-06	Ms. Megha Vishwanathan Department of Foods, Nutrition and Dietetics, College of Home Science, Nirmala Niketan, Mumbai.	Dyslipidemia in Women with Polycystic Ovarian Syndrome.
JACN-07	Ms. Kalai Selvi. E Department of Food Science and Nutrition, Avinashilingam Institute for Home Science and Higher Education for Women Coimbatore, Tamil Nadu	Development and Evaluation of Educational Modules on Food Safety for Street Food Vendors and Food Handlers
JACN-08	Ms. P. Muthulakshmi Department of Food Science and Nutrition Avinashilingam University For Women Coimbatore, Tamil Nadu	EFFECT OF SUPPLEMENTATION OF A MULTINUTRIENT CHOCOLATE BAR ON NUTRITIONAL STATUS AND ATHLETIC PERFORMANCE

Code No.	Name and Address	Title of Presentation
JACN-09	Ms. Vidya Narasimhan Department of Food Service Management and Dietetics Avinashilingam College for Women, Coimbatore, India.	Quality of Life among Selected Young Type I Diabetics
JACN-10	Ms. Roopa U. Department of Food Science and Nutrition University of Agricultural Sciences Dharwad, Karnataka.	Impact of Little Millet Based Sports Food Supplementation on Nutritional Status and Physical Fitness of Sports Persons
JACN-11	Ms. Deepa Prakash DOS Food Science and Nutrition University of Mysore, Mysore, India.	Impact of Nutrition Education for Children and Parents on their Nutrition Knowledge Scores and Food Behaviour of Children

JUNIOR AWARD IN COMMUNITY NUTRITION

JACN-01 KNOWLEDGE AND PRACTICES OF USING FOOD LABEL INFORMATION AMONG SCHOOL-GOING ADOLESCENTS IN KOLKATA, INDIA. *Snehasree Saha*¹, Vishnu Vardhana Rao M², Subba Rao GM³. ¹Participant, M.Sc (Applied Nutrition) Course, National Institute of Nutrition (ICMR), ²Division of Bio-statistics, National Institute of Nutrition, ICMR, Hyderabad, ³Extension and Training Division, National Institute of Nutrition, ICMR, Hyderabad, India. E-mail: sneha.snehasree16@gmail.com

INTRODUCTION: Obesity is growing among adolescents in India. Consumption of processed foods is an important risk factor. Food labelling can serve as a population-based approach to help consumers make healthy food choices. There are hardly any studies to assess the use of food labels among consumers. The current study attempted to assess the knowledge and use of food labels among adolescents for making food choices. **METHODOLGY:** The study was conducted in Kolkata. A total of 6 schools were selected from 3 natural regions of Kolkata (1 Government & 1 private from each zone) using stratified random sampling technique. Data was collected using a pre-tested, pre-coded, self-administered questionnaire containing 23 questions aimed at assessing knowledge of food labels and practices of using them. **RESULTS:** Over 90% of respondents reported that they check food labels; however, many of them checked only Manufacturing Date (79%), Expiry (74%) or Best-before Date (65%). However, checking for ingredients (50%) and nutrient (20%) was comparatively low. Almost 66% felt labels too complex to understand and 71% of them prefer symbol based labelling. There was no significant ($P < 0.01$) relationship between socio-economic background of students and checking label information. **CONCLUSION:** Although many adolescents check food labels, they check only aspects relating to shelf-life of the product and not nutrition information. As most of them cannot make sense of nutrition information, there is a need for nutrition education to promote choice of healthy foods. Symbol-based labelling can also be experimented in place of the text-dominated labels.

JACN-02 BODY COMPOSITION MEASURES OF OVERWEIGHT AND OBESE ADOLESCENT GIRLS OF 15 – 19 YEARS AGE. *J Anu Bhushani*, S Kowsalya, S Premakumari. Avinashilingam University for Women, Coimbatore, Tamil Nadu, India. Email: anubhushani@gmail.com

Studies on body composition of adolescent girls using Bioelectrical Impedance Analysis [BIA] method are scarce in India. The objectives of the study were to assess the body composition parameters of normal, overweight and obese adolescent girls aged 15 – 19 years and to find out the associations between anthropometry and body composition. Body composition of 45 adolescent girls, consisting of three groups of 15 normal, overweight and obese adolescents in each, was assessed using 'Bio Space, In Body 720 – the precision body composition analyzer', which works on the principle of BIA. The findings revealed that Body Fat Mass [BFM], Per cent Body Fat [PBF], skeletal muscle mass [SMM], soft lean mass, protein and mineral content of the body increased proportionately with body weight among the selected adolescents. There existed a significant ($p < 0.01$) difference in BFM, PBF and visceral fat area among the three groups. Body composition parameters such as Fat free mass, total body water, protein, SMM, mineral, bone mineral content and body cell mass on comparison among normal vs. overweight and normal vs. obese subjects showed a significant difference ($p < 0.01$). High degree of positive correlation was found between body fat mass among PBF, fat free mass, total body water and protein in obese subjects. SMM and body cell mass showed positive correlation with weight in all the subjects. Waist hip ratio showed positive correlation with body fat mass, PBF, fat free mass and protein in obese subjects. The findings revealed the importance of body composition analysis in adolescent girls.

JACN-03 EFFICACY OF NUTRITION COUNSELING ON HAEMATOLOGICAL PROFILE, CLINICAL AND MORBIDITY STATUS RELATED TO JUNK FOODS AMONG ADOLESCENT GIRLS OF WORKING MOTHERS. *Priya Singla*, Rajbir Sachdeva and Anita Kochhar. Department of Food and Nutrition, Punjab Agricultural University, India. Email: prsingla206@gmail.com

Sixty adolescent girls of working mothers aged 16-18 years who used to eat junk foods frequently were selected from two schools in Ludhiana and divided equally into two groups viz. Experimental (E) and Control (C). The data on demographic information, junk food consumption pattern, nutrient intake, clinical, morbidity and haematological profile were recorded before and after nutrition counselling. Nutrition counselling was imparted for

a period of three months. It was observed that 86.7 & 93.3 per cent of subjects spent their monthly pocket money on junk foods in group E & C and majority ate junk foods once a week at least. It was observed that junk foods contributed to 54 & 57 per cent and 50 & 54.32 per cent to total energy intake in group E & C before and after nutrition counselling respectively. The daily intake of energy, protein, β -carotene, niacin, vitamin B₁₂, iron, calcium was less than ICMR (2010) recommendations, while intake of fats, thiamine and ascorbic acid was adequate in group E after nutrition counselling. There was an overall improvement in the clinical and morbidity status in group E, while no change was observed in group C. It was observed that mean Hb levels were 9.14 \pm 1.56 and 9.78 \pm 1.32 g/dl in group E and 8.56 \pm 1.67 and 8.64 \pm 1.67g/dl in group C before and after nutrition counselling respectively. All the subjects in both the groups were anaemic during the study period. It was suggested that there is need to impart nutrition counselling for longer duration to improve their dietary habits.

JACN-04 EFFECT OF SUPPLEMENTATION OF BAEI (*AEGLE MARMELLOS L.*) AND NUTRITION COUNSELLING ON BLOOD GLUCOSE, LIPID PROFILE AND BLOOD PRESSURE OF NON-INSULIN DEPENDENT DIABETICS. *Uttara Singh*¹ and Anita Kochhar. Food and Nutrition, Punjab Agricultural University, Ludhiana, India, ¹Email: usuttarasingh@gmail.com

One hundred twenty non-insulin dependent diabetic subjects were selected from Punjab Agricultural University and Civil Hospital of Ludhiana. The selected subjects were divided into four groups viz. group I, II, III and IV having thirty subjects each. The subjects of group I was not given any treatment. The subjects of group II, III and IV were supplemented with 2 gm of bael (*Aegle marmelos L.*) leaf, pulp and seed powder respectively for a period of three month and supplementation was continued along with nutrition counselling for the next three months. The nutrition education was given for three months after fifteen days interval to the subjects of group II and III through individual and group contact. The blood glucose and lipid profile were analysed. The blood pressure of the subjects was also measured. It was found that there was significant reduction ($P\leq 0.01$) in fasting blood glucose level by 16.1, 10.8 and 11.4% and post prandial blood glucose level 11.5, 27.3 and 12.9% in the subjects of group II, III and IV respectively after the study and a non-significant reduction ($P\leq 0.01$) was seen in the subjects of group I. It was observed that significant reduction ($P\leq 0.01$) in total cholesterol 7.8, 9.3 and 5.0%, triglycerides 10.9, 8.5 and 6.6%, LDL-C 10.7, 9.9 and 6.4%, VLDL-C 16.7, 12.4 and 10.4% and an increase in HDL-C 16.9, 19.4 and 4.8% in the subjects of group II, III and IV respectively. The ratio of total cholesterol to HDL-C reduced from 6.3 to 4.9, 4.6 to 3.8 and 5.8 to 4.8 and LDL-C to HDL-C were reduced from 4.6 to 3.1, 4.2 to 3.4 and 4.2 to 3.4 in the subjects of group II, III and IV respectively after the study. There were also a significant decrease ($P\leq 0.01$) in the blood pressure of the subjects in group II, III and IV and a non-significant decrease ($P\leq 0.01$) were seen in the subjects of group I. Therefore, it can be reported from the results that supplementation of bael (*Aegle marmelos L.*) leaf, pulp and seed powder along with nutrition counselling significantly improved the nutritional status of the diabetic patients.

JACN-05 EVALUATION OF FOOD SAFETY ASPECTS OF MEALS SERVED UNDER A SCHEME FOR URBAN POOR. *Richa Pritwani*, Kalyani Singh and Pulkit Mathur. Department of Food and Nutrition, Lady Irwin College, University of Delhi, New Delhi, India. Email: richapritwani@yahoo.com

The present study was undertaken to assess safety of food catered to the poor under a newly initiated scheme in a metropolitan city. Food samples (n=45) collected from 5 distribution centres, were analysed microbiologically for Total plate count (TPC), coliform count, *E.coli*, coagulase positive *staphylococci*, *Bacillus cereus* and yeast and mould count. A total of 75 samples including surfaces, equipment and hands were also microbiologically analysed. An observation checklist cum interview schedule was used to evaluate production and distribution premises, food material handling practices and personal hygiene practices. Microbiological analysis revealed that rice of almost all centres, *Chole* and *aloo sabzi* of 2 centres, *kadhi*, *kheer*, *puris*, *rajma* and *parantha* of one centre each were not safe for consumption. Microbial counts of all samples of *dal* and *chapatti* were found to be in acceptable range. Vessels holding cooked food were contaminated with pathogens. HACCP plans were drawn out for dishes with high level of contamination to identify critical control points and suggest control measures. Thorough hand washing before touching food at any stage during preparation, washing of raw vegetables before and after peeling to remove all traces of visible dirt and ensuring cleanliness of utensils used for holding cooked dishes are recommended. Use of safe water is critical and it should not be assumed that

cooking would destroy all microbes introduced during lapses in food material handling. Consumer response was on the whole positive for the scheme. A continuous awareness and training programme for food handlers is of vital importance in ensuring service of safe food.

JACN-06 DYSLIPIDEMIA IN WOMEN WITH POLYCYSTIC OVARIAN SYNDROME. *Megha Vishwanathan and G Ibrahim.* Department of Foods, Nutrition and Dietetics, College of Home Science, Nirmala Niketan, New Marine Lines, Mumbai, Maharashtra. Email: megha.vishwanathan@gmail.com

Polycystic Ovarian Syndrome (PCOS) is much more than just oligomenorrhea, amenorrhea, or infertility. PCOS encompasses many long-term health problems such as the development of cardiovascular disease, type2 diabetes mellitus, and prolonged exposure to unopposed estrogen, which can lead to endometrial hyperplasia and endometrial carcinoma. Dyslipidemia is the most common metabolic abnormality found in women with PCOS. This study was aimed at assessing the risk for dyslipidemia syndrome in women with PCOS. 30 women each with and without PCOS were included in the study and subjected to various parameters like anthropometric measurements, biochemical parameters as per guidelines given by NCEP and ATP III criteria for diagnosis of metabolic syndrome and used to assess the risk for metabolic syndrome. The dietary analysis was done to rule out the possibility of contribution of faulty diets to metabolic syndrome. 71.42% of women with PCOS had family history of PCOS, indicating a strong familial component. Irrespective of treatment, women with PCOS had irregular menses ($\chi^2=15.907$, $p<0.001$). However there was no significant difference in the blood pressure. Glycosylated haemoglobin showed a significant difference between both groups ($t=4.001$, $p<0.01$). 17.2% women with PCOS had elevated cholesterol. The parameter differed significantly ($t=2.14$, $p<0.01$). Women with PCOS (32.1%) had significantly higher serum Triglyceride levels ($t=2.301$, $p<0.01$). 58.6% of women with PCOS had elevated LDL concentrations, which was significant ($t=4.338$, $p<0.01$). A typical characteristic of metabolic syndrome; depressed HDL levels were found in women with PCOS with a significant difference ($t=-6.204$, $p<0.01$). However no significant difference was found in the fasting insulin concentrations between both groups. When women with PCOS were considered individually and screened for metabolic syndrome on the basis of NCEP, ATP III criteria, it was found that 50% of women were positively identified with metabolic syndrome, indicating a high prevalence of metabolic syndrome. The risk of metabolic syndrome is high even at a young age, highlighting the importance of early and regular screening.

JACN-07 DEVELOPMENT AND EVALUATION OF EDUCATIONAL MODULES ON FOOD SAFETY FOR STREET FOOD VENDORS AND FOOD HANDLERS. *Kalai Selvi E, Kowsalya S, Premakumari S.* Department of Food Science and Nutrition, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu, India. E.mail: kalaiselvidas@gmail.com

Food safety issues are gaining importance throughout the world. National food safety strategies are required and food handlers and street vendors play an important role. The objective of this study was to assess the Knowledge, Attitude and Practices (KAP) of street vendors and food handlers from small-scale food establishments and to develop educational modules to impart Food Safety Education (FSE). Urban areas from 4 zones of Coimbatore were selected and 31 street vendors and 30 food handlers from small-scale food establishment were chosen by "purposive sampling". The KAP on food safety of these street vendors and food handlers were assessed by quantitative and qualitative methods using questionnaire and interview schedule. The KAP at initial stage was assessed followed by imparting FSE to 15 street vendors and 15 food handlers for a period of one month. FSE focussed on hygienic practices, safety measures, environmental safety, cleanliness, HACCP and food quality using the developed educational module. The impact of education brought about significant ($p<0.01$) improvements in KAP of street food vendor and food handler. The gain in score for knowledge was from 11.4 to 12.6, for attitude/practices towards food safety was from 2.87 to 2.97, for attitude/practices towards personal health and hygiene was from 1 to 1.67, for safety and hygienic practices was from 1.6 to 2.13, for attitude and practices towards cooking was from 1.27 to 1.73. This proves the efficacy of FSE using appropriate Educational Modules.

JACN-08 EFFECT OF SUPPLEMENTATION OF A MULTINUTRIENT CHOCOLATE BAR ON NUTRITIONAL STATUS AND ATHLETIC PERFORMANCE. *P Muthulakshmi* and *M Sylvia Subapriya*. Department of Food Science and Nutrition, Avinashilingam University For Women, Coimbatore, Tamil Nadu, India. Email id: madhumuthu.436@gmail.com

Nutritious, well balanced and conducive diet can enhance the performance of athletes whereas unbalanced diet can equally spoil the performance. A balanced diet is all that is necessary to meet the nutrient needs and restore the nutritional status to normal following competition or daily hard physical training. Sports nutrition has many modes to enhance performance. The present study was conducted to assess the effects of supplementation of a multinutrient chocolate bar among athletes. The study was conducted at YMCA, The College of Physical Education in Chennai. A group of 50 athletes (25 each of swimmers and runners) were selected and a specially designed interview schedule was given to elicit the background information, dietary pattern, life style pattern, psychological and performance parameters (muscular strength, flexibility, balance, resting heart rate and blood pressure) of the athletes. A multinutrient chocolate bar was formulated, standardized, analysed for nutrient content and supplemented for three months to ten athletes from each sub sample of swimmers (SEG) and runners (REG), for three months. Fifteen athletes each formed the control groups (SCG and RCG) and who received no supplementation. The impact showed that among swimmers, there was a significant increase in lean body mass and body mass index of the experimental group. Biochemical profile showed a significant improvement in random blood sugar, serum globulin and blood lactate. Intake in energy, protein, fat calcium, iron, phosphorous, sodium and potassium were increased in both the swimmers and runners after supplementation. A significant change was observed in muscular strength, flexibility ($p < 0.01$) and balance ($p < 0.05$) in the SEG compared to the SCG. Statistically significant positive correlation was observed between MUAC and body weight ($p < 0.05$), BMI ($p < 0.01$), wrist circumference ($p < 0.05$), waist ($p < 0.01$), hip circumference ($p < 0.05$) and flexibility showed a negative correlation at one percent level. A high negative correlation was observed between waist hip ratio and muscular strength at one percent level. Waist hip ratio and flexibility ($p < 0.05$) showed a negative correlation. In runners, there was a significant gain in waist hip ratio ($p < 0.05$) and the lean body mass ($p < 0.01$) between REG and RCG. Biochemical profile shows that a significant change in random blood sugar, serum globulin, albumin globulin ratio. Serum ferritin and blood lactate ($p < 0.01$) and hemoglobin ($p < 0.05$) level between the experimental and control groups. The muscular strength ($p < 0.01$) and balance ($p < 0.05$) were higher in the experimental group compared to the control group (REG and RCG). There was a positive correlation observed between MUAC and waist ($p < 0.01$), hip ($p < 0.05$) and body fat ($p < 0.01$). Weight, BMI, wrist circumference, waist hip ratio and flexibility showed no correlation with MUAC among the runners. A statistically significant positive correlation was observed between lean body mass and flexibility at one percent level.

JACN-09 QUALITY OF LIFE AMONG SELECTED YOUNG TYPE I DIABETICS. *Vidya Narasimhan* and *Uma Mageshwari*, Department of Food Service Management and Dietetics, Avinashilingam College for Women, Coimbatore, India. Email: vidyaharesh2009@gmail.com

Type I diabetes mellitus is long been linked with quality of life of children, negatively affecting developmental changes, independence, body image, sexuality, relationships, self-esteem required for normal growth and maturation. Thus making children feel "different" from their peers. Currently unpredictable, a diagnosis means life long commitment to insulin injections and monitoring health complications. Hence, the objectives of the present study were to assess the quality of life of type I diabetics and an understanding of their physical, social, mental functioning, overall well being and general satisfaction with life. Fifty type I diabetics were chosen for the study and details pertaining to background information, medical history, anthropometric measurements, life style and dietary pattern were ascertained using appropriate tools. Quality of life aspects of the selected type I diabetics was studied using a three pronged approach by assessing academic performance, general well being, skills and attitudes and compared with non-diabetics. Results revealed that academic performance of non-diabetics were far better than type I diabetics, despite a well-developed diabetes care system. It was observed that many children with diabetes had emotional / behavioural problems with higher rates of depression and poorer quality of life. Physical activity and lifestyle patterns also had significant impact over the life of diabetic children. Diabetes therefore disrupts a child's life at school. Hence caring for diabetic children forms an integral part of management. With a positive approach and emotional support, type I diabetics can be enabled to understand that they are socially accepted and not different.

JACN-10 IMPACT OF LITTLE MILLET BASED SPORTS FOOD SUPPLEMENTATION ON NUTRITIONAL STATUS AND PHYSICAL FITNESS OF SPORTS PERSONS. *Roopa U*, Kasturiba B and Rama K Naik. Department of Food Science and Nutrition, University of Agricultural Sciences, Dharwad, Karnataka, India.. Email: roopsu.08@gmail.com

Millets are being adjudged as miracle grains and potential future crops, besides potentials of cultivation under stress conditions with meager inputs. Proper nutrition helps athletes to achieve good physique, improve performance, prevent injury and enhance recovery after exercise besides improving the general health. Sports food was formulated from little millet, soybean, sugar powder, skimmed milk powder and cardamom powder, as per the guidelines of ICMR. The porridge from nutrient dense sports food was highly accepted by the consumers. The supplementation of sports food for 90 days significantly improved the weight (65.14 – 65.58 kg), BMI (21.14 – 21.30 kg/m²) and haemoglobin level (12.39 – 12.83 g/dl) of supplemented group compared to control group of sports persons. Improvement in physical fitness components of experimental group was observed upon supplementation with sports food compared to control group. A significant improvement in flexibility by 0.86 per cent, cardiac efficacy score by 4.69 per cent, strength by 7.27 percent and endurance capacity by 26.86 percent were recorded. No such improvement was observed in control group.

JACN-11 IMPACT OF NUTRITION EDUCATION FOR CHILDREN AND PARENTS ON THEIR NUTRITION KNOWLEDGE SCORES AND FOOD BEHAVIOUR OF CHILDREN. *Deepa Prakash* and Jamuna Prakash. DOS Food Science and Nutrition, University of Mysore, Mysore, India. Email: deepa474@gmail.com

Indian children are growing up in an obesogenic environment and are prone to developing maladaptive food behaviours resulting in impaired growth. Food behaviour formed in childhood impacts health lifelong. Parents play a significant role in the development of food behaviour of their children. The objective of this study was to explore the impact of nutrition education modules for children and their parents based on observational learning with reinforcement by operant conditioning to elicit autosuggestion for improved nutritional knowledge, food behaviour and increased dietary diversity. The study comprised of children between ages 6-12 years and their parents. A standardised pre-assessment and post-assessment control group design assessed food behaviour (n 1200) and nutrition knowledge (n 658) by a specifically designed questionnaire evaluation tool. Baseline nutrition knowledge of the children and parents was 46% and 55% respectively. Post intervention, nutrition knowledge of either group improved irrespective of their attending the program ($p < 0.001$), however a significantly higher improvement was observed in the test group. Food behaviour patterns showed an overall limited dietary diversity before the intervention and a high incidence of television viewing during meals and snacks (94%) in either group. Post intervention, the test group showed improved dietary diversity and significantly reduced television viewing during meals and snacks (38%). A significant improvement was recorded in the qualitative assessment of breakfast and school snacks in the test group. There is a need for nutrition education in schools for students and their parents, to improve their knowledge and food behaviour.

FREE COMMUNICATIONS

ORAL PRESENTATIONS

Friday, 11th November 2011

4.30 p.m. – 6.10 p.m.

COMMUNITY NUTRITION AND CLINICAL NUTRITION

Code	Name	Title of Presentation
COMMUNITY NUTRITION		
OPCN-01	Dr. Padmini Balagopal Principal Investigator and Nutrition Consultant in the United States and India	Exclusive Breastfeeding: on the Cutting Edge for Prompt Initiation and Support
OPCN-02	Dr. Ali Jafar Abedi J.N. Medical College Aligarh Muslim University, Aligarh	Determinants of Acute Malnutrition In Preschool Children
OPCN-03	Dr. Tinku Thomas St John's Research Institute St John's National Academy of Health Sciences, Bangalore India	Clustering of Diet and Physical Activity Behaviours in Parents and Offspring and Its Relation to Overweight in Offspring
OPCN-04	Ms. Pratibha Dwarkanath St John's Research Institute St John's National Academy of Health Sciences, Bangalore India	Influence of Maternal Dietary Calcium Intake on Pregnancy Induced Hypertension and Pre-term Births
OPCN-05	Dr. Preet K. Dhillon South Asia Network for Chronic Disease, Public Health Foundation of India, New Delhi, India.	Legume Consumption in North and South Indian Diets and Its Association with Fasting Blood Glucose Levels, Insulin Resistance and the Risk of Type 2 Diabetes
OPCN.06	Mrs. G.G.Kavitha Shree Dept. of Food Science and Nutrition Home Science College and Research Institute, Dept. of Agricultural Extension, Agriculture and Research Institute, Tamil Nadu Agricultural University, Madurai, Tamil Nadu	Fitness Interventions to Combat Childhood Obesity
OPCN-07	Ms. Rujuta Desai Department of Foods and Nutrition A WHO Collaborating Centre for Health Promotion The M.S. University of Baroda Vadodara, Gujarat	Impact of Mid-Day Meal Programme on School Children of Rural Vadodara

CLINICAL NUTRITION		
OPCLN-01	Ms. Nimi Barooah Department of Food and Nutrition Faculty of Home Science Assam Agricultural University, Jorhat	Association of Life Style Factors with Prevalence of Overweight and Obesity among Adolescents in Jorhat Town
OPCLN-02	Ms. Madhavi V. Dhobale Department of Nutritional Medicine Interactive Research School for Health Affairs, Bharati Vidyapeeth University, Pune, India	Reduced Levels of Placental Long Chain Polyunsaturated Fatty Acids in Pre-term Deliveries.
OPCLN-03	Ms. Neha Kajale Hirabai Cowasji Jehangir Medical Research Institute, Pune, India	Postpartum Health Status of Urban Lactating Women with Reference to Metabolic Parameters and Nutrient Intake
OPCLN-04	Ms. Tinu Mary Samuel Division of Nutrition St. John's Research Institute, Bangalore, Karnataka India.	Are Infants Born in Baby-Friendly Hospitals Being Exclusively Breastfed Until 6 Months of Age?

COMMUNITY NUTRITION

OPCN-01 EXCLUSIVE BREASTFEEDING : ON THE CUTTING EDGE FOR PROMPT INITIATION AND SUPPORT. *Padmini Balagopal.* Ekam Foundation, Chennai, India. Email: velchet2@gmail.com

WHO Guidelines (2002) and the Ministry of Women and Child Development, Food and Nutrition Board of India (2006) recommend exclusive breastfeeding of infants till 6 months of age, supported by complementary foods till the child reaches 2 years of age. However, studies indicate that although breast feeding initiation rates are high, drop-off rates are increasing. Long-term breastfeeding protects child health by reducing risk of morbidity and mortality that can beneficially impact disadvantaged populations (Molbak *et al.* 1994; WHO 2000). Studies show that a longer duration of breastfeeding is associated with greater linear growth of the child (Onyango *et al.* 1999; Simondon Simondon *et al.* 2001), lower risk of obesity (Harder *et al.* 2005) and diabetes (Sadauskaite-Kuehne *et al.* 2004) in later life. But post-partum practices in rural areas and urban cities highlight the need for education of health professionals on support strategies and new mothers on exclusively breastfeeding an infant. The advent of artificial baby milks (ABM) has played a strong role in deterring the process of breastfeeding. Studies have shown that there are critical stages which dictate both the breastfeeding process and its success. This presentation examines the present system of support being given to the new mother and infant and outlines critical steps and guidelines that can be implemented so as to ensure successful and continued breastfeeding.

OPCN-02 DETERMINANTS OF ACUTE MALNUTRITION IN PRE SCHOOL CHILDREN. *Ali Jafar Abedi**, JP Srivastava**, KP Mathur**, Z Khan*, MA Ansari*. Department of Community Medicine, *J.N. Medical College, Aligarh Muslim University, Aligarh, **Era's Lucknow Medical College Hospital, Lucknow. Email: alijafarabedi@gmail.com

Children whose Z-scores are below minus two standard deviations from the mean of the reference population are considered acutely malnourished. Acute malnutrition is a strong predictor of mortality among pre school children. It is usually the result of acute significant food shortage and/or disease which in itself is determined by many social factors. The main purpose of the study was to identify the levels and determinants of acute malnutrition in pre school children. 402 children aged 12-59 months, were selected randomly from rural and urban areas of district Lucknow. Pre tested and pre designed oral questionnaire was used to elicit history on demographic, socio-economic, environmental, dietary intake, health care, immunization and morbidity. Anthropometry was performed using standard techniques. The Z scores were calculated using WHO Anthro 2005 software. Results reveal that prevalence of acute malnutrition was 21.7%. 15.2% had moderately acute malnutrition and 6.5 % had severe acute malnutrition, indicating that it is one of the major public health problems in the area. Multivariate analysis showed that environmental sanitation, mother's personal hygiene and media exposure, child's caloric intake, birth order and birth interval, morbidities like respiratory sickness and diarrhea and care during illness were significantly associated with acute malnutrition. Implications of the results for interventions are discussed.

OPCN-03 CLUSTERING OF DIET AND PHYSICAL ACTIVITY BEHAVIORS IN PARENTS AND OFFSPRING AND ITS RELATION TO OVERWEIGHT IN OFFSPRING. Sumathi Swaminathan¹, Tinku Thomas¹, Salim Yusuf², Mario Vaz¹. ¹St. John's Research Institute, St. John's National Academy of Health Sciences, Koramangala, Bangalore, India. ²McMaster University, Hamilton Health Sciences Corporation, 237 Barton St E, Hamilton, Ontario, L8L 2X2. Email: tinku.sarah@sjri.res.in

This study was aimed to identify if familial clustering of weight status, diet and physical activity was evident in urban and rural families in South India. Data from a cross-sectional study of 325 offsprings aged between 8 to 21 years from families where anthropometric, dietary and physical activity data on both parents were available was used. Individuals were categorized as normal, underweight and overweight using appropriate age specific cut-offs. Diet intake was assessed using food frequency questionnaires, while physical activity was assessed using physical activity questionnaires. BMI of offspring was significantly correlated ($p < 0.001$) with the father ($\rho = 0.35$) and mother ($\rho = 0.42$). Percent protein, carbohydrate, fat and saturated fat were significantly correlated ($p < 0.001$) between offspring and parents, although energy intakes were not. A weak positive correlation between the sleep

duration of the offspring and that of the parents (both $\rho < 0.2$, $p < 0.05$) and a stronger correlation between the parents ($\rho = 0.5$, $p < 0.001$) was observed. The overall PAL of the offspring was significantly correlated with that of the mother but not with the father. A 2 step cluster analysis formed 2 distinct clusters, one the obesogenic cluster and the other the non-obesogenic cluster with the obesogenic cluster showing significantly higher intakes of fat and saturated fat and higher sedentary activity levels ($p < 0.001$) among offspring and parents. Individual dietary and physical activity behaviour of children, adolescents and young adults in India is most likely to be influenced by the lifestyle of the family. Health promotion campaigns should target families too.

OPCN-04 INFLUENCE OF MATERNAL DIETARY CALCIUM INTAKE ON PREGNANCY INDUCED HYPERTENSION AND PRETERM BIRTHS. *Pratibha Dwarkanath*^{1,2}, Tinku Thomas¹, Anura V Kurpad¹ and Mario J Soares², ¹St John's Research Institute, St John's National Academy of Health Sciences, Bangalore India, ²School of Public Health, Curtin Health Innovation Research Institute, Curtin University Perth, Western Australia. Email: pratibha@sjri.res.in

Calcium intakes during pregnancy may play an important role in attenuating pregnancy induced hypertension (PIH) and in determining pre-term birth (<37 weeks of gestation). Routine calcium supplementation is in part advocated for these reasons. The primary objective was to explore the relationship between dietary calcium, supplemental calcium and calcium rich food groups with pre-term births and to characterize the prevalence of PIH in a population that is routinely prescribed with calcium supplements. A cohort of 637 pregnant women was prospectively studied at each trimester until delivery. Dietary intakes from a food frequency questionnaire, compliance to calcium supplement intake, presence of PIH, pre-eclampsia and birth outcomes at delivery were recorded. Approximately 13.5% women were diagnosed with gestational hypertension (7.1% mild PIH, 5.5% PIH and 0.9% with pre-eclampsia). A higher proportion of pre-term babies were born to women with PIH (27.1% versus 7.3%; $p < 0.001$) as compared to normotensive mothers. Mothers of pre-term babies had significantly lower energy adjusted calcium intakes ~ 87 mg/d ($p = 0.033$) and calcium rich food groups ~ 141 g/d ($p = 0.012$) in the 3rd trimester of pregnancy as compared to the mothers of term babies. Similar trends for low calcium intake and low calcium rich food group intake was noted in women with PIH as compared to non PIH women. This study highlights that routine supplementation of calcium (1000 mg/d) may not abolish the inverse associations between calcium and calcium rich food group intakes with PIH and pre-term births. Substantiation of these findings would necessitate a re-examination of public health guidelines for pregnancy.

OPCN-05 LEGUME CONSUMPTION IN NORTH AND SOUTH INDIAN DIETS AND ITS ASSOCIATION WITH FASTING BLOOD GLUCOSE LEVELS, INSULIN RESISTANCE AND THE RISK OF TYPE 2 DIABETES. *Preet K. Dhillon*^{1*}, Liza Bowen², Sanjay Kinra², AV Bharathi³, Sutapa Agrawal¹, DP Prabhakaran^{5,6}, K. Srinath Reddy⁶, Shah Ebrahim^{1,2}. 1.South Asia Network for Chronic Disease, Public Health Foundation of India, New Delhi, India. 2. London School of Hygiene and Tropical Medicine, London, United Kingdom. 3. Department of Food Science and Nutrition, Indira Gandhi National Open University, New Delhi, India. 5. Centre for Chronic Disease Control, New Delhi, India. 6. Public Health Foundation of India, New Delhi, India. *E-mail: preet.dhillon@phfi.org

Legume consumption (e.g beans, [lentils](#), peas) is associated with lower fasting blood glucose and insulin levels in nutrition trials, lower cardiovascular disease mortality in large-scale epidemiological studies, and is recommended by the European, Canadian and American Diabetes Associations for diabetes control due to soluble fibers and alpha-glucosidase inhibitors that slow absorption and lower glycemic index. In India, legumes are widely consumed in various preparations, and no epidemiological study has evaluated legumes with fasting blood glucose (FBG) levels, insulin resistance and the risk of diabetes. In-person interviews were conducted on 6,819 men and women - urban migrants, their rural siblings and urban residents - in Lucknow, Nagpur, Hyderabad and Bangalore, to collect information on demographic, socioeconomic, physical activity, alcohol, tobacco, anthropometric measurements and diet, through a validated semi-quantitative food frequency questionnaire. In multivariate regression analyses adjusting for age, body mass index, total energy intake, macronutrients, physical activity and rural/migration status, daily legume consumption was positively associated with FBG ($p < .001$) and diabetes (OR=1.93, 95% CI: 1.39, 2.67; Q4 vs. Q1, $p < .001$) but not with insulin resistance (HOMA, $p = 0.52$). However, when we assessed the type of preparation, dhals and cereals as a proportion of total legume intake, were associated with lower fasting glucose levels ($p < .001$) and diabetes (OR=0.77, 95% CI: 0.59, 1.01 Q4 vs. Q1 $p = 0.05$) whereas legumes in fried snacks, sweets and vegetables were not ($p > 0.05$). In India, where high diabetes rates prevail, adding legumes to a healthy diet may be beneficial but methods of preparation are likely to be critical.

OPCN-06 FITNESS INTERVENTIONS TO COMBAT CHILDHOOD OBESITY. GG Kavitha Shree¹, MR Premalatha¹, T Padmini², MR Duraisamy³ and J Pushpa⁴. Dept. of Food Science and Nutrition¹, Dept. of Apparel Designing and Fashion Technology², Dept. of Family Resource Management³, Home Science College and Research Institute, Dept. of Agricultural Extension, AC&RI⁴, Tamil Nadu Agricultural University, Madurai-04, Tamil Nadu. E.mail: kavikarthikfsn@gmail.com

Childhood obesity is a significant risk factor associated with a range of serious non-communicable diseases. This study demonstrated the beneficial effect of a combined multidisciplinary dietary-behavioural-physical interventions of short-term and long-term in the treatment of childhood obesity with one year follow-up among totally selected 618 school children. Children were classified as Group-I of 228 children (Long-term behavioural intervention - who were given both the education program and were taught fitness exercises with the support of a Sports Physiotherapist) and Group-II of 390 children (Short-term behavioural intervention-who were given only the education program).The impact of short-term (Ist phase of six months – education alone) and long-term interventions (Ist phase of six months – education and IInd phase of next six months-fitness exercises) were studied periodically and compared among both the groups. It was found that 28.3 per cent of the selected children were overweight and 7.9 per cent were obese. The data showed that the initial mean Body Mass Index (BMI) was 21.6±3.9 in Group-I and 21.9±3.4 in Group-II. The BMI was reduced to 21.4±3.8 in Group-I and 21.8±3.5 in Group-II after six months at the first phase. After one year follow up, it was found that the mean BMI of Group-I was reduced significantly to 20.8±3.5 (P = 0.0001) due to long-term interventions, whereas the mean BMI of Group-II increased after one year (P=0.06) because this group did not undergo any fitness intervention. It was observed that there was significant reduction in Waist Hip Ratio (WHR) from initial to final among Group-I children alone. There was no significant change in the Pulse Rate (PR) among both groups at the end of the study. After one year intervention, it was found that among Group-I, 6.6 per cent children with high Blood Pressure (BP) and 4.4 per cent children who had low BP shifted to normal BP showing a significant change whereas there was no significant change in Group-II children. Peak expiratory flow rate (PEFR) improved significantly (P=0.0001) in Group-I due to fitness exercises and there was no significant change due to just the education program among Group-II children (P=1.0). There was significant influence of fitness exercise intervention on the fitness level test scores (P=0.0001) among Group-I after one year but there was no significant changes (P=1.0) in Group-II. Thus the study revealed that only long-term combined multidisciplinary dietary-behavioural-physical interventions had positive influence in preventing and treating overweight/obesity among children than short-term interventions.

OPCN-07 IMPACT OF MID DAY MEAL PROGRAMME ON SCHOOL CHILDREN OF RURAL VADODARA. *Rujuta Desai, Vanisha S Nambiar, Nishita Patel and Kuhu Roy. Department of Foods and Nutrition, A WHO Collaborating Centre for Health Promotion, The M.S. University of Baroda, Vadodara, Gujarat. India. Email: Rujuta.desai25@gmail.com and vanishanambiar@gmail.com

Objective: The study aimed to monitor and evaluate the Mid Day Meal (MDM) programme in rural Vadodara in comparison with the NP-NSPE, 2006 guidelines and assess its impact on the nutritional status of selected children attending rural schools. *Methods:* MDM was evaluated in 10 schools representing various zones of rural Vadodara, impact of MDM was assessed on a sub sample n= 207 (n=123 girls and n=84 boys). Qualitative and quantitative methods were used to assess MDM, Nutritional Status Assessment (NSA): Socio-Economic Status (SES), anthropometry, clinical signs and symptoms (IDA, VAD, vitamin B-complex and vitamin C), dietary behaviour (FFQ), and biochemical estimations (n=100) (hematological indices and red cell morphology). The data were analyzed using SPSS 13.0 software. *Results:* Only 30% of school's kitchens and 20% of the store rooms conformed to the norms for infrastructure. On average one serving (200ml) of the meal was served to the children which provided 390 kcal and 10 g proteins. According to the Z-scores for BMI for age only 44.9% were normal, 28% had severe thinness (<-3SD) and 26.6% were thin (<-2SD to -3SD). Prevalence of anaemia was found to be 74% (62%, mild anaemia and 12% moderate anaemia). *Conclusion:* Adequate training of MDM staff along with improved infrastructure of MDM would enable the MDMP reach towards the NP-NSPE guidelines and help in reducing malnutrition among school children.

CLINICAL NUTRITION

OPCLN-01 ASSOCIATION OF LIFE STYLE FACTORS WITH PREVALENCE OF OVERWEIGHT AND OBESITY AMONG ADOLESCENTS IN JORHAT TOWN. *Nimi Barooah*¹, Mridula Saikia Barooah¹ and Nilima Neog¹. Department of Food and Nutrition, Faculty of Home Science, Assam Agricultural University, Jorhat, India. Email – nimibarooah23@gmail.com

The prime objective of the study was to correlate the prevalence of overweight and obesity with food habits and life style factors of adolescents of Jorhat Town, Assam. Body Mass Index [BMI] criteria was used to screen out the overweight and obese samples from 1007 adolescents belonging to seven high schools of the town area. Standard techniques and structured pre-tested schedules were used to elicit information on different parameters of the screened samples. The survey revealed the prevalence of overweight and obesity to be 4% and 0.4% respectively. Percentage distribution of overweight and obesity according to gender showed 1.6% and 0% among boys and 2.6% and 0.4% among girls. Majority of overweight and obese were from the 15 years age group, the prime cause being physical inactivity. Positive association between BMI and fast food consumption was obtained for both boys ($r=0.5422$) and girls ($r=0.0097$). A significant association between BMI and food intake was observed in boys. Boys spent an average of 17.5-19.5 hours in sedentary activities while girls spent more hours in sedentary activities (18-20 hours). Mean physical efficiency index (PEI) of boys ranged from 38.10-47.28 and that of girls ranged from 34.49-41.08 for different age groups, exhibiting a very poor physical efficiency. Increasing prevalence of obesity in a population, particularly among children and adolescents is an early indicator of emerging health burden due to non communicable diseases which needs to be addressed. Formulation of need based govt. and non-govt. programmes could help to provide appropriate measures to combat the menace along with school and college campaign focusing on allied aspects of overweight and obesity.

OPCLN-02 REDUCED LEVELS OF PLACENTAL LONG CHAIN POLYUNSATURATED FATTY ACIDS IN PRETERM DELIVERIES. *Madhavi V Dhobale*¹, Nisha Wadhvani¹, Savita S Mehendale², Hemlata R Pisal¹, Sadhana R Joshi¹. ¹Department of Nutritional Medicine, Interactive Research School for Health Affairs, Bharati Vidyapeeth University, Pune, India, ²Dept of Obstetrics and Gynaecology, Bharati Medical College and Hospital, Bharati Vidyapeeth University, Pune, India. E-mail: sadhana.joshi@bharativedyapeeth.edu, srjoshi62@gmail.com

Reports suggest that the placenta in preterm birth may provide clues to predicting the risk of individuals developing chronic diseases in later life. Placental delivery of long chain polyunsaturated fatty acids (LCPUFA) (constituents of the cell membrane and precursors of prostaglandins) is essential for the optimal development of the central nervous system of the fetus. The present study examines the levels of LCPUFA and their association with placental weight and birth outcome in 58 women delivering preterm and 44 women delivering at term. Docosahexaenoic acid (DHA) and arachidonic acid (ARA) levels were lower ($p<0.01$) in women delivering preterm. There was a positive association of placental DHA with placental weight ($p = 0.036$) and nervonic acid with head circumference ($p = 0.040$) in the preterm group. Altered placental LCPUFA status exists in Indian mothers delivering preterm which may influence the birth outcome. Our results indicating reduced levels of placental LCPUFA may have implications for fetal programming of adult diseases. Future studies need to examine whether these altered levels of placental fatty acids which affect birth outcome lead to increased risk of neurodevelopmental disorders and non communicable diseases in childhood and later life.

OPCLN-03 POSTPARTUM HEALTH STATUS OF URBAN LACTATING WOMEN WITH REFERENCE TO METABOLIC PARAMETERS AND NUTRIENT INTAKE. *Neha Kajale*^{*}, Anuradha Khadiilkar, Shashi Chiplonkar, Uma Divate. Hirabai Cowasji Jehangir Medical Research Institute, Pune, India. ^{*}Email: nakajale@gmail.com

Incidence of postpartum weight retention and obesity is rising with increase in metabolic syndrome (MS) risks in urban population. We thus studied anthropometry, lipid profile, body fat (BF)% (Dual Energy X-ray Absorptiometry) and diet (24 hr recall) on 50 primiparous urban lactating women (mean age 27.8 ± 3.5 yr). They were compared with 28 age matched non-pregnant, non-lactating, parous women (NPNL). Mean pre-pregnancy BMI was 23.3 ± 3.3 kg/m² (70% women normal), which increased to 27.3 ± 3.4 kg/m² post-partum (22% normal), showing shift in BMI category from normal pre-pregnant to overweight postpartum state. BF % was similar in both

groups ($p > 0.1$), however, gynoid fat was significantly greater in study group ($p < 0.05$). Mean total cholesterol (214 ± 30.1 mg/dl) & triglycerides (178 ± 61.3 mg/dl) were greater than upper reference range and were significantly higher than in NPNL women (mean cholesterol and triglyceride 179 ± 38.6 and 77.7 ± 32.1 respectively ($p < 0.005$)). Mean energy (2315 ± 406 Kcal/d), protein (51 ± 11 g/d), fat (97 ± 28 g/d) and calcium intakes (996 ± 283 mg) of study group were significantly higher ($p < 0.05$). However, 58, 100 and 82 % study women were below recommended dietary intakes for energy, protein and calcium respectively. Macronutrient imbalances were observed as carbohydrates, protein and dietary fats were consumed in a ratio of 56, 8 and 38 % respectively. Thus, during postpartum period, higher BMI, hyperlipidemia, higher BF % along with higher dietary fat intake may increase risk for MS in future.

OPCLN-04 **ARE INFANTS BORN IN BABY-FRIENDLY HOSPITALS BEING EXCLUSIVELY BREASTFED UNTIL 6 MONTHS OF AGE?** *Tinu Mary Samuel¹, Tinku Thomas¹, Swarnarekha Bhat², Anura V Kurpad¹.* ¹Division of Nutrition, St. John's Research Institute, Bangalore, India. ² Department of Paediatrics, St. John's Medical College, Bangalore, India. Email: tinusamuel4@gmail.com

Objectives: To objectively measure rates of breast-feeding to infants born in a baby-friendly hospital in Bangalore, India, and to capture home-based compliance to exclusive breastfeeding (EBF). *Methods:* Breast milk (BM) and non breast milk (NBM) water intake were assessed in 50 mother-infant pairs using a deuterium dilution technique at months 1, 3 and 6. *Results:* Complementary feeding was introduced as early as 1 month among 44% of the infants and only 14.2% remained as exclusively breastfed by month 6. Intake of BM significantly declined from 166 to 87 ml/kg/day and NBM significantly increased from 23 to 51 ml/kg/day from month 1-6 ($P < 0.01$). There was a significant negative correlation between BM and NBM at month 3 ($r = -0.59$, $P < 0.001$) and 6 ($r = -0.61$, $P < 0.001$). The most common barrier to EBF was "a persistently crying infant". BM intake significantly correlated with weight for age (WAZ) (month 1: $r = 0.56$, $P < 0.001$; month 3: $r = 0.60$, $P < 0.001$) and weight for height (WHZ) (month 1: $r = 0.59$, $P < 0.001$; month 3: $r = 0.57$, $P < 0.001$). NBM intake showed a significant negative correlation with WHZ ($r = -0.33$, $P = 0.02$) at month 3 and correlated positively with WAZ ($r = 0.37$, $P = 0.01$) and height for age (HAZ) ($r = 0.30$, $P = 0.03$) at month 6. *Conclusion:* Despite intensive counselling at birth and during the immediate post-natal period in a baby-friendly hospital, early complementary feeding was observed at home. Reasons for the early introduction of CF were primarily a crying infant. Home and community oriented approaches should be designed to address barriers and improve EBF rates.

FREE COMMUNICATIONS

ORAL PRESENTATIONS

Saturday, 12th November 2011

8.30 a.m. – 10.00 a.m.

EXPERIMENTAL NUTRITION

Code	Name	Title of Presentation
OPEN-01	Ms. Mini Joseph Department of Home Science Govt. College for Women Trivandrum, Kerala, India	Nutritional Status of South Indian Professional Weightlifters
OPEN-02	Dr. Preeti Bora Deptt. of Foods and Nutrition Uttarakhand Open University Haldwani (Nainital), Uttarakhand, India	Nutritional Evaluation and Glycemic Index of Green Gram Husk Incorporated High Fiber Food Products
OPEN-03	Ms. Surabhi Shah Hirabai Cowasji Jehangir Medical Research Institute, Jehangir Hospital, Pune, India.	Effect of Iron Rich Snacks Cooked in Iron Pots on Iron Status of Underprivileged Pre-Schoolers : A Pilot Study
OPEN-04	Ms. Nisha G. Kemse Rajiv Gandhi Institute of IT and Biotechnology, Bharati Vidyapeeth University, Pune, Maharashtra	Systematic Evaluation of 25 Indian Antidiabetic Herbs for their Ability to Inhibit Non-Enzymic Glycation
OPEN-05	Dr. Haripriya.S Department of Food Science and Technology, Pondicherry Univeristy, Puducherry	Changes In Enzymatic and Non-Enzymatic Antioxidants of Selected Diabetic Subjects Supplemented with Wheat Germ
OPEN-06	Ms. Aruna.G. Biochemistry and Nutrition Department, Central Food Technological Research Institute Mysore, Karnataka, India.	Glycolipids Improve Lutein Bioavailability and Accumulation In Eyes in Mice
OPEN-07	Dr. Kowsalya.S Department of Food Science and Nutrition Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu	Impact of Supplementation of Nanoparticles of Almonds on Hypercholesterolemic Subjects
OPEN-08	Ms. Akshaya Meher, Department of Nutrition Medicine, Interactive Research School for Health Affairs, Pune, India.	Preconception Maternal Micronutrient Deficiency: Reproductive Cycles and Breast Development in Wistar Rats

Code	Name	Title of Presentation
OPEN-09	Ms. Vani Amalrajan Division of Nutrition, St John's Research Institute, St John's National Academy of Health Sciences, Bangalore, India.	Effect of Sodium Iron EDTA Fortified Wheat Flour on Urinary Zinc Excretion in School-Age Children
OPEN-10	Ms. Hetal Parekh Food Science and Nutrition Dr.BMN College of Home Science, Maharashtra, India	A Study of Vitamin (OH) D ₃ Status in Patients with Diabetes Mellitus Type 2.

OPEN-01 **NUTRITIONAL STATUS OF SOUTH INDIAN PROFESSIONAL WEIGHTLIFTERS.** Mini Joseph¹, Prema L², Korula Mani Jacob³, Ravi Kumar⁴, Mercy Inbakumari⁴ and Nihal Thomas⁴. ¹Department of Home Science, Govt. College for Women, Trivandrum, Kerala, India, ² Retd. Prof Nutrition, Kerala Agricultural University, Trivandrum, Kerala, India, ³ Dept. of Orthopaedics, CMC Hospital, Vellore, Tamil Nadu, India, ⁴ Department of Endocrinology, Diabetes and Metabolism, CMC Hospital, Vellore, Tamil Nadu, India.. Email:mini joseph66@yahoo.com

This cross-sectional study was done on 30 elite male weightlifters aged 17-28 years, competing at the National levels. Weightlifting is a power sport placing intense physical demands on the individual with high risk for various health problems. The objectives of this study were 1. To assess the Nutritional status using anthropometric, biochemical, clinical and dietary methods. 2. To study the body composition of the weightlifters using Dual Energy X-ray Absorptiometry Scanner (DXA scanner) and Harpenden callipers. Results indicated that low HDL levels (≤ 40 mg %) was the most predominant metabolic abnormality present amongst them followed by high LDL and hypercholesterolemia. Sports medicine specialist found that more than 50 % had a major sports injury. Hypertension was present in 23% of the subjects. The body composition of weightlifters is considerably different and their nutritional requirements are higher than the general sports population. DXA scan indicate that they have a low fat percentage of $15.15 \pm 5.28\%$ and a high lean body mass (LBM) (60.98 ± 9.19 kg.). Body Mass Index (BMI) misclassifies them as overweight. Waist circumference indicates that they are at high risk for metabolic abnormalities but the Waist hip ratio (WHR) indicates otherwise. Skin fold thickness at 5 sites is lower than the general population. The mean bone mineral density of the weightlifters was 1.37 ± 0.09 gm/cm² and mean bone mineral content was 2.96 ± 0.35 kg. The intake of all nutrients was below the recommended levels. Pearson correlation done between the measured variables showed significant correlation.

OPEN-02 **NUTRITIONAL EVALUATION AND GLYCEMIC INDEX OF GREEN GRAM HUSK INCORPORATED HIGH FIBER FOOD PRODUCTS.** Preeti Bora¹ and Kalpana Kulshrestha². ¹Deptt. of Foods and Nutrition, Uttarakhand Open University, Haldwani (Nainital), Uttarakhand, India. ²Deptt. of Foods and Nutrition College of Home Science, G.B.P.U.A.T. Pantnagar (Udham Singh Nagar), Uttarakhand. E-mail: borapreeti@gmail.com

Dietary fiber is steadily gaining importance in human diet. Dietary fiber is generally considered as unavailable carbohydrate and is useful in the prevention and treatment of chronic diseases such as hypertension, CHD, obesity, diabetes and certain cancers. It is also known as bran, roughage and plantix, is generally considered as unavailable carbohydrate and used as mild laxative. Pulse husk is a major by-product of dal mills and is basically used as ruminant feed purpose. Its nutritional significance in human diet is less known. So, in view of this, the present study was undertaken to evaluate green gram husk for its chemical and physicochemical characteristics along with the formulation of various recipes of staple and snack food item. Different traditional staple and snack food items were prepared with the incorporation of green gram husk at different levels (5-15%). From the sensory evaluation of green gram husk incorporated food products, *missi parantha* and biscuit with 15 and 12.5 % husk incorporation respectively were found to be most acceptable. The evaluation of the selected products for nutritional composition and glycemic index was also done. On the basis of physical characteristics, green gram husk was found to have good water absorption capacity of about 475 per cent and higher particle size fraction was above 40 mesh sieve size. The nutritional evaluation showed a good amount of dietary fiber, minerals and calorific content in both the products. Ionizable and soluble iron was found to be 1.47 and 1.46 mg/100g respectively with *in-vitro* iron bioavailability as 1.17%. The GI of fiber rich *parantha* and biscuit was found to be lower i.e. 32.54 and 46.26 respectively in comparison to control *parantha* and biscuit as 40.41 and 68.70 suggesting their suitability in diabetic diet.

OPEN-03 **EFFECT OF IRON RICH SNACKS COOKED IN IRON POTS ON IRON STATUS OF UNDERPRIVILEGED PRE-SCHOOLERS: A PILOT STUDY.** Surabhi Shah¹, Veena Ekbote¹, Aarti Sonawane², Angeline Jeyakumar², Shashi Chiplonkar¹, Anuradha Khadilkar¹, ¹Hirabai Cowasji Jehangir Medical Research Institute, Jehangir Hospital, Pune, India. ²Interdisciplinary School of Health Sciences, University of Pune, Pune, India. Email: surabhi.3007@gmail.com

Iron Deficiency Anaemia (IDA) is seen among preschoolers mainly due to meagre consumption of iron rich foods. Food-based approaches to address IDA in India are being promoted, but information on the same is scarce. Study objective was to formulate iron rich snacks and study effect of these snacks cooked in iron pots on

iron status of preschoolers. Four iron rich snacks (mean iron content 3.7 mg/ serving) were formulated. Iron content of snacks with/ without iron pot cooking was estimated (UV method, NIN). Thirty six preschoolers (2.9±0.9 years) were supplemented with snacks cooked in iron pot for 5 days/ week, 16 weeks. Anthropometry, haemoglobin (Hb), serum iron (Sr.Fe), transferrin saturation (TS) and 3 day 24 hour dietary recall were recorded pre and post-supplementation. Average increase of 17% in iron content was noted in recipes after cooking in iron pots (mean iron 4.5mg/serving). At baseline, mean dietary energy and iron intakes were 69.11% and 18.46% respectively of the Indian recommended dietary allowances and mean Hb, Sr.Fe, and TS were 10.1±1.5gm/dl, 20.2±20.5µg/dl and 5.1±5.4% respectively. Post Supplementation significant increase in Sr.Fe, TS and Hb by 69.3%, 78.2%, 6.93% (anaemia decreased by 10%) respectively ($p < 0.01$ for all) were observed. A positive correlation of supplemented iron intake was noted with Hb ($r=0.437$, $p < 0.05$), Sr. Fe($r=0.473$, $p < 0.05$) controlling for compliance and total energy intake. Thus, supplementation of iron-rich recipes with contaminated iron had a positive effect on iron status of preschoolers

OPEN-04 SYSTEMATIC EVALUATION OF 25 INDIAN ANTIDIABETIC HERBS FOR THEIR ABILITY TO INHIBIT NON ENZYMIC GLYCATION. Nisha G Kemse, Amrita A Khaire, Rashmi S Tupe. Rajiv Gandhi Institute of IT and Biotechnology, Bharati Vidyapeeth University, Pune, India. Email: rashmitupe@gmail.com

Prolonged exposure to uncontrolled chronic hyperglycaemia leads to non-enzymatic glycation and the accumulation of advanced glycation end products (AGEs), which is associated with various diabetic complications. Treatment of diabetes along with drugs requires life style modifications including diet where herbs can provides health and medical benefits. In the present study, the protein glycation inhibitory potential of 25 antidiabetic plants was evaluated *in vitro* using the model system of bovine serum albumin and fructose. The antiglycation effect of herbs was estimated by using 5 different biochemical parameters i.e. protein carbonyl group estimation (nmol thiol /mg protein), thiol content (nmol carbonyl /mg protein), Congo red binding (O.D. 530nm), fluorescence of AGEs (% Inhibition) and Thioflavin T (A.U. at 485nm). Overall results indicated that *P. crispum*, *S. reticulata*, *A. barbadensis*, and *T. chebula* were having significant antiglycating activity. While *O. sanctum* and *G. sylvestre* exhibited moderate antiglycating activity whereas the rest of the plants like *T. belerica*, *C. bonducella* were not significant in reducing the protein glycation. Secondly, plants which showed high % AGEs inhibition simultaneously reduced Thioflavin T fluorescence, which was found to be significantly correlated ($R = 0.4449$, $p < 0.02$). Overall study showed that plants could protect albumin thiol groups from glycation and reduce formation of AGEs, protein carbonyls, β aggregation (Congo red and ThT), which was indicated by negative correlation between the assays. Thus these antidiabetic herbs have prominent potential to reduce the glycation induced modification of proteins which can be further use in humans to prevent the secondary complications of diabetes.

OPEN-05 CHANGES IN ENZYMATIC AND NON-ENZYMATIC ANTIOXIDANTS OF SELECTED DIABETIC SUBJECTS SUPPLEMENTED WITH WHEAT GERM. Haripriya S¹ and Premakumari S².
¹Department of Food Science and Technology, Pondicherry Univeristy, Puducherry, ²Department of Food Science and Nutrition, Avinashilingam University for Women, Coimbatore. Email: shprieya@gmail.com

Experimental evidence suggests that diabetes is associated with a reduced overall antioxidant defense system. The antioxidant benefit of wheat germ was assessed on the diabetic subjects. Thirty diabetic patients were selected and divided into two groups of 15 each. Group A received 60 g of wheat germ daily for a period of six months and group B served as the control group and did not receive any supplements. The phytosterol content of wheat germ was also evaluated. Sixty grams of wheat germ was supplied in sachets to Group A every fortnight. The changes in the levels of mean total protein from (7.6± 0.74 to 8.4±5.3g/dl); albumin from (3.0±0.26 to 3.7±0.19 g/dl); TLC from (8423.73±28.33 to 7335.13±24.32 cells/m³); CD₄ from 322.93±2.3 to 573.93±0.25 cells/m³); superoxide dismutase (2733.14±5.8 to 2908.40 ±1.8 U/g Hb); Malondialdehyde from (4.29±0.16 to 2.00±0.12µM/L); Glutathione reduced from (45.3 ±1.11 to 56.6±1.2µM/L); Glutathione peroxidase from (22.73±1.3 to 52.33±1.05U/g Hb) and total antioxidant activity from, 0.62±0.02 to 1.11±0.04 mmol/L) was noted. The final changes in the blood profile were found to be significant over the initial levels measured.

OPEN-06 **GLYCOLIPIDS IMPROVE LUTEIN BIOAVAILABILITY AND ACCUMULATION IN EYES IN MICE.** Aruna G and V Baskaran. Biochemistry and Nutrition Department, Central Food Technological Research Institute (CSIR), Mysore, Karnataka, India. Email: arunagsk@gmail.com

Intestinal carotenoid absorption is greatly affected by dietary factors. In this study, it was hypothesized that lipids with varying functional groups may influence differentially on lutein bioavailability. Hence, the influence of glyco-, phospho-, neutral, crude (mixture of lipids) lipids or mixed micelles (control) on the percent lutein micellarization *in vitro* and its postprandial plasma, liver and eye response in mice were investigated. Results show that the percent micellarization of lutein *in vitro* with crude and glycolipids were higher (91.4 and 45.7 %) than control, while no significant difference was found between phospho- and neutral lipids. The mean plasma response of lutein was higher for crude- (6 fold), glyco- (3 fold), phospho- (2.7 fold) and neutral (2 fold) lipid than control ($12.4 \pm 1.18 \text{ nmol mL}^{-1} \text{ 8h}^{-1}$) group. Lutein levels (pmol/g) in liver were higher in crude (7.42 ± 1) and phospho- (3.59 ± 0.8) lipid groups while in eyes it was higher in glyco- (53.98) and neutral (21.2) lipid groups than control. The influential effect of glyco- and phospholipids may be due to smaller micellar size (glyco-3.4 μm , phospho-5.8 μm) than the neutral lipids (66 μm). Ingestion of lutein with glycolipid or phospholipids may improve lutein bioavailability. Findings of the present study will be useful in nutritional and biomedical applications for feeding lutein with specific lipid combinations to achieve enhanced lutein absorption in condition like age related macular degeneration.

OPEN-07 **IMPACT OF SUPPLEMENTATION OF NANOPARTICLES OF ALMONDS ON HYPERCHOLESTEROLEMIC SUBJECTS.** Kowsalya S¹, Premakumari S¹ and Mujumdar V². Department of Food Science and Nutrition, ¹Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu, ²Institute of Applied Research, Pune, India. Email : ID – kowsiskk@yahoo.co.in

High blood cholesterol signifies the risk of heart diseases. There is growing evidence that almonds play a significant role in heart health and the National Heart, Lung and Blood Institute (NHLB) recommends the use of almonds to reduce the cholesterol level. Nanotechnology is a recent study which uses particles of matter at the scale of 1 to 100 nm. Therefore, it was thought of interest to prepare nanoparticles of almonds and study its effect on hypercholesterolemia. A groups of hypercholesterolemic subjects were supplemented with nanopaste of almonds for a period of two months. The results revealed that a significant reduction in total cholesterol levels and significant improvement in HDL cholesterol levels which proved the efficiency of nanoparticles of almonds in hypercholesterolemia. Further studies would through more light on the possible mechanisms of almond nanoparticle on hypercholesterolemia. It may be concluded that the nutritional properties of almonds can attain medicinal properties when they are made in nanosize range. Nanoparticles are taken up by cells more efficiently and could be used as effective transport and delivering system. Thus almonds may be considered as a functional food possessing health beneficial action especially to the heart and circulatory system.

OPEN-08 **PRECONCEPTION MATERNAL MICRONUTRIENT DEFICIENCY: REPRODUCTIVE CYCLES AND BREAST DEVELOPMENT IN WISTAR RATS.** Akshaya Meher, Asmita Kulkarni, Sadhana R Joshi. Department of Nutrition Medicine, Interactive Research School for Health Affairs, Pune, India. Email: sadhana.joshi@bharativedyapeeth.edu, srjoshi62@gmail.com

Micronutrient deficiencies such as folic acid and vitamin B₁₂ are common in India and are suggested to be associated with significantly high reproductive risks, ranging from infertility, fetal structural defects, early pregnancy loss, recurrent miscarriage and non-communicable diseases in adult life. We have recently reported that maternal vitamin B₁₂ deficiency reduces the volume as well as the long chain polyunsaturated fatty acids especially docosahexaenoic acid in gastric milk. The present study examined the effect of maternal micronutrients (folic acid and vitamin B₁₂) on reproductive cycles and morphology of ovaries and mammary gland in Wistar rats. Rats were divided into 3 groups, 1) control 2) folic acid deficient 3) vitamin B₁₂ deficient from the birth and continuing through pregnancy. Estrous cycle was monitored in the preconception period prior to breeding. Tissues were collected at the day 20 of pregnancy and histological analysis was carried out. Our results for the first time indicate that maternal micronutrient deficiency (both folic acid and vitamin B₁₂) leads to an abnormal oestrous cyclicity in the rats ($p < 0.05$). Also there was an absence of lactating ducts in the mammary glands of rats fed folic acid and vitamin B₁₂ deficient diet. Number of corpus luteum was decreased in the ovaries of rats fed a folic acid deficient diet. Our data for the first time indicates that maternal micronutrient deficiency affects the reproductive system and breast development. This may have implications for infertility as well as poor infant growth leading to non-communicable diseases in adult life.

OPEN-09 EFFECT OF SODIUM IRON EDTA FORTIFIED WHEAT FLOUR ON URINARY ZINC EXCRETION IN SCHOOL-AGE CHILDREN. *Vani Amalrajan*, Prashanth Thankachan, Anura V Kurpad. Division of Nutrition, St John's Research Institute, St John's National Academy of Health Sciences, Bangalore, India .Email : vaniamalrajan@gmail.com

Foods fortified with sodium iron EDTA (NaFeEDTA) have been shown to improve iron (Fe) status in children, but little is known about the effect of this salt on urinary zinc (Zn) excretion, particularly in children. This is particularly relevant since Zn deficiency is known to limit growth and development in young children. The objective of the present study is to determine the effect of NaFeEDTA fortified wheat flour on urinary Zn excretion. This study was a part of a randomised control trial which was carried out among 6-13 year Fe depleted school children (n=179), who had received either a NaFeEDTA fortified wheat meal (Fe group) or an identical control meal without added Fe (control group) for a period of 7 months. Urinary Zn concentration was assessed at endpoint of the intervention period by spot urine samples. Results showed that the subjects Fe status improved since haemoglobin (Hb) and serum ferritin (SF) significantly improved ($P < 0.001$) in the Fe group. However, there was no significant difference in the urinary Zn excretion between the Fe (38.4, 18.2-67.1 $\mu\text{g/dL}$; median, 25th-75th percentiles) and the control group (33.1, 12.4-54.2 $\mu\text{g/dL}$). It appears that NaFeEDTA fortified foods, at a level of 6 mg Fe/day, did not increase urinary Zn excretion and thus may be considered safe at this level.

OPEN-10 A STUDY OF VITAMIN (OH) D₃ STATUS IN PATIENTS WITH DIABETES MELLITUS TYPE 2. *Hetal Parekh*, Food Science and Nutrition, Dr. BMN College of Home Science, Maharashtra, India, Email: hetal_parekh22@yahoo.com

Low vitamin D status is epidemic in India, despite of abundant sunshine. Vitamin D insufficiency has been associated with multiple disease outcomes like Diabetes Mellitus Type-2, Hypertension, Obesity and CVD complications. The objectives of the present study were, to study the prevalence of Vitamin D deficiency in patients with diabetes mellitus type 2, to co-relate vitamin D deficiency (VDD) with Glycemic status of the patients and with other parameters like anthropometry, lipid profile and blood pressure. A total of 110 diabetes mellitus type 2 patients, (55 males, 55 female) aged 30-70 years were selected by purposive sampling from the heterogeneous population, regularly visiting a diabetic clinic in Central Mumbai. The inclusion criteria was patients with Diabetes Mellitus TYPE 2 with variable duration of diabetes and patients with Vitamin D level case reports. The exclusions criterion was Type-1 diabetics, Pregnant and Lactating mothers and patients with hepatic or renal disease. These subjects were examined and questioned in specific format. Data collected and analysed for statistical significance by SPSS 16.4 The results of the study showed that 75 subjects out of 110 diabetic Type 2 patients had lower vitamin (OH)D₃ levels (67.2%). Low serum vitamin D₃ was found to be non-significantly correlated with FBS ($P = -.106$) and PPBS ($P = -.106$) and also with other parameter like systolic BP ($P = 0.083$), diastolic BP ($P = -.082$), with Obesity markers eg. WHR ($P = -.061$), BMI ($P = 0.102$) and with lipids parameters like TG ($P = -.150$), total cholesterol ($P = -.035$), LDL ($P = - 0.35$), VLDL ($P = -0.154$). However low vitamin D₃ was observed to have a significant correlation with low HDL ($P = 0.001$). The study suggested high prevalence of vitamin D insufficiency in Diabetes Mellitus Type-2 patients. There was no significant correlation between low vitamin D₃ with blood sugar levels but low vitamin D has shown positive correlation with HDL. These finding needs to be supported with larger multi centric data and further studies are required to confirm the data.

FREE COMMUNICATIONS

POSTER SESSIONS

COMMUNITY NUTRITION

PSCN-01 HEAVY METAL CONTENT OF SELECTED FOODS AND HEALTH RISK ASSESSMENT IN THE STUDY POPULATION. Prachi Deota and *Suneeta Chandorkar*. Department of Foods & Nutrition, WHO Collaborating Centre, The M. S. University of Baroda, Vadodara, Gujarat, India, Email: suneetachandorkar@hotmail.com

Indiscriminate disposal of waste water by industries and use of effluent from the effluent channel for irrigation purpose in the peri-urban areas pose a major threat to food safety. The key objective of this study was therefore to estimate the heavy metal content of foods grown around the city of Vadodara and assess the health risk in the study population. A total of 40 foods and 17 water samples were assayed for heavy metal content using the AAS. The results indicated that the mean Arsenic content of cereals (4ppm), pulses (2.5ppm), other vegetables (1.95ppm), green leafy vegetables (5ppm) and roots and tubers (2.5ppm) exceeded the critical values. Cereals (1.65ppm), fruits (1.98ppm) and curd (2.8ppm) exceeded the critical limits for Cadmium. Mean Arsenic (3.79ppm) and Lead (0.17ppm) content in drinking water was higher than the limits. Health risk assessed using Total Daily Intake (TDI), Provisional Tolerable Daily Intake (PTDI), Provisional Tolerable Weekly Intake (PTWI), provisional tolerable monthly intake (PTMI), Daily Intake of Metals (DIM), Health Risk Index (HRI) and Total hazard Quotient (THQ) for Cadmium, Lead and Arsenic indicated that the study population was at risk of heavy metal toxicity.

PSCN-02 WAIST HEIGHT RATIO – A SIMPLE INDICATOR OF OBESITY. *Suneeta Chandorkar* and Asmi Shah. Department of Foods & Nutrition, WHO Collaborating Centre, The M. S. University of Baroda, Vadodara, Gujarat, India, Email: suneetachandorkar@hotmail.com

Overweight and obesity is rapidly becoming a major public health problem and is associated with many diet-related chronic diseases including diabetes mellitus, cardiovascular disease and hypertension. The present study was planned to assess body composition, map the prevalence of obesity and insulin resistance in adults (25-60 years) and study the association if any between the two in two hundred participants in an urban set-up. Anthropometric measurements were taken using standard procedures and body composition was assessed using BIA. Fasting blood sample was collected for estimating glucose and insulin levels. Using the Asia Pacific classification two third of the participants were overweight and obese. Using the gender wise appropriate cutoffs for WC, WHR and WHtR; 62%, 9% and 72% of the subjects were found to be at risk for cardiometabolic diseases respectively. Percent fat had a positive correlation with Fat Mass Index (FMI). Five percent of the subjects were hyperglycemic and 7 % of the male subjects were hyperinsulinemic. Using the HOMA-IR cutoff value of >2.5 for diagnosing insulin resistance in adults, 6.8 % males were found to be at risk while none of the female subjects were found to be at risk. WHtR emerged as a simple, easy, accurate and age independent index with high applicability for screening overweight and obese individuals and a predictor of cardiometabolic diseases especially in a population characterized by short fat phenotype. Similarly, FMI and Fat Free mass Index (FFMI) emerged as better indicators of body composition vis-a-vis percent fat and percent lean mass.

PSCN-03 NUTRITIONAL RISK ASSESSMENT OF OLD-AGE HOME BASED ELDERLY WOMEN IN KOLKATA & ITS RELATION WITH LOSS OF APPETITE AND DEPRESSION. *Bidisha Maity*¹, *Upasana Banerjee*², *Minati Sen*¹, *Indranil Saha*³, and *Debnath Chaudhuri*². ¹Department of Home Science, University of Calcutta, ²Department of Biochemistry & Nutrition, All India Institute of Hygiene and Public Health, Kolkata, ³Department of Community Medicine, Burdwan Medical College & Hospital. E.mail: bidisha.maity@gmail.com

Loss of appetite and depression can affect the nutritional status of elderly. Present study assessed the prevalence and risk of malnutrition among elderly women and tested its relationship with loss of appetite and depression. Forty women aged 60 and above were randomly selected from different old age homes of Kolkata. Mini Nutritional Assessment (MNA) questionnaire, Council of Nutrition appetite questionnaire (CNAQ) and Geriatric Depression Scale (GDS-30) were used for nutritional status assessment, assessment of appetite loss

and prediction of weight loss and depression level assessment, respectively. According to MNA 27.5% were malnourished (MNA < 17), 50% were at risk of malnourishment (MNA 17- 23.5) and 22.5% were well nourished (MNA > 23.5). Mean MNA score was 20.2. According to CNAQ, 67.5% had significant risk of weight loss within six months (CNAQ ≤ 28). Mean CNAQ score was 26.4. Prediction for appetite loss based on CNAQ score was significantly correlated with MNA scores ($p \leq 0.01$). According to GDS-30, 70% were suffering from depression (GDS ≥ 10). Though mean GDS score was 12.4 no significant correlation between MNA and GDS scores exist. However, a significant correlation ($p \leq 0.01$) between these two parameters was observed when tested with 100 subjects.

PSCN-04 **DEVELOPMENT AND PRETESTING OF A RAW FOOD BASED QUANTITATIVE FOOD FREQUENCY QUESTIONNAIRE FOR ITS REPRODUCIBILITY AND VALIDITY IN URBAN INDIVIDUALS.** Sarin Sara Jose¹, N. Balakrishna², M. Radhika³, G.N.V. Brahmam³ and G. Bhanuprakash Reddy¹. ¹Eye Research Group, ²Division of Biostatistics, ³Division of Community Studies, National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, India. Email: sarinsara@rediffmail.com

Wide variations between urban and rural diets exist in India due to regional difference and varied food consumption patterns. Food frequency questionnaire (FFQ) is the suggested tool to assess long term and habitual food intake pattern in large epidemiological studies related to chronic diseases including type 2 diabetes mellitus in which, diet is one of the major etiological factors. It is relatively economical and less labour intensive when compared with other dietary assessment tools. In this pilot study, we attempted to develop and assess the reproducibility and validity of a 127 item, raw food based quantitative food frequency questionnaire (RFQnFFQ) which was developed based on commonly consumed foods and local food habits. RFQnFFQ was administered twice, at baseline (0M) and after 6 months (6M) on 40 individuals living in Hyderabad. Standardized values corresponding to the edible portion sizes and/or volume of raw foods were imputed into the RFQnFFQ. The RFQnFFQ was validated by comparing it with mean of 3 non-consecutive days' 24 hour recall (24HR) which was the reference (at 0M and 6M). The 24HR included two week days and one weekend day. Pearson's correlation coefficients between the 0M FFQ and 6M FFQ ranged from 0.27 (leafy vegetables) to 0.99 (milk and meat products) and 0.60 (vitamin A) to 0.94 (proteins). The Pearson's correlation coefficients between 24HR and RFQnFFQ ranged from -0.53 (fruits) to 0.61 (pulses) and 0.13 (riboflavin) to 0.57 (thiamine). Nutrient and food group intakes estimated from FFQs were higher than those estimated from the 24HR at 0M and 6M. The RFQnFFQ shows good reproducibility and hence it could be used to assess dietary pattern of urban individuals in relation to lifestyle diseases

PSCN-05 **LIFE STYLE CHANGES & EARLY MENARCHE – A CASE STUDY OF BHAGALPUR.** Mini Tudu*¹, Faruque Ali², Pramila Prasad³, Manoj Kumar⁴, P.G Dept of Home Science-Food & Nutrition, Dept of Zoology, T.N.B. College, Tilkamanjhi Bhagalpur University, Bhagalpur

Puberty is the period of time when children begin to mature biologically, psychologically, socially and cognitively. Girls start to grow into women and boys into men. Bailey explains that puberty can happen any time from the age of 8 to 17 although most people begin between the ages of 10 and 14. During the last few decades, there has been a sharp rise in the number of girls reaching puberty at younger and younger ages. There are various factors that cause this change. Modern lifestyle, social issues, hormonal changes due to emotions, environment and pollution, etc. affect the process of attaining puberty. Some important causes for earlier puberty: 1) Environment interplay of bisphenol A or BPA in the environment is triggering early puberty. 2) Pollution exposure to chemicals like phthalates through water and other sources can cause a large increase in breast development which is a major sign of puberty in girls. Pollutants in milk, certain food items and meat can also be one of the factors causing early periods. 3) Obesity and average weight of girls is higher today than in the past. This chemical can stimulate the release of the three main hormones responsible for puberty. 4) Emotional reasons modern generation is emotionally more depressed. Busy lifestyle in the families and influence of mass media may be the causes. 5) Social religion situation & exposure to mass media is more in the modern era than any other time. Young girls of Bhagalpur were subjected to a study pertaining to onset of puberty. Only those 462 girls were subjected to this study whose date of birth and menarche were accurate and recorded. When the age wise break up of the menarche was analysed it was found that more than 45% of the girls attained menarche in the age group of 8-11yrs. Thus, there was a clear cut decline in the trend of attaining puberty at a later age because approximately half of the girls attained puberty at 8-11 years age, whereas the ideal age is considered to be 12-13

years. The above result clearly shows that there is an obvious indication of early menarche among the Bhagalpur girls as approximately 46% of the girls are in early age group. This need to be extensively correlated with climate changes socio, psyco and physiological parameters. The above declining trend will continue till it stabilized naturally.

PSCN-06 NUTRITIONAL STATUS OF ADOLESCENT GIRLS IN TRIBAL AREAS. K. Samatha, Zubaida Azeem, P. Ashlesha and *Hannah Jessie Francis T.* Department of Food and Nutrition, Osmania University College for Women, Hyderabad, India. E-mail: hannahjessie_22@yahoo.co.in

Tribal population constitutes about 8% of the total population in India. They are particularly vulnerable to undernutrition, because of their geographical Isolation, socio-economic disadvantage and inadequate health facilities. Recognizing the problem, Government of India launched different programmes for their welfare. Adolescence is a significant period of growth and maturation. The nutritional status of adolescent girls, the future mothers, contributes significantly to the nutritional status of the community. A study on nutritional status of adolescent girls of tribal areas like Kundellapahad, Pangidi Maadaram of Adilabad district was carried out on 50 adolescent girls in order to know their nutritional status, routine practices of dietary habits and Adilabad district in order to cover the adolescent girls from varied ages and types. The present study revealed that the majority of adolescents are normal around 44% are near to underweight. Therefore the study has concluded that more than 50% of the Adolescents have no sufficient knowledge on foods and they are nutritionally normal and some are below normal. They do not know about balanced diet, iron rich foods, as they are mostly living in far ridden areas with out knowing any information

PSCN-07 IMPACT OF SUPPLEMENTATION OF SELECTED FOODS ON STRESS MANAGEMENT AMONG WORKING WOMEN. R Usharani and UK Lakshmi. Department of Food Science and Nutrition, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu, India

Stress is a psychological and physiological response to the events that upset our personal balance. This study was aimed at assessing the stress level among 250 women working in silk fibre mills located at Arni taluk of Thiruvannamalai District of Tamil Nadu using Occupational Stress Index (maximum score 230). Nutritional status of all the women was assessed using standardized techniques. Based on stress scores, 40 women with high scores (156-230) were selected. Among stress relieving foods Lime juice, Milk and Banana were selected and supplemented for three experimental groups (Lime juice-200ml, Milk-200ml and Banana-1no.) respectively for three months. One group of 10 women served as control. Nutrition education was also given to all. The difference in the mean stress scores of the supplemented groups was found to reduce among Lime Juice Group by 99.9, Milk Group by 73 and Banana Group by 98, which were found to be statistically significant at one per cent level. Control group showed a significant increase in their stress scores. Haemoglobin levels of all the supplemented groups increased by 1.3g (Lime juice group), 1g (Milk group) 1.1g/dl (Banana group) and found to be significant at one per cent level. Control group showed a significant reduction in Haemoglobin levels. Women of all the experimental groups showed a highly significant increase in the nutrition knowledge scores whereas control group showed no change in their knowledge scores.

PSCN-08 RELATIONSHIP BETWEEN BODY MASS INDEX AND DIETARY FACTORS IN CHILDHOOD OBESITY. Tharani Devi N¹ and Radhai Sri S¹. ¹Department of Food Science and Nutrition, Avinashilingam Deemed University for Women, Coimbatore, Tamil Nadu, India, ²Department of Nutrition and Dietetics, Food Service Management and Dietetics, PSG College of Arts and Science, Coimbatore, Tamil Nadu, India. E-mail: dharani_charan@yahoo.co.in

The prevalence of childhood obesity is increasing rapidly in most industrialised countries including India. In order to prevent adult obesity, understanding the contributing factors, prevention and management of childhood obesity are essential. Considering this, a study on prevalence of obesity was conducted to evaluate the relationship between the Body Mass Index (BMI) and the factors affecting childhood obesity. A total of 1500 children in the age group of 7-12 years in and around Coimbatore district were selected for the study by quota sampling method. A pre-tested proforma was administrated to elicit the socio economic background, dietary pattern, physical exercise and genetic factors of the selected children. Further, anthropometric measurements such as height, weight, and fat fold at Triceps were recorded. The prevalence of obesity detected was 16.73%

(rural 16.2 % and Urban 17.29 %). The obtained data on consumption of snacks and calorie dense foods, physical exercise and genetic pattern were interpreted to test the relationship with BMI. A significant relation was observed between BMI and birth weight, dietary, physical activity and the genetic factor (obesity in parents). This study confirms that consumption of high fat and high energy (Junk foods) and snacking in between the meals should be avoided by children, which could be achieved through imparting appropriate education.

PSCN-09 HEALTH AND NUTRITION NEGLIGENCE – AN URGENT NEED FOR INTERVENTION PROGRAMMES. *K. Amrutha Veena* and *S. Kowsalya*, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu, India. Email: saiamruthaveena@gmail.com

Nutrition neglect greatly accounts for the recent upsurge in death toll among many developing nations. A total of 15400 subjects belonging to different groups namely infants, preschool and school going children, adolescents, adults and pregnant women including 200 male and 200 females from each taluk were selected from seven taluks of Ramanathapuram District of Tamil Nadu. Information on the various health problems faced by the subjects and morbidity pattern were collected using a pre-tested questionnaire. Clinical examination for the various signs and symptoms of nutritional deficiencies were done for all the subjects with the help of a registered medical practitioner. Common illnesses such as diarrhoea, respiratory illness, worm infestation, cough/cold, fever and skin problems were seen to be frequently affecting more number of infants, preschool and school going children than the other age groups. About 24.9 of the subjects were treated with home remedies for common illnesses faced by them. About 15.4 per cent of the subjects depended upon pharmacy or self medication and 28.8 per cent of the subjects often neglected common illnesses. The delay in visiting the doctors was seen to be more common among the female subjects. It was also evident from the study that majority of the subjects visited the physician only after four to six days after the onset of illness. Increased health care cost and low socioeconomic status of the people added up to the increased prevalence of home remedy and neglect of such illnesses among the people. A large amount of negligence in terms of health is common among the community demanding an urgent need for intervention programmes, especially health and nutrition education.

PSCN-10 MICROBIOLOGICAL QUALITY OF SALADS SERVED ALONG WITH STREET FOODS IN HYDERABAD. *Sabbithi Alekhya*¹, *Naveen Kumar*², *V Sudershan Rao*², ¹Participant, M.Sc. (Applied Nutrition Course), National Institute of Nutrition, Hyderabad, ²Food and Drug Toxicology Research Centre, National Institute of Nutrition, Indian Council of Medical Research, Hyderabad. Email: alekhya.sabbithi@gmail.com

In India during recent years, there has been an increasing trend towards the sale and consumption of street food at the road side. Different types of salads are served along with street foods. Salad vegetables are consumed without any heat treatment, sometimes without washing and peeling therefore the possibility of foodborne diseases is more. This study is an attempt to know the microbiological quality of salads served with street foods. A total of 106 salad samples, 53 each of onion and carrot were collected from four different zones of Hyderabad i.e. East- Alwal, West-Yousufguda, North-Secunderabad, South-Koti, information of processing of salads and hygiene practices of vender were collected through questionnaire cum observation method. About 98% of carrot samples and 75% of onion samples had *E.coli*, 77% and 48% had *staphylococcus aureus* in carrots and onions respectively. About 60% carrot and 34% onions contained *salmonella*, 85% carrots and 65% onions had *Yersinia*. About 98% of the vendors did not wash the vegetables before processing and serving. About 56.6% vendors do not peel the vegetables. About 60% of street vendor's nails were uncut. A significant difference ($P < 0.01$) was observed in *Yersinia* spp. and *Salmonella* spp. in wet-dirty chopping board when compared to clean-dry. A significant difference ($p < 0.05$) of *Staphylococcus* spp. was observed when the status of cleaning cloth is neat/untidy. HACCP study was carried out with 6 street food vendors to identify the source of *Salmonella* contamination in salads. Food handlers were found to be the cause of *Salmonella* contamination in salads. The present study revealed the potential hazards of street vended salad vegetables, considering the handling practice usually carried out by vendors and environment in which they display and the possibility of food related outbreaks of the disease.

PSCN-11 **NO INCREASED RISK FOR ANEMIA IN OVERWEIGHT WOMEN IN INDIA.** *Isabelle Aeberli* and Anura V Kurpad. St. John's Research Institute, St. John's National Academy of Health Sciences, Bangalore, India. E-mail: iaeberli@ethz.ch; a.kurpad@sjri.res.in

An increased risk for iron deficiency with increasing body mass index (BMI) has been shown repeatedly, but mainly in developed countries with low anaemia prevalence. In India, the prevalence of anaemia is >50% in women and around 15% are overweight, reaching >30% in certain population groups. Of the anaemia, about 80% is due to iron deficiency and a low socioeconomic status is a further risk factor. Thus, the increasing burden of obesity may add to the existing burden of anaemia. The aim of this study was to analyse the associations between BMI and anaemia, taking into account socio economic differences, in women participating in the third Indian National Family Health Survey (NFHS 3). From the 107'397 non-pregnant women participating, 52% were anaemic (Hb<12 g/dl). Prevalence of anaemia decreased from underweight (BMI<18.5 kg/m², 58%) through normal-weight (BMI 18.5-25 kg/m²) to overweight and obese subjects (BMI 25-30 and >30 kg/m², both 42%). The lowest mean Hb concentrations were seen in the poorest underweight group (11.2 g/dl) while the highest mean Hb was found in the richer obese and the richest overweight subjects (12.2 g/dl). Even though a large portion of the anaemia is supposed to be due to iron deficiency, the associations between iron- and weight status do not reflect in these data. Thus, more research is required to better understand the effect of obesity on anaemia in a country where iron supply and bioavailability are low and the double burden is increasing.

PSCN-12 **BIOCHEMICAL AND BIostatistical ASSESSMENT OF URBAN INDIAN POPULATION WITH THE PERSPECTIVE OF EMOTIONAL EATING.** Jyoti D Vora, Manasi Y Padate and *Sneha R Pednekar**. Department of Biochemistry & Food Science and Quality Control, Ramnarain Ruia College, Matunga, Mumbai, India. *Email: snehapednekar30@yahoo.in

As *Homo sapiens*, we are at the apex of food pyramid and the difference between us and other animals is our ability to emote with our food. Our relationship with food is not only physiological but also emotional. Many of us use food to cope with our feelings – anger, boredom, loneliness, stress, depression, frustration, and anxiety. However, this can be a vicious cycle. Food – eating it and thinking about it - distracts us from our uncomfortable feelings but often end up with overeating and unwanted weight gain. Emotional eating disorders are simply consuming food to comfort an undesired emotion. They involve self-critical, negative thoughts and feelings about body weight and food, and eating habits that disrupt normal body function and daily activities. Experts estimate that 75% of overeating is caused by emotions. Many children, particularly teens, feel self-conscious about their bodies, especially while going through puberty. This concern can grow into an obsession that can become an eating disorder. While more common among girls, eating disorders can affect boys, too. The social, emotional, situational, thoughts, physiological situations trigger us to eat. A carefully structured questionnaire was administered to the urban Indian subjects in the age group of 18 – 30 years with the view of obtaining a holistic picture of their perspective towards food consumption. The questionnaire comprised of a series of questions regarding their food habits, choice of food, and logistics. A total of 60 subjects were studied. The findings were statistically analysed. The results are indicative of important benchmarks of psychosocial aspects of eating food. The research endeavour is relevant because it has been executed in urban India, that mirrors the 'correct' picture of prevalence of emotional eating among young urban Indian population.

PSCN-13 **NUTRIENT GAP OF SCHOOL GOING CHILDREN OF PIRAVOM CONSTITUENCY – THE SITUATION ANALYSIS.** *Mumtaz Khalid Ismail*¹, K V Beena², Lalitha Ramaswamy³. ¹National Rural Health Mission, ²National Rural Health Mission, District Health and Family Welfare Society, Kochi, ³Department of Nutrition and Dietetics, PSG College of Arts and Science, Coimbatore, India. Email:mumtazkismail@gmail.com

School going children go through remarkable physical changes of all kinds; their food intake becomes a critical aspect for the growth and development. During their growing period, care should be taken to include all the nutrients in their diet. Nutrition affects the overall development of the child for which a balanced diet has to be followed. Nutritional assessment was carried out for the age group of 5 – 17 yrs of the all the 1328 students of various schools of Piravom constituency in Kerala. Out of them, 642 were females and the remaining 686 were males. The caloric intake ranged between 617 kcal to 1107.62 kcal /day, the protein intake was 12.92 gm to 57.79

gm per day, calcium 60.3 mg to 322 mg per day, iron intake was 5.54 mg to 27.9mg per day which was far below the ICMR (2000) recommendations of dietary allowances of Indians. It was also found that most of the children had a complete meal only in the school lunch. Breakfast was not consumed as the mothers could not provide it due to poverty and lack of knowledge. Dinner was also poor with only rice as the only food. It is recommended that with the help of nutritionists should formulate an improvised locally available nutritious diet for school children. Also breakfast be provided by the Government to ensure more nutrition to the children. Nutritious food not only makes a child healthier, but also makes a child emotionally more stable and improves school performance.

PSCN-14 **NUTRITIONAL STATUS OF RURAL WOMEN IN VARANASI.** *Zoobi Khanam, H Shankar, CP Mishra.* Department of Community Medicine, Institute of Medical Sciences, Banaras Hindu University, Varanasi, UP, India. *Email: zoobi.bhu@gmail.com

Because of prevailing culture and traditional practices in India, the health and nutritional status of women becoming worse effected. There are several problems in the implementation of appropriate Government intervention programmes due to poverty, gender discrimination, illiteracy in the population. Therefore, an attempt was made to assess the dietary and nutritional profile of rural women in Varanasi district of Uttar Pradesh. Objective of this study was to find out the nutritional status of rural women. A cross sectional study was conducted on 160 rural women of reproductive age group (15-45 years) selected by simple random sampling of 'Chiraigaon' community development block of Varanasi district. Respondents were interviewed with the help of pre-tested schedule. Results show that 12.5% respondents were found to be under the category of chronic energy deficiency. 14.9% respondents of lower socio economic status were having BMI less than 18.5 and majority (22.2%) chronic energy deficient respondents were within the age group of 21-25 years. Mean protein and fat intake among respondents were found to be 40.44 gm/day and 18.72 gm/day respectively. It was also found that majority (70.3%) respondents of lower socio-economic status have only 2 times diet in a day. Majority of the respondents belonging to the lower socio-economic status consume energy providing foods daily while they have to ignore foods rich in proteins vitamins and minerals due to their limited purchasing power. These results suggest that CED among rural women is predominant problem in this area and increased consumption of local traditional food (particularly pulses, vegetables and animal source food) should be incorporated as an important component of intervention strategies to improve their nutritional status.

PSCN-15 **STUDY ON WEANING PRACTICES & MALNUTRITION AMONG INFANTS (6-12MONTHS) AT URBAN UDAIPUR CITY (RAJASTHAN).** *Mani Mishra and Preeti Rathi.* Maharana Pratap University of Agriculture and Technology, Udaipur College of Home Science, Department of Food and Nutrition, Udaipur. Email-maanvi29@gmail.com, rathi.preeti5@gmail.com

India has achieved socio economic progress with increasing industrialization and urbanization. This has influenced the life of the people including their feeding habits and practices, living style, economy as well as traditional mothering and child rearing practices. The present study was undertaken to discover the prevalence of malnutrition among the children (6-12 months) followed by weaning practices in Udaipur. Data on demography and socio-economic aspects were collected on a total of 50 children i.e. using interviewing their mother. Anthropometric measurements were taken to assess the nutritional status. Out of 50 respondents, the degree of malnutrition was higher mainly in the age group 6-8 months both boys and girls in case of weight for age, height for age and head and chest circumference. The possible reasons were lack of knowledge of mothers as 24 % mothers were found illiterate. 36% mothers fed their children upto 6 months only so ,short duration of breastfeeding leads to malnutrition. Poor socio-economic conditions as most of families 44 % belonged to low income group. So it can be concludes that mothers have to be educated about the importance of breast feeding, proper time to start weaning, advice against indulging in harmful feeding practice.

PSCN-16 **ASSESSMENT OF NUTRITIONAL STATUS & FEEDING PRACTICES OF CHILDREN.** *Nisha Jacob,* Govt. College of Nursing, Medical College Thiruvananthapuram, Kerala. Email: nishashajjohn@gmail.com

Development of successful interventions to improve the age specific child feeding practices requires appropriate instruments for quantitative & qualitative assessment. The present study identifies the nutritional status and feeding practices of rural and urban children. The child feeding index (CFI) score prepared in this study provides a comprehensive assessment of child feeding practices. The objectives were to assess nutritional status

and the child feeding practices of children of rural coastal area and to prepare an age specific child feeding index. The present investigation (Phase I) was a community based cross sectional study carried out in rural coastal area. All children 1- 3 years who were healthy (attending the anganwadis & immunization clinics) were selected. The tool used were structured interview schedule and nutritional status assessment proforma. Focused group discussions were conducted among the mothers to collect data on complementary feeding practices including hygiene and psychosocial care during feeding of children. An age-specific child (1-3 years) feeding index for children between 12-36 months was prepared at par with current feeding recommendations (WHO, 2007). Of the subjects, stunting was present in 29% of children and 50% of children were underweight revealing the poor nutritional status. In next phase, the design used was comparative cross sectional study to compare rural & urban children. The mean CFI score (-0.2) was lower among rural children where as urban counterparts had consistently higher mean CFI (2.8) scores. Majority (77%) were in average grade in rural area whereas in urban counterparts, majority (57%) were having good grade in feeding practices. The statistical difference was seen between rural & urban children in following parameters : CFI scores (ANOVA, $F=19.2$, $p<0.001$), Age of Initiation of complementary feeding (ANOVA, $F=16.9$, $p<0.001$). Poor child feeding practices were strongly associated with poor nutritional status in rural children. Age -specific feeding practices helps to target nutrition education and behaviour change programs among mothers of these children.

PSCN-17 A REVIEW OF STREET FOODS IN DEVELOPING COUNTRIES. *R Hemarupaa*, Dept. of Home Science, Fatima College (Autonomous), Madurai, India. email: mailrupaa@gmail.com

The Food and Agricultural Organization defines street foods as ready-to-eat foods and beverages prepared and/or sold by vendors and hawkers, especially in streets and other similar public places. Urban population growth has stimulated a rise in the number of street food vendors in many cities throughout the world. Migration from rural areas to urban centres has created a daily need among many working people to eat outside the home. Demand for relatively inexpensive, ready-to-eat food has increased as people, especially women, have less time to prepare meals. Street foods often reflect traditional local cultures and exist in an endless variety. Their marketing success depends exclusively on location and word-of-mouth promotion. Street food micro-industries are vital for the economic planning and development of many towns. The contribution of street food vendors to the economies of developing countries has been vastly underestimated and neglected. Regulations can make street food safer: Once policy-makers have decided that street foods are here to stay, there are innumerable small ways to make life easier for both vendors and inspectors while ensuring that food is safer for the consumer. Fair licensing and inspections, combined with educational drives, are the best long-term measures to safeguard the public. Customers and consumer organizations also have a role to play in association with government authorities, vendors' associations and scientists. Participation and advocacy by consumers can help to prevent food borne diseases through street foods. Better consumer information and education regarding food hygiene can help authorities to take quick remedial action and preventive measures in street food safe and enterprising.

PSCN-18 A COMMUNITY BASED PARTICIPATORY DIABETES PREVENTION AND MANAGEMENT INTERVENTION IN RURAL INDIA USING COMMUNITY HEALTH WORKERS. *Padmini Balagopal*¹, *Ranjita Misra*², *N Kamalamma*³, *Thakor G Patel*⁴. ¹Principal Investigator and Nutrition Consultant in the United States and India, ²Texas A&M University, College Station Texas, ³Retired HOD & Professor, Gandhigram Rural Institute, Tamilnadu, India, ⁴Uniformed Services University of the Health Sciences, Bethesda, USA. Email: velchet2@gmail.com

Objective - This study tested the effectiveness of a community based participatory diabetes prevention and management program in rural Gujarat. *Research Design and Methods* – A 5-month non-pharmacological education intervention program was tailored for 1638 respondents from two distinct socio-economic status (SES) groups using Community Health Workers as change agents. They provided culturally and linguistically-appropriate health education messages in individual and group sessions. Illiteracy and participants' widely differing educational levels were addressed by tailoring health messages through events such as 'edutainment' and intra-competition. Pre-and post intervention parameters were compared to examine the educational intervention's impact and effectiveness. *Results* - Overall the pre-intervention crude point prevalence of diabetes,

pre-diabetes, obesity and hypertension were 7.2%, 19.3%, 16.7%, and 28% respectively with significant differences between the low SES agricultural workers (3.3% & 16.7%, 6.4%, and 19.0%) and the high SES business community (10.4%, 21.6%, 25.6% and 35.6% respectively) due to differing diet and activity levels. Intervention significantly reduced blood glucose and blood pressure levels in the overall population and increased knowledge of risk factors. While a positive correlation between diabetes and age was expected ($p < .001$; highest among 40-59 year age group), high rates of undiagnosed hypertension (26.1%) even in the low SES farm worker group were surprising. Among individuals with a history of diabetes, metabolic complications such as diabetic nephropathy and chronic kidney disease were noted. *Conclusion* - Through collective engagement of the community, participatory programs can serve as a prototype for future prevention and management efforts which are rare/under-utilized in India.

PSCN-19 THE IMPACT OF VARIOUS CHOCOLATE CONSUMPTION ON HUMAN BEINGS – A SURVEY REPORT. *Tanusree Daw* and *Suniti Ghosh Chatterji*. Department of Home Science, University of Calcutta, Kolkata, West Bengal, India. Email: tanusreenutrition@gmail.com

Chocolate is a universally accepted food. A survey was conducted on 200 subjects (male : female=1:1) of all ages in and around Kolkata (West Bengal) to see the acceptability, attitude, effect of consumption of chocolate on health. The study revealed that 89% male subjects and 97% female subjects like to eat chocolate. Again 49% females and 36% males eat chocolate whenever they get. The preference for milk chocolate and dark chocolate for both males and females are 48%, 33% and 14%, 13% respectively. Taste, flavour, colour of chocolate is liked by 50% females, 43% males. In 92% females and 84% males, consumption of chocolate helps in mood elevation. The male and female subjects eat chocolate due to their delicious taste (64%, 68%); feeling of happiness (15%,12%); energy giving and flavour, smell (21%,15%) respectively. The health promoting effect (i.e. - anticarcinogenic, energy giving, CVD preventing) of chocolate is 65% according to both males and females. The bad effect of chocolate such as – dental problems, fat inducing and others are 76% according to females and 68% according to male subjects. Further studies are needed to overcome the limitations of this study.

PSCN-20 FOOD AND NUTRITION SECURITY: AN ASSESSMENT OF PRESCHOOL CHILDREN OF RURAL ANGANWADI CENTRE. *Manoj Kumar*¹, *Pramila Prasad*², *Faruque Ali*³, ^{1,2}P.G. Dept. of Home Science - Food & Nutrition, ³Dept. of Zoology, T.N.B. College, T.M. Bhagalpur University, Bhagalpur, Bihar. Email: Kumarmanoj9234@redifmail.com

Food and Nutrition Security is broadly characterized by three pillars: Availability, Accessibility, and Absorption (Nutritional Outcomes). Millions of children suffer from food and nutrition insecurity resulting in chronic undernutrition. The social composition along with the inability to buy foods also play a role in food insecurity. Nutrition Security implies physical, economic & social access to balanced diet, clean drinking water, safe environment & health care for every individual. Several programmes, missions and acts including a National Nutrition Policy (1993), National Nutrition Plan of Action (1995), National Nutrition Mission, have been formulated. Integrated Child Development Services (ICDS) is one of the most important scheme for the improvement of nutritional status of preschool children. But they have not achieved nutritional goals. The present study was aimed to assess the adequacy of diet and nutrition and its impact on the nutritional status of preschool children of rural AWCs of Bhagalpur and Banka Districts of Bihar. For this purpose, 200 preschool children were randomly selected from AWCs to assess the diet intake and adequacy by 24-hour recall method, and calorie and micronutrient were calculated and compared to RDA. For the nutritional assessment anthropometry tools and WHO Growth Standards (2006) were used. Out of 200 children, only 16% of the children were getting full diet, while 84% were not getting full diet, of which 20% children were getting ½ diet compared to RDA, Protein Intake was only 16% compared to daily requirement. Minerals & Vitamins intake including Calcium, Iron, Iodine, Zinc, and Vitamin 'A' were less than 25% compared to daily requirement. Environment & Sanitation was poor in common. No single child was getting pure drinking water. Due to low intake of food & nutritional diet, resulting 52% children undernourished in which 22% severely undernourished, and 48% were normal. It may be concluded that Food & Nutrition Insecurity leads to undernutrition in children. Food & Nutrition Security must be ensured through the ICDS and other National Nutritional Programmes for combating malnutrition in India.

PSCN-21 LONGITUDINAL TRENDS IN PHYSICAL ACTIVITY PATTERNS IN SELECTED URBAN SOUTH INDIAN SCHOOL CHILDREN. *Sumathi Swaminathan, Sumithra Selvam, Tinku Thomas, Anura V Kurpad, Mario Vaz.* St John's Research Institute, St. John's National Academy of Health Sciences, Koramangala, Bangalore, India. E-mail: sumathi@sjri.res.in.

Very few studies document patterns of physical activity in Indian children and none have examined change over time. The aim of this study was to document patterns of physical activity in South Indian school children aged 8 to 15 years and examine changes over one year. Physical activity was assessed using interviewer-administered questionnaires at baseline (n=256) and at follow-up (n=203) in the years 2006 and 2007. Frequency and duration of each activity was recorded and metabolic equivalents (MET) assigned. Sedentary activity included activities with MET < 1.5, and moderate-to-vigorous physical activity (MVPA) those ≥ 3.0 . For each activity, daily duration, intensity (MET), and the product of the two (MET-minutes) were computed. Children were categorized by age group, gender and socio-economic status. Height and weight were measured. At baseline, sedentary activity was higher in children aged >11 years, while intensity of MVPA was higher in boys than girls. Over one year, physical activity at school significantly decreased (<0.001). There was also a significant decrease in MVPA MET-minutes (p <0.001) with interaction effects of age group (p<0.001) and gender (p<0.001). There was a significant decline in moderate-to-vigorous physical activity over a single year follow-up, largely due to a decrease in physical activity at school, especially in girls and in the older age group. There would appear to be a gap between State educational policies that promote physical well-being of school-going children and actual practice.

PSCN-22 ASSESSMENT OF ROLE OF DIETARY PRACTICES IN PREVALENCE OF DIABETES MELLITUS AMONG MIDDLE & HIGH INCOME GROUP MEN, GENETICALLY PREDISPOSED TO DIABETES. *Anjali Rajwade,* Home-Science Department, Radhadevi Goenka College for Women, Akola, India. Email : arajwade28@yahoo.com

Prevalence of diabetes mellitus (DM), a lifestyle disease is increasing alarmingly. Dietary practices & exercise play a vital role in nutritional & health wellbeing. There is upward transition in economical status in India. The objectives of the present study were to study the dietary practices & exercise of middle aged men with one parent genetic predisposition to diabetes (GDP) & assess the role of dietary practices on the prevalence of DM among them. A large population was surveyed in Akola city to detect 50 middle aged men each of middle income group (MIG) (n₁ = 50) & high income group (HIG) (n₂ = 50) and having GDP. Assessment of factors like diabetic status, dietary practices, exercise, body mass index (BMI) was done. The results were compared against standard normal indicators of relevant factors. Data analysis revealed that the prevalence of DM in MIG men was 22% of which 72.73% had diabetes not under control as revealed by high HbA1c levels where as 27.27% had controlled diabetes as per HbA1c levels. Normal HbA1c was achieved by 66.67% diabetics with the use of medicines and 33.33% managed to control diabetes with Diet + Medicines + Exercise. In the HIG 36% had diabetes of which all 100% had elevated HbA1c levels indicating uncontrolled diabetes. No (0.00%) HIG diabetic individual had controlled diabetes. The dietary practices revealed that in MIG 28% had lunch + dinner; 14% had breakfast + lunch + dinner; 8% had breakfast + lunch + snacks + dinner & 50% had lunch + snacks + dinner pattern. The corresponding values in HIG were 20%; 30%; 4% & 46% respectively. In MIG 20% had balanced diet while 70% had excess & 10% inadequate diet, corresponding values in HIG were 16%, 78% & 6% respectively. Consumption of processed food & homemade food was 24% & 76% in MIG and 44% & 56% in HIG. In MIG 76% and in HIG 90% consumed fat rich food. Lack of proper exercise was evident in 80% MIG & 94% HIG individuals. BMI study showed 60% overweight & 24% obese in MIG and 44% & 48% respectively in HIG. The results reveal that inspite of having one known diabetic parent, majority MIG & HIG respondents were not aware of healthy dietary practices & exercise regime. Those with controlled diabetes relied on medicines rather than diet to manage diabetes. Prevalence of DM & its uncontrolled status was significantly more in HIG than MIG. Upward economic transition probably was responsible. There is significant need of education of nutrition & exercise regime for stable diabetes control.

PSCN-23 PREVALENCE AND RISK FACTORS OF HYPERTENSION AMONG ADULTS IN URBAN FIELD PRACTICE AREA OF COMMUNITY MEDICINE DEPARTMENT, OSMANIA MEDICAL COLLEGE, HYDERABAD, ANDHRA PRADESH. Lavanya KM, CH Koteswaramma, Vimala Thomas, ML Surya Prabha, Prakash Bhatia, Department of Community Medicine, Osmania Medical College, Hyderabad, India. E mail: doclavanyarao@gmail.com.

Hypertension (HTN) is a major public health problem. It is commonly asymptomatic, readily detectable, usually easily treatable and often leads to complications if left untreated. Developing countries are going through demographic transition with increase in life-expectancy, urbanization and changing lifestyle, non-communicable diseases such as HTN are coming up in epidemic proportions. Recent studies using revised criteria (BP 140 and/or 90 mmHg) have shown a high prevalence of hypertension among urban adults: men 30%, women 33% in Jaipur (1995), men 44%, women 45% in Mumbai (1999), men 31%, women 36% in Thiruvananthapuram (2000), 14% in Chennai (2001), and men 36%, women 37% in Jaipur (2002). *Aims and Objectives:* To estimate the prevalence of hypertension, among adults above 20 years of age in the urban field practice area of Community Medicine Department, Osmania Medical College, Hyderabad;. To determine the risk factors for hypertension in the study population and to assess knowledge, attitude and practices about hypertension in the study population *Study design:* Cross-sectional study. *Study area:* Harazpenta (urban field practice area of community medicine dept). *Study period:* 1 month (Aug 20th to Sep 20th 2011). *Materials:* Mercurial sphygmomanometer (Diamond), Weighing machine, Measuring tape, Stethoscope, a predesigned and prestructured questionnaire. *Sampling:* Simple random sampling. *Data analysis:* Analysed using SPSS 17.0 version and Epi info. *Results:* Will be disclosed at the time of presentation.

PSCN-24 A STUDY ON HEALTH STATUS AMONG GOVERNMENT PRIMARY SCHOOL CHILDREN IN RURAL FIELD PRACTICE AREA OF DEPARTMENT OF COMMUNITY MEDICINE, OSMANIA MEDICAL COLLEGE, HYDERABAD. Sunil Pal Singh, CH Koteswaramma, Vimala Thomas, Ravi Babu, Prakash Bhatia, Department of Community Medicine, Osmania Medical College, Hyderabad, India. Email:sps_hari@yahoo.co.in

Primary school children are important group in the community .This is the period where inculcation of good personal hygiene and nutritional habits takes place. "Bad nourishment" concerns not only about enough food but also too much food, the wrong type of foods. Poor personal hygiene results to a wide range of infections to which body response brings in malabsorption of nutrients or inability to use nutrients properly to maintain health. ⁽¹⁾ The recent facts: Malnutrition (10 - 80 %) Dental Morbidity(70%) Worm Infestations(2-30%) Skin Diseases(3-10%) Eye Problems(4-8%) Anaemia (4-15%) Justification of the study: In spite of national nutritional programmes like ICDS, Mid-day Meal Programme etc., prevalence of malnutrition in government primary school children remains to be high in India, both rural and urban. Hence there is immense need to determine the current prevalence of malnutrition and its associated contributing factors. *Aims and Objectives:* 1. To estimate nutritional status among Government primary school children with the help of anthropometric tools. 2.To correlate these results with parent's education, occupation and their personal addictions. 3.To elicit the relationship of personal hygiene with their nutritional status. *Study design :* Cross sectional study. *Study period:* 3 months (Feb-April 2011). *Sample size:*100 primary school children from three randomly selected schools in rural area. *Study variables:* Anthropometry, Personal hygiene and Morbidities *Study tools:* pre designed pre-tested, questionnaire, weighing machine, height measuring rod, Snellen's chart, tuning fork, stethoscope, gloves *Analysis:* SPSS, epi info version 3.5.2 *Results:* Under weight:86%, poor hygiene:70%, anaemia: 55%, dental caries: 52%, CSOM: 33%, Myopia:23%, Mottled enamel:15%.

PSCN-25 CARDIOVASCULAR RISK BEHAVIOR DETERMINANTS AMONG HIGH SCHOOL STUDENTS OF A PRIVATE SCHOOL IN URBAN FIELD PRACTICE AREA, OSMANIA MEDICAL COLLEGE, HYDERABAD. Sudhabala, CH Koteswaramma, Vimala Thomas, MLS Prabha, Prakash Bhatia. Department of Community Medicine, Osmania Medical College, Hyderabad. Email id: dr.sudhabala78@gmail.com

Lifestyle related behavioural risk are mainly implicated for increased burden of cardiovascular diseases .Research related to these risk behaviours especially among high school students is essential, considering as role models for future generations ahead. The objective is to evaluate the burden of cardiovascular risk behaviors among high school students. A cross sectional study was carried out among high school students using self

administered questionnaire to collect information on identification data and risk behaviours in relation to cardiovascular diseases. Percentages and chi-square test were done. Results showed 59% of moderate dietary score and 17% high score. Frequent consumption of carbonated soft drinks was present in 34.4% and 33.6% reported frequent consumption of fast foods in past week. Large proportion (80.3%) were using extra salt. Sedentary activity was seen in 43%. Small proportion (4.9%) were current smokers and 4.1% were consuming alcohol. 58.2% were either not carrying out or involved in only occasional physical activity in past week. Significant association was found between gender and sedentary activity ($p=0.004$). Unhealthy behavioural practices are present and may progress as student advances through adulthood. Developing strategies targeting at these behaviours and determining factors is necessary to promote healthy life style.

PSCN-26 AN EVALUATION OF THE FOOD LABELS AND CONSUMER AWARENESS ON FOOD LABELING SYSTEM. *Annapriya R* and Premakumari S. Department of Food Science and Nutrition, Avinashilingam Institute for Home Science and Higher Education for Women University, Coimbatore, Tamil Nadu, India. Email: tomolah5@yahoo.in

A food label refers to the legally required nutritional or consumer safety information about the food product. It is there for safety and suitability reasons. A study on the present Food labelling system and Creating Awareness among consumer Groups was carried out with the following objectives, (1) Conduct the consumer awareness survey on Food labelling, (2) Analyse the nutrients present in the health claim products, (3) Determine the adulteration in the labelled products, (4) Evaluate the present food labelling system. A consumer survey was carried out among school children, college students, adult group, home makers and senior citizens comprising of five hundred samples. The results indicated that the adult group had more knowledge about food labelling when compared to the other groups and at the same time school children had poor knowledge on food labelling. Senior citizens read all the details in food label when compared to the home makers and college students. When 10 selected samples were analysed for the content of enriched nutrients (iron, fibre, iodine, Fat, Carbohydrate, Protein and calcium) the values were found to be more than the labelled value. Laboratory analysis of 13 products of cottage industry as well as branded ones, revealed that all the cottage industry products were adulterated while all the labelled products were free from adulterants. Out of 170 products examined, 90 per cent of food labels contained all the details as per the specification. Proper sensitisation of all the groups of consumers is essential to increase the habit of reading the food labels while purchasing foods.

PSCN-27 A STUDY ON HEALTH, DIETARY STATUS AND PHYSICAL ACTIVITY LEVEL OF WOMEN WORKING IN CASHEW FACTORY. *MS Lal Soniya* and SS Vijayanchali. Department of Home Science, Gandhigram Rural Institute, Deemed University, Gandhigram. Email: m.s.lalsoniya@gmail.com

Diet and physical activity influence health both together and separately. The diet and healthy food promotes good health, thus a nutritious and healthy diet is important in the prevention and cure of various diseases. Physical activity is a fundamental means of improving the physical and mental health of individual. Women work in two systems and need to perform both familial and occupational roles these lead to many health problems among them. The women belong to lower mid and hilly area are engaged more as workers in cashew factories. In this study ($n=200$) of women working in the cashew factory were selected from ten factories in Kanyakumari (District) with interview schedule. The health and nutritional status was assessed by anthropometric measurement, 24 hours-dietary recall and physical activity they perform. Their meal intake was deficit in calories, calcium, iron and vitamin C, intake of protein and fat was in excess. PAL (Physical Activity Level) was high during weekdays since they were active with a household chores and factory work when compared to weekend. Health problems like back pain, leg pain, hand pain, irregular bleeding, low BP was observed among majority of them and few of them suffered from the skin and respiratory problems like ring worm, rashes and breathing problem. The cashew factory women workers were prone to malnutrition like overweight and obesity, underweight which may affect their livelihood in future.

PSCN-28 IMPACT OF IRON SUPPLEMENTATION AND NUTRITION EDUCATION OF ANAEMIC ADOLESCENT GIRLS. Mekha MS and Meera M, Department of Home Science, Sri Sathya Sai Institute of Higher Learning, Anantapur, India. Email: meeramanik@yahoo.com

Iron deficiency is most widely distributed nutritional disorder in the world. Children, adolescents and women from developing countries are the most vulnerable groups for anaemia prevalence. Nutrition is an unavoidable factor in education and health growth of nation. Nutrition education is important as a means for improving the nutrition of the community in developing countries. Hence nutrition education was given to adolescent girls and the impact was studied. To study the effect of supplementation of iron enriched product on the haematological status, 30 adolescent girls were selected whose blood haemoglobin levels were low (8-10gm) in the age group of 16-18 years. Iron rich podi was formulated using cauliflower leaf powder, niger seeds, rice flakes, roasted bengal gram, tamarind and jaggery. Supplementation of iron enriched podi (20gm/day was given for 30 days for experimental group(20girls) and other 10 were used as control samples. The effect of supplementation on haematological parameters such as blood haemoglobin, serum iron, and packed cell volume was statistically significant upon supplementation. Total iron binding capacity (TIBC) and the unsaturated iron binding capacity (UIBC) decreased significantly upon supplementation. The results of the study indicated that supplementation of iron enriched podi along with nutrition education improved the iron status of selected anaemic adolescent girls.

PSCN-29 MACRONUTRIENT INTAKE STATUS OF ADOLESCENT GIRLS IN A RURAL AREA OF VARANASI. Jaya Krishna*, MK Gupta** and CP Mishra***. Department of Community Medicine, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India. *jaya7021@gmail.com, ** drmkgbhu@gmail.com, ***drcpmishra@gmail.com.

Background: The current nutritional status of adolescent girls will decide the well being of the present as well as the future generations. Decreased dietary intake among these girls is associated with reduced lean body mass, lack of muscular strength and decreased work capacity. *Objectives:* To assess the macronutrient viz. calorie, fat and protein intake in rural adolescent girls. *Study Design:* Community based cross sectional study. *Participants:* 400 adolescent girls from age group 10 to 19 years were selected from Chiraigaon Community Development Block of Varanasi district by adopting appropriate technique. *Tools and Techniques:* Predesigned and pretested schedule was used to elicit pertinent information by 24 hour dietary recall method. *Statistical Analysis:* Intakes were compared with their RDAs. *Results:* With reference to RDA calorie, protein and fat intake was less than 80% in 74%, 61.8% and 39.0% subjects, respectively. Calorie intake as percentage of RDA was significantly ($p < 0.05$) less in early (10-14 years) adolescent girls. Study subjects who had more number of sisters than brothers were found with significantly lower percentage calorie intake ($< 50\%$ of RDA). Adolescent girls who belonged to SC category were consuming significantly less amount of protein. Percentage fat consumption as per RDA was significantly more in late adolescence (18-19 years), who had left school, whose main occupation was other than student and whose timing of meal consumption was irregular. *Conclusion:* Macronutrient intake of adolescent girls was not up to the mark.

PSCN-30 CORRELATION OF CARDIOVASCULAR DISEASE PREVALANCE WITH FOOD INTAKE PATTERN. Rajkumar M Kamble¹, Avinash Kale² and Puspanjali Samuntray³. ^{1,2}Dept. of Home Science, Rajaram College, Kolhapur, Maharashtra, India. E-mail: rmkamble@hotmail.com ³Department of Home Science, Beharampur University, Beharampur, Orissa State, India

Cardiovascular disease is a major lifestyle disorder and claim nearly about 5 to 6 million Indian population. It accounts 64 per cent of all deaths in every year in India. There are several risk factors increases the burden of cardiovascular disease. Present investigation has been undertaken to assess the correlation in the prevalence of cardiovascular disease with the specified risk factor in particular food intake pattern among cardiovascular diseases patients in western Konkan of Maharashtra State. Five hundred cardiovascular disease male patients between 40 to 60 years in age from Sangli, Satara and Kolhapur districts were chosen by purposive random sampling method. Food intake and lifestyle factors were assessed with two way analysis method of correlation coefficient. It is concluded that mostly non-vegetarians, except fish eaters, consumption of milk and milk products, animal fats, groundnut oil and lifestyle like drinking alcohol, soft drinks and smoking cigarette were found to strongly associated with prevalence of cardiovascular disease.

PSCN-31 DIETARY IRON DENSITY AND PREVALENCE OF ANAEMIA AMONG ADOLESCENTS OF GOVERNMENT RESIDENTIAL SCHOOLS IN HYDERABAD. Roy Choudhury Dripta¹, MS Radhika², GNV Brahmam² and K Madhavan Nair¹. ¹Micronutrient Research Group, Biophysics Division; ²Division of Community Studies, National Institute of Nutrition, ICMR, Hyderabad.

Adolescence is the second decade of human being's life which is characterized by rapid growth, physiological changes and psychological modulation. These changes demand extra nutritional requirement for both boys and girls especially that of iron, the RDA of which is set at 32mg and 27mg for 13-15 years boys and girls respectively. Two government residential schools under Andhra Pradesh Social Welfare Residential Educational Institutions Society were selected to study whether the prescribed dietary menu meets the RDA of iron for 13-15 years adolescents. The nutrient composition of ration and institutional consumption (Boys = 400; Girls= 380) along with individual intakes (N= 24; 13-15 years) were assessed for the lunch-meal on two consecutive days using weightment method. The data on nutrients was expressed as per 1000 Kcal and compared with Indian RDA for the respective age and gender groups. The iron density of prescribed diet (5.55 mg / 1000 Kcal) was found to be about 50% lower compared to RDA (12 mg / 1000 Kcal). The iron density in the individual intake was also found to be lower (5 mg / 1000 Kcal) than the corresponding RDA. To corroborate these findings, the overall prevalence of anaemia was found to be 66% in girls (N= 102) and 75% in boys (N= 72). The deficit in the iron density of diets and concomitant prevalence of anaemia among adolescents in the government residential schools are of concern and calls for implementation of focused strategies for dietary diversification and food fortification (e.g., DFS Programme) concurrently to improve and maintain the micronutrient status of adolescents.

PSCN-32 CHANGE IN DIETARY PROFILE OF PARTICIPANTS UNDERGOING A LIFESTYLE INTERVENTION PROGRAM FOR PREVENTION OF DIABETES. Ranjani H¹, Lakshmi Priya N¹, Sudha V¹, Weber MB², Anjana RM¹, Narayan KMV², Mohan V¹. ¹Madras Diabetes Research Foundation & Dr. Mohan's Diabetes Specialities Centre, Chennai, India. E-mail: ranjuhar@gmail.com ²Hubert Department of Global Health and Epidemiology, Rollins School of Public Health, Emory University, Atlanta, Georgia.

Diabetes Community Lifestyle Improvement Program (DCLIP) is an ongoing translational research trial adapted from the Diabetes Prevention Program carried out to study the effect of a step-wise model of diabetes prevention among pre-diabetic adult participants. Individuals with impaired glucose tolerance and / or impaired fasting glucose, were randomised either into an intervention or control arm. Relative changes in the participant's dietary profile and BMI were assessed by comparing the results at baseline and at the end of a 6-month intervention period. Of the total participants (n=620) recruited in the trial, 138 participants from the intervention group and 100 participants from the control group were included for the analysis. At baseline, both arm participants showed no significant difference in their dietary profile and anthropometric measurements. After 6 months follow up, the intervention arm participants showed a significant reduction in the intake of foods such as refined cereals (-30.9% v/s -10.5%; p<0.01), fats and oils (-20% v/s -12.8%, p<0.05), meat and poultry (-55.7% v/s 9.4%; p<0.05) and a significant increase in the intake of leafy vegetables (9.9% v/s -3.5%, p<0.01). However, the intake of whole cereals (8.1% v/s -2.3%) and millets (30.2% v/s -30.7%) though markedly increased could not be proven statistically. The change in the dietary habits was reflected by a significant reduction in the BMI of the intervention arm participants (-4.4%) compared to the control arm (-1%). Preliminary findings from DCLIP programme indicate a definitive change in the dietary profile as reflected by significant reduction in weight of the intervention group participants.

PSCN-33 ROLE OF VITAMIN D IN HYPERTENSION. Harbans Lal and RK Goel. Maharaja Agrasen Medical College, Agroha (Hisar), Haryana.

Vitamin D is known to play an important role in calcium homeostasis. Recent studies have suggested that Vitamin D also has a role in blood pressure regulation and heart health. It is also reported that cases of high blood pressure increase during winter and in the places that are far away from the equator, the situations where a decrease in available sunlight leads to lower Vitamin D production. On the other hand others found no association between Vitamin D intake from diet and supplements, and the risk of incident hypertension. Due to conflicting reports, it was planned to study the role of Vitamin D supplementation in patients with hypertension. One hundred hypertensive patients (group I) were given conventional antihypertensive drugs while another 100 patients (group

II), in addition, were supplemented with Vitamin D₃ (33,000 IU, after every 2 weeks, for 3 months). Besides diastolic and systolic blood pressure, serum calcium, phosphorous, alkaline phosphatase, albumin, albumin-corrected calcium, and 24 h urinary creatinine levels were estimated in both the groups before the start of treatment and after 3 months. Vitamin D supplementation showed a more significant decrease in systolic blood pressure. This group also showed a significant increase in serum calcium as well as albumin-corrected calcium with a decrease in phosphorous. Results of the study confirm that Vitamin D supplementation has a role in reducing blood pressure in hypertensive patients and that it should be supplemented with the antihypertensive drugs. More extensive studies with a larger group, to draw a definite conclusion, are in progress.

PSCN-34 SYM- KEM: INTERVENTION PROGRAMME FOR PREVENTION OF LIFESTYLE DISORDERS IN SCHOOL CHILDREN. *Chinchwade T, Kharkongor P, Bhave S, Madkaikar V, Pandit A.* Dept. of Paediatrics, KEM Hospital Research Centre, Pune, India. _trushna05@gmail.com, kemhrc@vsnl.net

Hypothesis: Multifaceted School based Intervention Programme can reduce prevalence of childhood obesity and change life style parameters e.g. TV viewing, exercise & diet. *Background:* Childhood obesity is now well established as an important factor in the development of adult chronic disease such as diabetes mellitus and coronary heart disease. 10% of urban school children are overweight or obese as per recent surveys. Sedentary life styles (study, computers), lack of physical activity & food habits are responsible. School based intervention appears to be the most logical attempt at interrupting the epidemic of obesity and thereby, DM and CHD. *Objectives:* (i) To evaluate compliance towards intervention components and (ii) To evaluate the effect of an exercise program on physical fitness parameters in school children. *Methodology:* Program commenced in 2005 in class III & IV students of Symbiosis School, Pune, (n=453) were enrolled. The intervention components were: (i) to increase the number of (PT) classes (ii) to make PT a scoring subject (iii) dietary modifications (iv) to remove food hawkers around school (v) impart health education & (vi) counseling of overweight children. Base line fitness parameters were assessed through a battery of fitness tests. 6 months physical activity intervention programme was implemented & fitness parameters were reassessed & documented. Compliance towards intervention activities were studied. *Conclusions :* This study highlights areas requiring special attention for improving compliance with such a program. Significant effect in improving health and sports related fitness can be achieved within a short time of 6-months by special fitness modules. Health Awareness (Life style related) is definitely increasing in society as a whole. However attitudinal changes in parents, school authorities and children themselves will take time. The study can serve as a prototype for such programs in the rest of the country.

PSCN-35 DEVELOPMENT OF INDIGENOUS FIBER RICH BREAKFAST RECIPES FOR CARDIOVASCULAR PATIENTS. *Thilakavathy S* and Tia Susan Chandy, Department of Food Science and Nutrition, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, India.. Email: thilaka.ravichandran@gmail.com

To combat lifestyle diseases a balanced diet and healthy regime including exercise is the need of the hour. An interview schedule was formulated to elicit information on socio economic status and dietary pattern of the cardio vascular patients. Three different combinations of fibre rich mix were formulated, combination C1 consisting of whole wheat flour, defatted soy flour, green gram dal and lotus stem, combination C2 consisting of wheat flour, defatted soy flour, horse gram, and agathi leaves, combination C3 consisting of whole wheat flour, defatted soy, black gram and curry leaves. These mixes were incorporated into 10 breakfast recipes at proportions of 20 percent, 25 percent and 30 percent along with other ingredients. The recipes were standardized and the best recipes were chosen for nutrient analysis. The cost effectiveness of the formulated mix was calculated. Nutrition education was imparted to selected 30 cardiovascular patients using a booklet. In regard to consumption of fibre rich food 64 percent and 57 percent of the subjects consume vegetables and fruits daily. Forty three per cent of them have the habit of skipping meals and 18 of them skip their breakfast weekly twice. Among the 10 recipes and its 90 variations tried out, five recipes which obtained top score were pancake (C1V1), Broken wheat upma (C2V1), kolukattai (C1V1), Dosa (C3V3), Idiyappam (C2V2). The formulated mix had a shelf life of 90 days and was cost effective at household level. Nutrition education imparted was effective.

PSCN-36 COMPLIANCE TO LIFESTYLE MEASURES AND DIABETES KNOWLEDGE OF TYPE 2 DIABETES PATIENTS AND THEIR RELATION TO CLINICAL OUTCOMES. *Lakshmi N¹, Varalakshmi Rajam², Anjana RM³, Mohan V³, Ranjani H³.* ¹Madras Diabetes research Foundation & Ethiraj College for Women, ²Ethiraj College for Women, Chennai, ³Dr.Mohan's Diabetes Specialties Centre & Madras Diabetes Research Foundation. Email: lakshmiapril19@gmail.com

Adherence to lifestyle measures for good glycemic control in patients with type 2 diabetes is notoriously difficult to initiate and sustain and the reason for non-adherence are very complex. Knowledge about the disease and its management is a critical component in behavioural change. Our study objectives were therefore to determine compliance to lifestyle measures and knowledge about type 2 diabetes in patients attending a tertiary care diabetes centre in Chennai, India and their relation to clinical outcomes. In this descriptive study, using convenient sampling adults diagnosed with type 2 diabetes of more than 1 year duration and aged ≥ 20 years were selected. The 150 subjects were divided into two groups based on their adherence to lifestyle measures such as diet, exercise and self-monitoring of blood glucose. The mean age was 56.8 ± 10.9 years, diabetes duration 11.8 ± 7.2 years and mean BMI was 33.4 ± 10.0 . Sixty four percent of subjects belonged to the compliant group and 36 percent belonged to the partially compliant group. HbA1c was negatively correlated with compliance to lifestyle measures ($r = -0.38$; $p < 0.01$) while diabetes duration was positively correlated to compliance ($r = 0.33$; $p < 0.01$). Nearly 70 percent of the subjects who showed increased knowledge about diabetes were from the compliant group ($p < 0.001$). Adherence to lifestyle measures proved to play an important role in the glycemic control of patients with type 2 diabetes.

PSCN-37 NUTRITIONAL STATUS OF RURAL SCHOOL CHILDREN OF HANUMANGARH DISTRICT, RAJASTHAN. *Kamna Bhati and Vibha Bhatnagar.* Department of Foods and Nutrition, College of Home Science, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan, India Email: theindiandoctor@gmail.com

School going children are the most important segment of a society who are vulnerable to retardation in growth as a result of under nutrition. It is estimated that majority of the undernourished people in the world live in Indian subcontinent and most of them are children. At school age, certain specific biological, psychological and nutritional needs must be met to ensure the survival and healthy development of a child. The health and welfare of this age group is important because they are the future of our country and working hands of tomorrow. Therefore the present study was planned to assess the nutritional status of rural school children. Two hundred and forty school going children (7-12 years) of both the sexes from two age groups i.e. 60 boys and girls each from 7-9 years and 9-12 years age group were selected from four Government schools located in four villages of Sangaria Tehsil (Hanumangarh District, Rajasthan). Background information of the subjects indicated that mostly children were Hindu (82.5%) families, belonged to SC and OBC category and were illiterate. Majority of them were from joint families (70%) and were from lower income group. The results indicated that only 6.67 percent children between having malnutrition of grade I followed by 35.83 percent of grade II. About 66 percent children (7-12 year aged) based on height for age was marginally malnourished followed by 20 percent were moderately malnourished. Blood haemoglobin revealed that 74.17 percent children were suffering from different forms of anaemia. The mean haemoglobin level of children was 9.06g/dl. Common cold, cough, diarrhoea and fever were major infectious diseases in the area during the survey period. The study concludes the high prevalence of malnutrition among rural school children of Rajasthan. Therefore there is a need to create awareness on diet, hygiene and sanitation, family norms and education of the children so their nutritional status may be improved.

PSCN-38 A STUDY ON PREVALENCE AND RISK FACTORS OF DIABETES MELLITUS AMONG ADULTS IN URBAN HYDERABAD. *M Hari Krishna, Babu Rao, ML Surya Prabha, Prakash Bhatia.* Department of Community Medicine, Osmania Medical College, Hyderabad, India Email: drmhkrishna@gmail.com

The prevalence of Diabetes is rapidly raising all over the globe at an alarming rate. Over the past 30 years the status of diabetes has changed from being considered as a mild disorder of the elderly to one of the major causes of morbidity and mortality affecting the middle age and young population. The prevalence of diabetes in Hyderabad is around 16%. *Aims and Objectives:* 1.To estimate the prevalence of diabetes among adults above 20 years. 2.To determine the risk factors for diabetes in study population.3.To assess knowledge, attitude and practice. *Study Design:* Cross sectional study. *Study Area:* Saroornagar, Greater Hyderabad. *Study Period:* 1

month (20th August 2011-20th Sep1 2011). *Materials*: Glucometer, sphygmomanometer, weighing machine, measuring tape, pre-designed and pre-tested questionnaire. *Sampling*: Simple random sampling. *Data Analysis*:: Using SPSS 17.0 version. Results: Will be disclosed at the time of presentation.

PSCN-39 EFFECT OF IRON FORTIFIED FOODS ON HEMOGLOBIN CONCENTRATION IN CHILDREN (<10 YEARS) : A SYSTEMATIC REVIEW AND META-REGRESSION ANALYSIS. *Ramesh A*¹, *Vishnu Vardhana Rao M*¹, *Madhavan Nair K*². ¹Division of Biostatistics, ²Division of Micronutrient Research, National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, India. Email: mphil.ramesh@gmail.com

India continues to be one of the countries with very high prevalence of anaemia due to iron deficiency. Food fortification with iron is an intermediate strategy aimed at increasing the intake of iron in the population. Many industrialized countries have adopted the strategy and to a great extent have been able control to it. The Objective of the study was to carryout a systematic review and meta-regression analyses of trials to identify and quantify the effect of iron fortified foods on haemoglobin concentration in children. Studies were identified by PubMed database searches and by other methods. Weighted mean difference (WMD) and 95% CIs were calculated for mean changes in haemoglobin concentration. A Forest plot was generated, to illustrate the relative strength of treatment effects (WMD). The publication bias of the studies and heterogeneity were done by using funnel plots. Meta-regression and covariate meta-analysis was performed using predefined independent variables. An estimate of the between-study variance and its square root was calculated for estimating the SD of underlying effects across studies. Twenty five studies were included out of 414, which met the inclusion and exclusion criteria. A significant beneficial effect of iron fortified foods on haemoglobin response in children [WMD: 2.79 g/dL; 95% CI: 0.98-4.61; $p < 0.00001$] was observed. There was a significant heterogeneity ($I^2 = 90\%$) among the studies. The duration and level of iron fortification were found to contribute to heterogeneity in these studies by using meta-regression analysis. The covariate meta-analysis was performed to reduce the effect of these variables and estimate the net effect of fortification on haemoglobin status. The net effect of haemoglobin due to fortification 2.496 g/dL. It is concluded that iron fortification impacts haemoglobin of children.

PSCN-40 RISK PERCEPTIONS ON FOOD SAFETY ISSUES AMONG WOMEN - A STUDY. *Swetha Boddula*¹, *V Sudershan Rao*², *N Balakrishna*³ and *GM Subba Rao*⁴. ¹Participant, M.Sc (Applied Nutrition); ²Food and Drug Toxicology Research Centre; ³Division of Biostatistics; ⁴Extension and Training Division, National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, India. Email: swethaboddula22@gmail.com.

Food safety is a public health concern in India. Food risk communication is an important measure to promote food safety. The roots of risk communication lie in risk perception research. In India, no studies have been conducted so far to understand consumer risk perceptions. This study attempted to assess perceived food safety risks among women (food preparers at household level). A household survey was conducted in rural and urban areas of a region of Andhra Pradesh, using a pre-coded questionnaire, which required the respondent to rate perceived risks on a three-point scale (high, medium or low) against 29 commonly consumed food items. The urban sample comprised 90 women selected from 3 geographical zones of Hyderabad city using stratified random sampling technique. Similarly, 30 women were randomly selected from a village in Karimnagar District. Results showed that infestation and adulteration were perceived as greater risks in cereals and pulses by over 50% respondents. Infestation and pesticide residues were perceived as major risks in vegetables by > 70%. Chemicals and pesticide residues were perceived as risks in fruits by over 55%. In non-vegetarian foods, flies and mosquito infestation was perceived as the only risk. Adulteration was perceived as the major risk in milk, oil, chilli powder and sugar. None of the respondents was aware of GM foods. There was no significant ($p > 0.005$) correlation between income/education and food risk perceptions. This study for the first time gave an overview of a section of consumers' perceived food safety risks. These could form the basis for food risk communication strategies. More studies are needed in India due to its diverse cultures and food habits.

PSCN-41 OBESITY, DIABETES AND CARDIOVASCULAR RISK FACTORS IN AGRAWAL COMMUNITY. *Mukta Agrawal¹, Ritu Dhabaria¹ and Rajeev Gupta².* ¹Department of Home Science, University of Rajasthan, Jaipur, ²Fortis Escorts Hospital, Jaipur. E mail: muktadr@hotmail.com

Agrawal community traditionally is known as traders' community. Majority of people are engaged in business. The life style of majority of Agrawals in Jaipur, Rajasthan is such which favours degenerative diseases. The present study was planned to evaluate the prevalence of obesity, diabetes and cardiovascular diseases in the Agrawal community. One thousand forty nine adults in the age group of 18-70 years of Agrawal Community residing in Jaipur formed the study group. Height, weight, waist and hip circumferences were recorded using standard methods. Obesity was assessed using BMI and WHR. Persons having fasting blood glucose level more than 124 mg/dl were considered as diabetic. Serum total cholesterol level more than 200 mg/dl was used as cut off value to label a person as hypercholesterolaemic. The results indicated that 63.1% subjects were either overweight or obese (BMI \geq 25kg/m²). Females were more obese as compared to males. Truncal obesity was very high (76.16%) among Agrawals and more in males as compared to females. Diabetes was prevalent among 16% subjects. Hypertension was present in 34% of the subjects. Hypercholesterolemia was observed in 33% of subjects being more in females as compared to males.

PSCN-42 VALIDATION OF ANTHROPOMETRIC INDICATORS FOR PREDICTING MALNUTRITION AMONG PRIMARY SCHOOL CHILDREN (6-9 YEARS). *M Deepa, T Poongodi Vijayakumar and Z Aaliya Shireen.* Department of Food Science, Periyar University, Salem, Tamil Nadu, India. Email: poonvija@gmail.com, periyammal1986@gmail.com

The present study was framed to assess the prevalence of malnutrition among children aged 6-9 years as per various anthropometric indicators and to compare the commonly used anthropometric indicators in forms of their sensitivity and specificity. Totally 600 primary school children in the age group of 6-9 years were selected from Omalur and Kottagowndampatti Taluk of Salem district, Tamil Nadu, India. The anthropometric measurements like age, height, weight, mid upper arm circumference (MUAC), head circumference (HC) and chest circumference (CC) were measured using proper tools. The indices like percentage height for age, weight for age, weight for height, MUAC for age and HC for age were used to predict malnutrition. The best cut-off for each index was calculated using NCHS, Harward, ICMR, Field formula and Weech formula reference standards that had highest sensitivity and specificity in relation to weight for age. Prediction of the prevalence of malnutrition by height for age indicator was found to be very less (0.8 – 4.3% among boys; 0.29 -1.4% among girls) when compared to weight for age (9.4 - 37% among boys; 6.23 - 21.96% among girls) and weight for height (22.8% among boys; 24.03% among girls) indicators. Prevalence of stunting was in a decreasing trend once the age increases whereas age did not have significant influence on prevalence of wasting. MUAC and chest circumference for age has been proposed as an alternative index for nutritional status in relation to weight for age. The use of field formula as a method to calculate the reference values for comparison was also superior to using MUAC in terms of its sensitivity.

CLINICAL NUTRITION

PSCLN-01 THE RELATIONSHIP BETWEEN MATERNAL NUTRITION AND LOW BIRTH WEIGHT OF BABIES IN BANGALURU, INDIA. *Rashmi Agrawal and Anita Singh.* Department of Food and Nutrition, Sri Agrasen Kanya Autonomous P.G. College, Varanasi (U.P.) India. Email: rashmiavns@yahoo.co.in

Many factors affect birth weight. The present study is an approach to find out the relationship between maternal nutrition and low birth weight of their offsprings. Two hundred pregnant women with less than sixty days pregnancy were registered and followed from government hospitals in Bangaluru. Low birth weight baby and maternal pairs were studied after excluding multiple births, normal birth weight and complicated pregnancies. Twenty four hour dietary recall method was used to record the dietary intake in past twenty four hours for first and third trimester. The total energy intake in Kcal/day and total protein intake in gm/day unit were calculated for each trimester. The mean of energy intake and protein in two trimester were calculated for the study. Product moment

co-efficient was computed to enumerate the correlation between maternal energy and protein intake and low birth weight. The 't' test was applied to see the significance of mean difference of low birth weight of different maternal energy and protein intake groups. Out of two hundred pregnant women, only 25.15% delivered low birth weight babies. Significant ($p=0.01$) positive correlation was found between low birth weight and maternal energy and protein intake. The differences in mean birth weight between different groups of energy intake were statistically significant ($p=0.05$, and $p=0.01$). The highest difference in mean birth weight was observed between energy intake less than 1500 K cal/day and more than 2000 Kcal/day (0.774 kg). Similarly the mean birth weight for low birth weight babies among pregnant women with protein intake of less than (1.551+-0.542) 40gm/day was significantly lower (1.551+-0.542) as compared to mean birth weight (2.227+2.219) among those who were consuming more than 50gm protein per day. The result of the study suggests that the maternal nutrition play an important role on the birth weight of babies and must be taken care off.

PSCLN-02 A STUDY ON NUTRITIONAL STATUS AND FOOD HABITS OF INDUSTRIAL WORKERS. Tahmeena Kabeer, Zubaida Azeem, and *Rumana Farooqui*. Department of Food and Nutrition, Osmania University College for Women, Hyderabad, India. E-mail id: rumafarooqui@gmail.com

The industrial workers are usually from the lower socio-economic groups of the society. The study was carried out by taking into consideration 50 samples from a plastic industry located at the industrial estate, Kattedan. The nutritional status was assessed taking anthropometric measurements and then calculating the BMI. Also the dietary patterns were studied through the food frequency table and the 24-hour recall method. Questionnaire was used as a tool to conduct the survey and it consisted of both close-ended as well as open-ended questions. It was found that 30% of the subjects were underweight, 58% normal weight, 8% overweight and 4% obese. It was seen that many of the subjects showed signs and symptoms of anaemia. 34% of the subjects felt tired and fatigued easily, 26% felt breathlessness and palpitations. Due to anaemia there was reduced work output that is confirmed by the fact that only 42% of the workers were able to work overtime. It was found that there is inadequate food consumption, green leafy vegetables were consumed by 22% on daily basis. Fruits, legumes, nuts, organ meat were taken occasionally by the subjects. Thus it can be concluded that the industrial workers showed poor nutritional status and signs of anaemia due to lack of resources and lack of nutritional knowledge. Awareness was created among workers by imparting nutrition education and also they were recommended to take low cost iron rich foods.

PSCLN-03 A STUDY ON NUTRITIONAL STATUS OF PREGNANT WOMEN. Sarita B, Zubaida Azeem, P Ashlesha and *M Santoshi Lakshmi*. Department of Food and Nutrition, Osmania University College for Women, Hyderabad, India. Email: Santoshi.kulkarni1@gmail.com

Pregnant women have been recognized as a vulnerable group from health point of view. They need more nutrient intake than a normal person for the proper nourishment of the growing foetus. The field of nutrition of the pregnant women, particularly in urban, middle and lower class has been sadly neglected. Against this backdrop, the study was carried out among 50 pregnant women in Government maternity Hospital. A pre tested structured interview schedule was used to elicit general information. 24 hour dietary recall method was used to collect dietary information. Pathological reports of the subjects have been taken. It was found that the mean iron, calcium, carotene and folic acid were much lower than the RDA. Percent incidence of common nutritional deficiencies among the pregnant women was much higher in the 3rd trimester than 1st and 2nd trimesters. In spite of better education and high income, nutrition intake was lower than RDA with respect to many subjects. Based upon the analysis the study finally emphasized the need for popularising cultivation of low cost nutritious greens and vegetables in each household and imparting nutrition education to the urban, middle and poor women.

PSCLN-04 STATUS OF VITAMIN A AND ITS RELATION WITH HEMATOLOGICAL PARAMETERS IN REFERRED SICKLE CELL CASES OF ORISSA. *Shuchismita Behera*, Sujata Dixit, G Bulliyya and SK Kar. Regional Medical Research Centre, Indian Council of Medical Research, Bhubaneswar, India. Email: Shuchi.mrc@gmail.com

Population with sickle cell anemia reported to have high potential for oxidative damage. This study evaluates the plasma level of vitamin A as an indicator of antioxidant status in a sample of 130 referred cases during 2010. Venous blood samples were collected from each individual referred for sickle cell anaemia. The sickling test was

performed by wet sealed metabisulphite solution. Red cell indices were measured on an automated MS4 cell counter and HbA₂, HbS and HbF were measured in the haemoglobin variant. Plasma retinol level was measured by HPLC. A total 37 (28.5%) cases were found to have positive for sickling, of which 24 (18.5%) were sickle cell trait cases (heterozygous for sickle cell anaemia) and 13 (10%) were sickle cell disease (homozygous for sickle cell anaemia). With increase in sickling percentage there was a significant decrease in the levels of Hb ($r = -0.575$, $P < 0.001$) and retinol ($r = -0.381$, $P < 0.05$). A significant positive correlation was found between haemoglobin and retinol level ($r = 0.592$, $p < 0.001$). There was a significant decline in mean retinol level of sickle cell disease from that of sickle cell trait cases ($t = 2.38$, $p < 0.05$). When retinol levels of age and sex matched controls were compared with sickle cell disease cases, significant variation was found ($t = 2.098$, $p < 0.05$) while it was found to be insignificant in trait cases. However, no associations were found between vitamin A with WBC/RBC counts, hematocrit, mean corpuscular volume, mean corpuscular haemoglobin or red cell width. The results show sickling percentage influences plasma retinol level, which is shown to have positive association with haemoglobin levels.

PSCLN-05 **FOOD INSECURITY IN ELDERLY MALES (60-80 YEARS) AFFECTING NUTRITIONAL AND HEALTH STATUS.** *Namita S Moyal* and *Gulraj Kalsi Kohli*, Department of Food Science and Nutrition, Maharshi Dayanand Saraswati University, Ajmer, Rajasthan, India. Email: namita.moyal@gmail.com, gulrajkk@rediffmail.com

The present study was undertaken to assess the food insecurity in elderly males (60-80 years) affecting nutritional and health status. *Method and Materials:* Hundred subjects were studied through multistage random sampling, taking fifty subjects each from the two decades. Nutritional assessment was done by anthropometry, clinical investigation and dietary survey and food insecurity status of the elderly males were judged by various measures. *Results:* The mean height was $162.6 \text{ cm} \pm 5.6$, mean weight $62.8 \text{ kgs} \pm 3.1$, mean MUAC $22.5 \text{ cm} \pm 0.4$, mean TSF $26.6 \text{ mm} \pm 3.3$ and Mean BMI $23.8 \text{ kg/m}^2 \pm 5.0$ of the elderly males in 60-70 years of age. Similarly, mean height was $163.4 \text{ cm} \pm 5.2$, mean weight $61.9 \text{ kgs} \pm 6.7$, mean MUAC $23.8 \text{ cm} \pm 0.3$, mean TSF $26.7 \text{ mm} \pm 2.5$ and mean BMI $22.8 \text{ kg/m}^2 \pm 3.8$ in the age of 70-80 years. Clinical signs of sparseness and easy pluckability of hair, swollen gums, pale conjunctiva, dental cavities, rough and dry skin, spoon shaped nails and oedema of the feet were observed in the elderly of both the groups indicating the deficiency of vitamin c, iron and protein in spite of taking vitamins and minerals supplements. Regarding consumption of meals, the elderly of 70-80 yrs were eating at regular meal times (74%) but were taking only two meals per day (70%) and generally skipped their dinner. On the other hand, only 48 % of the elderly of 60-70 yrs were eating at regular meal time and were taking three meals per day (58%) and only some skipped their breakfast and some lunch. About 58 % and 42 % each, feel that their life style does have the negative effect on their diet. The study also reported that some food items in common were avoided and disliked by the elderly of both the decades, the reason in common were unpleasant taste, ill health and lack of money. The overall consumption of cereals, pulses, roots and tubers, fruits and milk were significantly lower than the RDA, whereas, the consumption of sugar and fat were more. The nutrient intake when estimated and compared with RDA showed the intake of energy was more than required by the age, while protein, vitamin A, iron and zinc and fibre were lower in both the groups. Based on the subjects' food habits and behaviour, life-style and living standard they were categorised as food secure and food insecure. The results obtained indicated that majority of the households in both the age groups were food secure and only 14 % (60-70 years) and 6% (70-80 years) were found to be insecure. The spectrum of Food Insecurity measured by an 18-core Food Security Module (CFSM) indicated that though there is mild food insecurity amongst the elderly, the spectrum is very narrow. *Conclusion:* Based on all these findings, it was concluded that the elderly males aged 60-80 years, residing in Ajmer City, were at good social and mental health status and were food secure, but were at the health risk due to their improper eating behaviour and unhealthy food habits.

PSCLN-06 **DEMOGRAPHIC PROFILE, DIETARY HABITS AND LIFESTYLE PATTERN OF HYPERLIPIDEMICS IN HYDERABAD CITY.** *Prasanthi P* and *Amirthaveni M.*^{1&2} Department of Food Science and Nutrition, Avinashilingam Institute for Home Science and Higher Education for Women University, Coimbatore, Tamil Nadu, India. Email: prasanthi.poli@gmail.com

Cardiovascular disease, the most prevalent and one of the leading lifestyle diseases, accounts 60 percent of the cardiac patients worldwide. The present study conducted in a private hospital at Hyderabad city. Two hundred male hyperlipidemic subjects were selected and data was collected through questionnaire on demographic profile, dietary habits, lifestyle pattern and family history. The salient findings of the study revealed that the

hyperlipidemics are in the age range of 35-60 years. The subjects were involved in moderate to sedentary activity and are in nuclear families and belong to the middle and high income groups. Most of the subjects are highly educated involved in various occupations like business, agriculture, engineer, employees of different organizations, doctors and retired personnel. The consumption of different foods are more or less equal in both vegetarians and non-vegetarians. Fats and oil consumption of the subjects was less after the diagnosis. Family history is seen in paternal or maternal or both. Most of the subjects are having complications like elevated blood pressure, cholesterol and blood sugar with symptoms of weakness, giddiness and shortness of breath even after the treatment. Many of them are doing regular exercise like walking before and some after the diagnosis. Modification in the dietary pattern will alter the dietary intake. Subjects are unable to give up of the habits like smoking and alcohol. Thus there is a burning need to emphasize on the modification in the dietary intake and lifestyle to improve the health status.

PSCLN- 07 INFLUENCE OF DIET PATTERN, ANTHROPOMETRY AND LIPID PROFILE ON HYPERTENSION. S Sugasri and UK Lakshmi, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu. Email: saisugasri@yahoo.com

Against the backdrop of increasing cardiovascular disease burden worldwide, the gap between what we know and what we do in hypertension prevention and management is a major cause for concern. This study was conducted in six hospitals specializing in cardiovascular disease in Madurai city to examine the risk factors of hypertension among 1640 individuals aged 40 to 65 years with a history of hypertension. They were categorized according to the stage of hypertension based on JNC-7 criteria (2003) and their diet choices were recorded. Anthropometric measurements, blood pressure and lipid profile were measured using standardized procedures. More than 50 per cent of the adults who regularly included salads, greens, whole grains and green tea in their diets had lower blood pressure levels as compared to others. Restricted intake of fats, sweets, salt, meat and coconut were also seen to be more among these adults. Anthropometric indices such as weight, BMI, waist-hip ratio and mid arm circumference were seen to be more among hypertensive adults. Adults with stage I and stage II hypertension had increased levels of total, triglyceride, low and very low density lipoprotein cholesterol levels as compared to adults with normal and pre hypertension. Diet, anthropometry and biochemical factors seem to be interlinked to hypertension and their pathogenesis is yet to be explored. Further research on the diet and lifestyle factors can yield a closer insight to the management and control of hypertension.

PSCLN-08 INCREASED LEVELS OF OXIDATIVE AND CARBONYL STRESS MARKERS IN HUMAN TYPE 2 DIABETIC PATIENTS. *Vailshali D Mittal*¹, Pavani S Narayanam¹, Kamlesh B Mahajan¹, Rashmi S Tupe^{1*}, Arundhati G Diwan². ¹Rajiv Gandhi Institute of IT and BT, Bharati Vidyapeeth University, Pune, ² Bharati Medical Hospital, Bharati Vidyapeeth University, Pune, India. *Email: rashmitupe@gmail.com

India is often referred to as the diabetic capital of the world and there is an urgent need to understand the underlying complications. Enhanced non-enzymatic glycation reactions are often the consequence of sustained hyperglycaemia. In these reactions initially Schiff bases are formed, which spontaneously rearrange themselves into an Amadori product, as is the case of the well-known haemoglobin A1c. These reactive intermediates modify structures and functions of various proteins leading to carbonyl stress (CS). This consequently leads to increase in reactive oxygen species and ultimately enhances oxidative stress (OS) thus reducing antioxidant potential in diabetes. The proposed study aims to investigate the effects of glycation and levels of CS and OS markers in diabetic patients as compared to healthy subjects by examining blood biochemistry. For this fasting blood samples along-with clinical information of 40 type 2 diabetics and 10 controls (age 50 ± 10 years) were collected. Fasting blood glucose, total carbonyl stress, ferric reducing antioxidant power (FRAP), Congo red binding to amyloid-β structures, fructosamines, reduced glutathione (GSH), erythrocyte fragility and plasma thiols were estimated using standard protocols. Overall results indicated that in diabetic blood samples, Congo red binding, fructosamines, protein carbonyls and erythrocyte fragility levels were higher than controls. Secondly low values of protein thiols, GSH and FRAP in diabetics indicated low antioxidant potential than healthy subjects. Thus, the present study demonstrates various biochemical alterations and is indicative of elevated CS and OS levels in diabetic patients as compared to healthy controls.

PSCLN-09 **RISK FACTOR PROFILE OF CARDIOVASCULAR DISEASE IN URBAN AND RURAL POPULATION.** *Nuzhat Sultana*, MR KSK College, Shivaji Nagar, Beed, Maharashtra, India. Email: nuzhatsultanamb@gmail.com

Cardiovascular diseases are the disease that involve the heart or blood vessels (arteries' and venires) (Maton, Ranthea 1993). In recent years, cardiovascular risk in women has been increasing and has killed more women than breast cancer (United States 1999). Obesity and diabetic mellitus are often linked to cardiovascular disease and is treatable with initial treatment primarily focused on diet and life style interventions (Comish and Dean *et. al* 1980). Three hundred and fifty samples in the age of 25-64 years were selected randomly from urban and rural population of Beed district. The result revealed that there is an association between high level of androgenic air pollutants and human health problems. A direct correlation of exposure to the polluted environment and cardiovascular diseases observed 65% in urban and 35% in rural population while 42% of urban and 58% of rural samples have health problems like chronic bronchitis, asthma and skin irritation. Cough problems were reported by 54% in urban and 43 in rural population. 49% and 51% have lowered immunity to infections were observed in rural and urban subject. It is concluded that incidence of cardiovascular diseases cannot be related to any single attribute to diet but it is an integration of dietary and environmental pollutions specific risk factors.

PSCLN-10 **FRUIT, VEGETABLE AND FIBER INTAKE IN PATIENTS OF CHRONIC KIDNEY DISEASE – A HIGH RISK POPULATION.** *Bhavna Dubey*, Sandeep Barde, Gopesh K Modi. Samarpan Kidney Institute and Research Centre, Shahpura, Bhopal (MP), India. Email: kidney_bhupal@rediffmail.com

The recent dietary guidelines recommend intake of at least five servings of fruits and vegetables per day along with adequate dietary fiber intake. This assumes increasing importance in view of rising prevalence of non-communicable diseases. Chronic kidney disease (CKD) has become a major public health problem. CKD patients have very high risk of cardiovascular disease and therefore these subjects absolutely need to follow these recommendations. We carried out a cross sectional survey of fruit, vegetable and fiber intake in the following groups of subjects: CKD not on dialysis (CKD) and their closest relative (R-CKD); patients on regular hemodialysis (HD) and their relative (R-HD); and healthy subjects (N). The sample included 10 consecutive subjects attending our clinic. The survey instrument used was a previously validated Block Fruit-Vegetable-Fiber Screener (Nutritionquest/Block Dietary Data Systems; permission obtained). The results showed the following. The Mean (SD) intake of fruit and vegetable (servings/day) and fiber (g.) in various groups were : HD 3.5 (1.4) and 16.8 (2.8); HD-R 4.1 (1.6) and 19.6 (5.1); CKD 4.6 (1.3) and 19.6 (4.4); CKD-R 4.6 (1.5) and 19.8 (3.2); N 3.6 (1.2) and 21.3 (4.5) respectively. This pilot study revealed to our surprise that despite anorexia and many restrictions placed on the consumption of fruits and vegetables due to the risk of hyperkalemia, CKD and hemodialysis patients were consuming reasonable amount of fruits and vegetables per day. Still, the mean consumption of fruits and vegetables and fibre was below the recommended guidelines. The healthy subjects were doing the worst of all the groups. Efforts to optimise these intakes are important for both the patients and healthy subjects.

PSCLN-11 **A STUDY OF METABOLIC SYNDROME AND PHYSICAL ACTIVITY IN MIDDLE AGED ADULTS.** *Mahak Sharma* and Ranjana Mahna. Institute of Home Economics. University of Delhi. Email: mahak.sharma97@gmail.com

Asian Indians have a high predisposition to metabolic syndrome due to a marked shift in life style caused by economic growth, urbanization and dietary westernisation. The present study was done to assess the association of physical activity and metabolic syndrome in an urban middle aged population. A hospital based study was conducted with 996 subjects. The subjects comprised 498 (40.8% males and 59.2% females) with metabolic syndrome (MS) by NCEP (ATPIII) criteria. An equal number of non metabolic syndrome (NMS) subjects matched for age and gender were taken. Anthropometrics, glucose and lipid profile were assessed. Physical activity assessment was done by a suitable structured questionnaire and Physical Activity Level (PAL) was calculated. Biochemical parameters showed elevated blood glucose in 60%, elevated triglycerides in 50%, reduced HDL in 96% and elevated blood pressure in 55% of the MS subjects. Waist circumference showed abdominal obesity in 85% of MS subjects. There was a significant difference ($p < 0.0001$) in the PAL value of MS and NMS subjects, indicating that MS subjects were sedentary as compared to NMS. Moreover, MS subjects had not been physically active/ reduced physical activity over the past few years. The mean MET/Week was lower for MS subjects. The

odds ratio relating to physical activity was 1.37. The study revealed that sedentary lifestyle and lack of physical activity are associated with the occurrence of metabolic syndrome.

PSCLN-12 DIETARY INTERVENTION OF FUNCTIONAL FOODS INCORPORATED CHIKKIES AMONG THE HIV INFECTED SUBJECTS. *Karthiga Pandeewari N* and *Gandhimathy R*. PG Department of Human Nutrition & Nutraceuticals, Fatima College, Madurai. E.Mail: jesuskarthiga@gmail.com

AIDS is a disease complex characterized by a collapse of the body natural immunity against disease. India is estimated to have 23.9 lakhs people infected with HIV in 2009 at an estimated adult HIV prevalence of 0.31% (among men is 0.36%, while among women, it is 0.25%). As per the HIV estimations 2010, it is estimated that 0.3% of adult are affected globally by HIV positive. About 25-33% of patients experience either short or long term side effects while using ART. Thus there is a need for the discovery of novel therapeutic strategies; one of the strategies has been to identify anti-HIV compounds from natural sources, particularly from plants and current study. The objective of the present study were therefore, to formulate a functional food incorporated product and to supplement to the HIV infected adults aimed to improve their health status as well as their CD4 count. Fifty adult women in the age group of 20-40 years were selected. A health and nutritional survey was conducted using well structured interview schedule. Their background details, dietary pattern and physical activity pattern were studied. This study also involved the assessment of anthropometric, clinical and biochemical parameters. It was found that their health and nutritional status was poor. Clinical assessment revealed symptoms of nutritional deficiency. Immunological assay has shown a low CD4 counts. Hence supplementation study was carried out. From the fifty selected HIV infected women, (n=10) HIV infected non-ART women were selected for the supplementation study based on their CD4 level. They were supplemented with the functional foods incorporated chikkies for a period of 4 months. The CD4 count was increased from 475.6 to 543.4 cells in the experimental group and decreased from 612.3 to 541.5 in the control group. Nutrition education was given in the form of a leaflet and administered to the HIV infected women. The effect of the supplementation of functional foods incorporated chikkies showed a significant improvement of CD4 counts and it was statistically proved.

PSCLN-13 EFFECT OF MICRONUTRIENT RICH SPIRULINA INCORPORATED CHIKKIES AMONG THE HIV INFECTED CHILDREN. *Priya K* and *Vithya R*. PG Department of Human Nutrition and Nutraceuticals, Fatima College (Autonomous), Madurai Kamaraj University, Madurai. Email: selvaranipriya11@gmail.com

Human Immuno Deficiency Virus attacks the body's immune system, making it unable to fight infection. HIV infection ultimately leads to Acquired Immuno Deficiency Syndrome (AIDS). Diet and nutrient status are important factors contributing to immune competence. Food rich in micronutrients are likely to help the patient more effectively to fight infection and improve overall health. Spirulina produces an immuno stimulating effect by enhancing the resistance of humans, the capacity of influencing hemopoiesis stimulating the production of antibodies and cytokines under the influence of spirulina macrophages T and B cells are activated. Small amount of spirulina extract reduced viral replication while higher concentration totally stopped its reproduction. Keeping this in mind, a study was conducted to see the effect of spirulina in HIV infected children. The intervention programme was conducted for three months on a sample (n=10) purposive sampling method was adopted to select the HIV infected children between the age group of 6-15 years in Mullai Nagar. A two gram of spirulina incorporated chikkies per day per children was supplemented. After intervention there was a significant increase in the CD4 count and haemoglobin level. When visual assessment was done there was a remarkable decrease in clinical symptoms. A significant increase of weight was observed in experimental group. By this the study concluded that spirulina is rich in nutrients like antioxidant, vitamins and minerals consumption to increase their immune power and their health status of the HIV infected children.

PSCLN-14 IMPACT OF DIETARY INTERVENTION ON THE BEHAVIOUR OF AUTISTIC CHILDREN. *Alli MV*¹, *S Premakumari*². ¹Seethalakshmi Ramaswami College, Trichy, ²Avinashilingam Institute of Home Science and Higher Education for Women, Coimbatore, India. Email: alli.m.v@gmail.com

The study was undertaken to assess the impact of dietary intervention on behavioural change in the autistic children (5-16 yrs). A group of 60 autistic children were selected from two centres based on the consent obtained from the parents and teachers. They were divided into 3 groups of 20 children each. Children in the experimental group I were administered daily specially developed biscuits (50g), experimental group II received the biscuits

(50g) with added probiotic. Experimental group I, II and the control group received nutrition education. All the children received behaviour therapy as a routine school programme, in addition to this. The impact of intervention was evaluated after a period of 6 months in terms of changes in their general behaviour under the 5 domains namely, sensory, relating, body/object use, language and self- help and their specific food behaviours. A significant improvement ($p < 0.05$) was observed in both the experimental groups at the end of the intervention. The children receiving probiotic biscuits were slightly better than those in the experimental group I in certain observations. Both the experimental groups showed a greater improvement than that of the control. The results of this study stress the need for dietary intervention and nutrition education to autistic children for a positive behavioural change.

PSCLN-15 PROPHYLACTIC USE OF LICORICE IN ACID PEPTIC DISEASE. *Chetan Mehta* and Parth Mehta. Department of Gastroenterology, H J Doshi Hospital and Medical Research Centre, Rajkot, Gujarat, India. Email : mehtacn@hotmail.com

High consumption of chilli powder in the diet is detrimental to gastric mucosa leading to development of Acid Peptic Disease. Licorice, a naturally occurring herb, has a high ulcer healing property. The aim of the present study was to incorporate Licorice in the diet and assess whether it has a prophylactic role in protecting the gastric mucosa in susceptible subjects who are high consumers of red chilli powder. We incorporated 10 grams of Licorice powder per 100 grams of a pickle in such a way that it did not alter its taste. Twenty healthy volunteers who were heavy consumers of chilli powder were enrolled in the trial. Ten subjects agreed to consume 10 grams of the premixed pickle daily. The other ten acted as controls. Gastric secretion DNA was measured at the onset of the trial and after a period of six weeks to study the protective effect of Licorice. After six weeks of consumption of the Licorice premixed pickle, the Gastric secretion DNA was significantly reduced by 35% as compared to initial levels. This result was associated with significant reduction in symptoms and physician visits. Prophylactic usage of Licorice provides a protective cover against the detrimental effects of high dietary chilli powder consumption. Just as prophylactic use of Iodized salt reduces Goitre disease, similarly routine use of Licorice in the diet can reduce the occurrence of Acid Peptic Disease.

PSCLN-16 ASSOCIATION OF DIETARY PATTERN, ANTHROPOMETRIC MEASURES, LIPID PROFILE AND SERUM HIGH SENSITIVITY C REACTIVE PROTEIN WITH INSULIN RESISTANCE. *Asegaonkar Shilpa*, Mane KB, Bavikar JS, Thorat AP. Department of Biochemistry, Govt. Medical College, Aurangabad, Maharashtra. Email ID- b_asegaonkar@yahoo.com

Insulin resistance (IR), an impaired biological response of target tissues to Insulin precedes and predicts Metabolic Syndrome, Diabetes Mellitus, cardiovascular disease. Indians have an Insulin resistant phenotype due to changed lifestyle, dietary pattern, and physical inactivity. Data on association between dietary pattern and risk of IR is scarce. So the proposed study was aimed to analyse dietary pattern, lipid profile, anthropometric measures and serum high sensitivity C - reactive protein (hsCRP), a marker of chronic low grade inflammation in persons with IR ($n=50$). Dietary intake was measured using 168 items food frequency questionnaire. The mean age and BMI of study subjects were 32.6 ± 2.4 years (25-46 years) and 27.8 ± 3.3 kg/m^2 (23.9–32.9 kg/m^2), respectively. The mean daily total energy consumption was 2734 Cal contributed by carbohydrates (48%), total fats (32%), proteins (20%). Absolute daily intake of total fat was 58 ± 29 g/d which was approximately 3 times the recommended dietary allowance for Asian Indians (20–22 g/d). Among food groups, very low intake of fruits and vegetables observed. Serum hsCRP levels were significantly raised (mean 2.8mg/lit/ \pm 1.1) and positively associated with BMI, waist circumference and waist: Hip in IR subjects. IR was measured using homeostatic model assessment for IR method. We found positive association of IR with measures of obesity, serum Triglycerides and serum hsCRP levels with high intake of total energy and low intake of vegetable and fruits. Lifestyle interventions to lower risk and consequences of IR with sub-clinical inflammation are necessary by dietary modifications and exercise.

PSCLN-17 EFFECT OF LYSINE SUPPLEMENTATION ON ANXIETY IN HEALTHY ADULT INDIANS: A METABOLIC WARD BASED STUDY. *Uma S Unni¹, Tinku Thomas¹, Tony Raj, Sheila Uthappa², Krishnamachari Srinivasan¹ and Anura V Kurpad¹.* ¹St John's Research Institute, St John's National Academy of Health Sciences, Bangalore, India ²Department of Biochemistry, St John's Medical College, Bangalore, India. Email: uma@sjri.res.in

Indians consuming predominantly cereal based diets are likely to be deficient in Lysine. Lysine is known to decrease anxiety in populations with high perceived anxiety. A Study was conducted in 40 healthy young adult males recruited from urban slums to evaluate the effect of Lysine supplementation on anxiety. Spielberger Trait Anxiety Inventory (STAI) and plasma cortisol were measured before and after the 8wk stay in the metabolic ward. After baseline measurements, subjects received either high or low Lysine. Each of the Lysine groups had equal number of subjects with low and high anxiety. Subjects with high anxiety receiving high Lysine showed significant decrease in their STAI-T (trait) scores (P=0.043) with no change in STAI-S (state) scores. Low anxiety subjects receiving high Lysine had no change in STAI-S or STAI-T scores whereas, there was significant increase in the STAI-T scores (P=0.016) in the low Lysine group. Plasma cortisol during venepuncture was not significantly different between the groups. The 8wk metabolic ward stay had a differential effect on people with high and low anxiety. The decreased trait anxiety in subjects receiving high Lysine is similar to the results of fortification studies conducted in economically poor populations. Lysine could modulate the increase in trait anxiety caused due to the stay in the metabolic ward in subjects with low anxiety. Therefore, the results of the study suggest that high lysine intake may play a role in both prevention as well as reduction of anxiety particularly in individuals with moderate to low intake of lysine.

PSCLN-18 DIETARY INTAKE AND NUTRITIONAL STATUS OF CHILDREN WITH TYPE 1 DIABETES. *Swarupa K¹ and Lalitha Reddy RP².* ¹Nutrition & Dietary Department, Sagar Hospitals, Bangalore. ²Dept of Food and Nutrition, Smt. VHD Central Institute of Home Science, Bangalore. Email: kakaniss@gmail.com.

Type 1 diabetes is an autoimmune disease, Globally it is the most common form of diabetes in children, affecting around 500,000 children under 15 years of age. The incidence of type 1 diabetes is increasing in many parts of Asia. It can strike children of any age, even toddlers and babies. Objectives of the study was to evaluate the daily nutritional intake as well as distribution of micronutrients. Methods: Nutritional status of 129 subjects between the age 1 to 18 years suffering with type 1 diabetes and attending diabetes out patient clinic was determined using standard techniques. A questionnaire was designed to collect information regarding background information, family and clinical history and lifestyle factors was used to evaluate dietary intake and repartition of nutrients was based on 24 hr recall method in cross sectional study. Results: Among 129 patients 58 are male and 71 female. Our results show that average calorie intake of children 695- 2715 calories for different ages. The minimum carbohydrate, protein and fat percentages from total calorie intake was 40, 5.1 and 8.8% and the maximum was 84,17.5 and 42.4% respectively. In conclusion our data evidenced several fit falls in the diet of diabetic children. The intervention program must importantly have to target lifestyle modifications with practical demonstration of tailor made diet sheet with detailed counseling.

PSCLN-19 A STUDY ON PHYSIOLOGICAL CHANGES AND NUTRITIONAL STATUS OF MENOPAUSAL WOMEN. *Snehal Kochar,* Department of Home Science, J.D. Birla Institute, Kolkata, India. Email: sksnehalkochar@gmail.com

An intensive study of the health and nutritional status of 70 menopausal women was carried out in Kolkata. An attempt was made to relate the dietary habits of the women to the various physiological changes that occur in menopause. An analysis of their dietary habits revealed that the women consumed about 1500 Kcal/ day, where proteins averaged 43g and fats averaged 50g in their diet. Calcium and phosphorus intakes were lower than the ICMR recommended values especially in the non vegetarian group. Although, anthropometric measurements indicated that the subjects' dietary intakes were deficient in nutrients and they had inadequate energy reserves, they were not suffering from postmenopausal diseases such as osteoporosis. According to the data, menopausal women on a non vegetarian diet were more prone to insomnia and restlessness whereas, hot flashes and vaginal dryness were more frequent in women on a vegetarian diet. It was observed that itching, was more common in the vegetarian obese group, while it was

totally absent in the non-vegetarian normal group. On the other hand, the ability to deal with stress was better in the vegetarian group.

PSCLN-20 EFFECT OF COMPOSITE GLUTEN FREE FLOUR ON BONE MINERAL DENSITY CONTENT IN GROWING CHILDREN WITH CELIAC DISEASE. *Aditi Gupta, Vimla Dunkwal and Madhu Goyal.* Department of Food and Nutrition, College of Home Science. SKRAU, Bikaner, Rajasthan, India. E-mail: aditiguptabkn@gmail.com

Celiac disease affects people in all parts of the world. Low bone mineral density (BMD) is common in children with celiac disease. The strict adherence of gluten free diet (GFD) improves the bone mineralization. Calcium deficiency is important that people with celiac disease meet their calcium requirements to reduce the risk of osteoporosis. The aims of this study were to compare BMD on strict and not strict GFD. A total of (n=120) biopsy proven registered celiac children of 6-12 years of age were selected from hospital. We measured the BMD in 50 randomly selected celiac patients among them. Composite gluten free flour (GFF) was made using nutritious grains i.e. finger millet, soya bean, rice and sorghum. Two groups were made i.e. control group (n=25), patients who were on not strict GFD and experimental group (n=25), patient who were following strict GFD for the period of four months. Total body BMD were measured by dual –energy X-ray absorptiometry. BMD in patient on strict GFD was significantly higher than in patients on not strict GFD (total body p=0.05). There were more patients with total body BMD below -1.1 in non strict compliance group (36 % compare to 68 %). Children on not strict GFD are at increased risk for low BMD because of low calcium intake or vitamin-D deficiency. Therefore, strict GFD with recommended calcium intake and vitamin D supplementation should be encouraged in children with celiac disease.

PSCLN-21 IMPACT OF LOW SALT DIABETIC DIET ON PATIENT WITH MULTIPLE DISEASES CONDITION: A CASE STUDY. *Chingakham Basanti Devi and Archana Kushwaha.* Department of Food Science and Nutrition, College of Home Science, G.B Pant University of Agriculture and Technology, Pantnagar, U.S.Nagar, Uttarakhand, India. Email: chinaobi08@gmail.com

Diet plays a significant role in the health condition of a living body. A case study was carried out at Christian Medical College, Ludhiana for five days. The objective of the study was to provide optimum nutrition, give counseling to the patient regarding the diseases condition and also to see impact of nutrition on the patient's health and biochemical parameters. A male patient of 68 years of age with the medical diagnoses of diabetes mellitus type-II, interstitial lung diseases, cor pulmonalle, atrial fibrillation, and hypertension was selected as a case. Information on patient's profile, history of illness, and dietary habits before admission to hospital was collected. The physical and blood parameters including blood sugar levels, lipid profile and arterial blood pressure of the patient were noted during the period of study conducted. Drug, respiratory and diet therapy were given to the patient. Patient was provided 1800 kcal low salt diabetic diet keeping in view of diabetes and hypertension. Daily food consumption of the patient was noted and nutrient intake was calculated. The average nutrient intake of five days was calculated and compared with the sample hospital diet. The modified nutrient requirement of the patient was energy-1800kcal, protein-63gm, fat- 40g (both visible and invisible), carbohydrate- 297g, fibre- 35-45g and sodium-2000-3000mg. Hospital diet provide contained energy-1793 Kcal, protein-68.54g, fat-54.85g (both visible and invisible), carbohydrate-36.16g, fibre-36.16 and sodium-2486.39mg. And it provides 28% fat, 15% protein, and 57 % carbohydrates. It was observed that after the completion of the study the blood pressure of the patient reduced from 140/90 mm Hg to 120/80mmHg. The saturation point of oxygen increased from 92% to 98%, patient was able to breathe without the help of nebulizer. The blood sugar level of the patient could not be brought in normal condition but prevent from going into extreme level from 143 mg/dl to 145mg/dl. Present case study indicates that low salt diabetic diet has great role in maintaining good health and positive impact in diabetes and hypertension.

PSCLN-22 A COMPARATIVE STUDY ON NUTRITIONAL STATUS OF HIV INFECTED SUBJECTS. V Premal Priyadharsini and Huidrom Nidhi Kumari. Department of Food Service Management and Dietetics Avinashilingam Institute of Home Science and Higher Education for Women, Coimbatore, Tamil Nadu. E-mail id: premala09@hotmail.com

More than twenty five years into HIV/AIDS pandemic, the disease still remains one of the most serious challenges to global public health. With the objective to assess and compare the nutritional status of HIV infected subjects of Manipur and Coimbatore and to developed a nutrition educational material to impart nutrition education., totally 202 HIV / AID infected subjects both drug and non-drug users of both the sex from three hospitals (Manipur-2 and Coimbatore-1) treating HIV infected patients were interviewed and. were assessed for nutritional status using anthropometric measurement, biochemical assessment, clinical assessment, lifestyle factor and dietary assessment . Nutrition education was imparted to the selected subjects with the help of booklet and a pamphlet developed by the investigator. Of the selected 202 HIV positive cases from Coimbatore and Manipur, 89 were from Manipur (Drug users) and 113 from Coimbatore (Non-Drug users). Except for protein, a significant difference for the rest of nutrients between the RDA and actual mean nutrient intake was observed at one per cent level of significance for the male subjects from both the region. Irrespective of region, female HIV infected women showed a poor nutritional status compared to men at one percent level of significance. Health professional, dietitians and voluntary organization should come forward together not only to render their service in the management of the disease, but also to create a mass awareness and sensitise the population on the healthy practices and the role of nutrition in the management of diseases to enable every citizen to lead a healthy quality of life ahead.

PSCLN-23 PREVALENCE OF OSTEOPOROSIS IN SELECTED POST MENOPAUSAL WOMEN. A Sundaravalli¹, R Manjushree² and G Saraswathi³. ^{1&2}Department of Home Science, Mount Carmel College, Bangalore and ³DOS In Food Science & Nutrition, University of Mysore, Mysore. Email: asvalli_27@yahoo.com

Osteoporosis is characterized by low bone mass and micro architectural deterioration of bone tissue, leading to enhanced bone fragility and consequent increase in the risk of fracture. The Objectives of the study is to find out the prevalence of osteoporosis using Dual Energy X- ray Absorptiometry (DEXA) and related biochemical parameters in selected postmenopausal women. The subjects were from Defence Research and Development Organization (DRDO) labs and residential township of DRDO, in Bangalore. The age group of the subjects was 41-60 years. The subjects who had either osteopenia or osteoporosis on screening with Quantitative Ultrasound (QUS) were subjected to 'gold standard' test (DEXA) and biochemical parameters associated with the bone metabolism like serum calcium, phosphorus, alkaline phosphatase, and vitamin D3 for an intervention programme (n=111). With reference to WHO standards the t score results of DEXA in four sites is given as Mean, SD and range of Lumbar Spine (-1.63 ± 1.1 and -4.5 to -1.2), Femoral neck (-0.7±1 and -3 to +2.4) Wards triangle (-1.18±1.1 and -4 to +1.8) and Right forearm (-1.2 ±1.6 and -5.3 to +2.1). Out of 111 women who underwent DEXA test 16% were normal and 84% had either osteopenia/osteoporosis at any one of the site mentioned above. The association between BMI and BMD (p<0.0001) using chi square shown significance. Among biochemical parameters only vitaminD3 (p=0.08) using t test found not to be quite significant .The risk factors like age, menopause, food habits and physical activity did not show any significance along with other biochemical parameters in association with BMD. The prevalence of osteoporosis was found to be high even without any significant association with the risk factors.

PSCLN-24 CLINICAL PROFILE OF PEOPLE (20-50 YEARS) LIVING WITH HIV/AIDS FROM A TERTIARY CARE CENTRE, JAIPUR. Neetu Bansal¹, Anuradha Goyle¹ and Dinesh Mathur². ¹Department of Home Science, University of Rajasthan, Jaipur, India, ²Department of Skin and STD, SMS Hospital, Jaipur, India. Email: neetu.bansal14@gmail.com

The present study was designed with the objective to ascertain the clinical profile of people (n=100) living with HIV/AIDS in the age group of 20-50 years with Body Mass Index (BMI) ≤20 kg/m², reporting to the Department of Skin and STD, SMS Hospital, Jaipur. Data on demographic profile, anthropometric measurements, presenting complaints and blood profile was collected. The mean age of the subjects was 36.1 ± 6.82 years. Of 100 subjects, 63% were males and 37% were females. On the basis of BMI, 68% of the subjects were chronic energy deficient (CED) and 32% subjects were in 'low weight but normal' category. About 12% of the males (n=52) and 37% of the

females (n=30) were in the 'low' body fat percent category. Regarding the presenting complaints faced by the subjects (n=100), 82% had weakness, 71% had fatigue, 37% had skin problems, 28% had loss of appetite, 20% had gastro-intestinal problems, 17% had oral lesions, 16% had fever and genital problems. Some of the subjects had also complained of cough, insomnia, headache and diarrhoea. About 83% of the males (n=63) and 81% of the females (n=36) were anaemic (haemoglobin <14 g/dl and <12 g/dl, respectively). Serum iron of 61.7% males (n=60) and 58.3% of females (n=36) was found to be low (<60 µg and <40 µg, respectively). About 78% of the subjects (n=98) had low total red blood cells (<4.5 million/cumm). It can, therefore, be concluded that the subjects of the present study exhibited poor clinical profile.

EXPERIMENTAL NUTRITION

PSEN-01 DEVELOPMENT OF PULSE BASED PRODUCT FOR DIABETICS AND EVALUATION OF ITS GLYCEMIC INDEX. Radha Banka and Shilpi Sharma. Department of Home Science, MJRP University, Jaipur. Rajasthan, India. E mail: bankaradha123@yahoo.co.in

The present study was conducted with the objective to develop hypoglycemic mix and its low energy dense product i.e. modified vada (MV) using black gram (*Phaseolus mungo soxb*), green gram (*Greengram phaseolous*), soybean (*Glycine max*) and guar gum (*Cyamopsis tetragonalobus*). Four mixes were formulated using different ratio of ingredients and from each mix MV was developed by using baking rather than frying. MV developed from mix-1 had the highest mean score 8.3 and liked very much by 30 panel members. Significant difference (P< 0.05) was observed in sensory characteristic among 4 MV. Therefore, mix1 was selected for further assessment of glycemic index (GI). Standard vada (SV) was also developed from decorticated black gram and green gram using standardized recipe and panel members also liked the product. Nutritional composition of the MV and SV was also carried out using the standardized AOAC(1995) methods. The MV contained 30.10±0.05%, moisture, 1.4±0.05% ash, 16.80±0.02% protein, 2.0±0.02% fat, 3.3±0.05% fiber, 46.40±0.88% carbohydrate and 270.0±0.45 kcal/100gram energy. However SV inherited 19.63±0.88% moisture, 0.78±0.02% ash, 10.43±0.05% protein, 20.00±0.01% fat, 0.2±0.01% fiber, and 43.85±0.02 carbohydrate and 456±0.84 kcal/100 gram energy. Significant difference (P<0.05) was observed in all nutrients expect carbohydrate. The MV was evaluated for its GI. Therefore, 10 healthy female subjects free from any disease were selected for the assessment of GI. The subjects were fed the MV along with SV and blood glucose estimated at subsequent time intervals at three consecutive days. All the samples provided 25gm of carbohydrate. The GI of MV and SV was 19.31 and 82.70 respectively. Significant difference (P<0.05) was observed between GI of MV and SV. GI value for MV was very much lower than SV. The results were interesting and need to be confirmed on large number of diabetic subject.

PSEN-02 EFFECT OF SUPPLEMENTATION OF FUNCTIONAL BEVERAGE ON THE PHYSICAL PERFORMANCE OF SPORTSWOMEN. Anupriya Singh^{1*}, Anita Kochhar*, Rajbir Sachdeva* and Vandana Kochhar**. Department of Food and Nutrition*, Department of Processing and Food Engineering**, Punjab Agricultural University, Ludhiana. ¹Email: jasrotia.anu5@gmail.com

Being a tropical country, Indian athletes tend to get exhausted quickly particularly during summer and this affects their performance. Functional beverage was prepared by using whey water, pearl millet, cauliflower leaf powder, banana and jaggery at three different levels i.e. S₁, S₂ and S₃. The developed functional beverage was organoleptically evaluated by a panel of judges and students by using nine-point hedonic scale. Both the panels gave the highest overall acceptability scores to the S₁ level which was prepared by using 2.5 g cauliflower leaf powder, 5 g pearl millet, 10 g jaggery, 20 g banana and 63 ml whey water per 100 ml. The most acceptable level was chemically analysed. Thirty sportswomen in the age group of 16 to 18 years from Punjab Agricultural University, Ludhiana were selected to determine the effect of supplementation of functional beverage on the physical performance of sportswomen. The study was divided into two periods i.e. control and experimental. In control period supplementation was not done. In experimental period supplementation of 200 ml developed functional beverage was done for 3 months. The run time, heart rate and blood pressure of the subjects were measured. It was observed that run time for 'Cooper's 1.5 mile run test' and rise in heart rate after the test reduced significantly (p≤0.01) i.e. 15.95 % improvement in their average run time and 7.67 % decrease in heart rate after the experimental period. Therefore, it can be reported from the results that supplementation of functional beverage before the sports training improved physical performance of the sportswomen. Therefore, the consumption of the underutilized foods like pearl millet, whey water and cauliflower leaf powder should be encouraged.

PSEN-03 **EFFECT OF SUPPLEMENTATION OF IRON RICH FUNCTIONAL FOODS BASED MIXES ON ANAEMIC ADULT WOMEN.** Lakshmi UK² and Selvarani S. Department of Food Science and Nutrition, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu, India.*Email: uklakshmee@yahoo.co.in

Iron deficiency anaemia among reproductive age women leads to maternal deaths, foetal wastage and low birth weight infants. The study was aimed at developing iron rich food mix and evaluating its supplementary effect. A total of 250 women aged 20-40 years residing at a rural area, Vedasandur in Dindigul District, Tamilnadu was selected and screened for anaemia. Socio-economic and dietary information was collected. Anthropometric, biochemical, clinical and 24 hour food intake by recall were done. Three food mixes were developed using iron rich functional foods. Mix I contained rice flakes, jaggery and amla powder, Mix II had same ingredients as Mix I and also ragi flour, Mix III had same ingredients as Mix I along with amaranthus tritris powder at different proportions to supply same amount of iron. Based on haemoglobin levels 40 moderately anaemic women were selected and grouped into three experimental and one control group. The supplements were given as ladoos for a period of 100 days. The findings revealed more of nuclear, small sized families with 79% earning more than Rs.7000 per month. Low intake of fruits and vegetables and iron, vitamin A and C inadequacy was observed. BMI revealed 27% women as overweight and 9% as obese. Results showed 29% moderately anaemic and 27% mildly anaemic. Supplementation showed an increase in body weight by 0.4 to 0.6kg and 1.27g/dl, 1.4g/dl and 1.6g/dl in haemoglobin levels among experimental groups I, II and III respectively and found to be statistically significant.

PSEN-04 **IN VITRO STUDIES ON ANTIOXIDANT AND ANTIMICROBIAL ACTIVITIES OF SOME SELECTED SPICES.** Tattari Shalini, Virendra Panpatil, Chetan Nimgulkar and Kalpagam Polasa. Food and Drug Toxicology Research Centre, National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, India. Email: anitha.tej4@yahoo.com

Antioxidants are the agents, which scavenge free radicals like reactive oxygen species and prevent the damage caused by them. Antioxidants have gained a lot of importance because oxidative stress is a major etiological factor of many diseases such as cancer, diabetes, cardiovascular diseases, neuro-degenerative disorders, autoimmune diseases, ageing, myocardial infarction, parkinson's disease, hypertension etc. Spices like turmeric, ginger, alliums etc. are indispensable for the preparation of our daily food and are used to impart flavour and colour to food and are reported to possess compounds, which have varied beneficial biological effects. Spices are reported to prevent microbial spoilage of food. The objective of the present study is to evaluate the antioxidant and antimicrobial activity of spices extract like ginger (*Zingiber officinale*), turmeric (*Curcuma longa*) and garlic (*Allium moly*). Antioxidant property of spices extract is evaluated in-vitro by DPPH free radical scavenging activity assay. The method was standardized by using different concentrations of DPPH; finally 0.6mM concentration of DPPH was taken. Vitamin C was used as a reference standard, to compare the potency of spice material. Antimicrobial activity is evaluated by slant method at different concentrations against the test organisms like *Escherichia coli*, *Salmonella typhi* and *Staphylococcus aureus*. The IC₅₀ values were calculated. Ginger was found to have most antioxidant potency, followed by turmeric, dry garlic and fresh garlic. The antimicrobial activity was found to be highest in turmeric, followed by ginger and garlic against the test organisms. This study indicates that the extract of spices like ginger, garlic and turmeric have antimicrobial and antioxidant activity, further research may be needed to understand the in-depth mechanisms through which these effects are exerted.

PSEN-05 **EFFECT OF DIFFERENT TYPES OF HEAT TREATMENT ON THE PHYTONUTRIENT CONTENT OF FRUITS.** T Sujatha¹, Lalitha Ramaswamy² and B Venkadesh³. ¹Madras Medical College and Rajiv Gandhi Govt. General Hospital, ²Department of Nutrition & Dietetics, PSG College of Arts and Science, Coimbatore, ³Muslim Arts College, Kanyakumari District. *Email: tuoja500@yahoo.com

Fruits are important components of a healthy diet, since they have low energy density and are sources of micronutrients, fibre and other components with functional properties. Consumption of fruits is beneficial against various conditions like obesity, constipation and cardio vascular disease. Fruits are best consumed raw in order to derive all the nutrients that they contain. Fruits also undergo processing and cooking as in jam and preserves. In the present study, cooking practices such as boiling, pressure cooking, steaming and microwaving were done for 5 and 7 minutes to selected fruits like apples, grapes, guava, pineapple and tomato and the effect on

phytonutrients such as carotene, lycopene, polyphenol phenol, and vitamin C were found out using standardised procedures. The carotene content of all the fruits except tomato showed a loss in all types of cooking. The lycopene content of all the fruits had increased by 98% to 98.83% after cooking for 5 minutes with the exception of guava. The polyphenol content of all the fruits also showed an increase (with the exception of guava) and that of apple, grapes and tomato doubled after cooking. The polyphenol content of grapes which was 61.5mg/100gm increased to 225mg/100gm after 7 minutes of boiling. The phenol content of all the fruits showed a marginal increase on account of cooking. However the vitamin C content of all the fruits decreased. Results of ANOVA showed that there is a significant difference in the phytonutrient content of fruits due to cooking. This confirms the fact that these cooking methods have made the phytonutrients more readily available for utilisation.

PSEN-06 DEVELOPMENT OF RAPID AND SENSITIVE METHOD FOR SCREENING IRON BIOAVAILABILITY IN FOOD SAMPLES. Swarnim Gupta, P Raghu, P Ravinder and K Madhavan Nair. Micronutrient Research Group, National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, Andhra Pradesh, India. Email: gupta.swarnim@gmail.com

There is a paucity of information on iron availability from individual foods and their combinations to facilitate dietary diversification to improve iron bioavailability. Measuring iron dialyzability is used as surrogate of iron bioavailability. The existing colorimetric method is not sensitive to detect low level of iron present in the dialysate especially from plant sources. The objective of the present study was to develop a sensitive method of detection of dialyzable iron as a surrogate of food iron bioavailability. A method using 6 well plate set up with dialysis membrane was developed. We tested utility of radio isotope ^{59}Fe and Phen Green SK, a fluorescent probe for measuring dialyzable iron in 6 well plates set up. These methods were validated based on percentage dialyzability of ^{59}Fe and quantitation using fluorescence of Phen Green SK against the colorimetric method. The method was tested with various inorganic chemical sources of iron and foodstuffs. There was a negative correlation between ^{59}Fe dialysed and concentration of iron in the dialysate. The magnitude and direction of the changes in dialyzable iron in the presence of ascorbic acid and phytic acid are in agreement with the known property of these dietary ligands. Further, studies performed with Phen Green SK showed that this method could be more sensitive than colorimetric methods and could detect iron concentration in pico mole levels. These results indicate that both isotopic and fluorescent probe methods seem to be promising for rapid screening of dialyzable iron for selecting most promising foods for dietary diversification.

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PSEN-07 PANORAMA ON USE OF PROTEINOUS LATHYRUS SATIVUS WITHOUT AFFECTING HUMAN HEALTH BY ADOPTING CORRECT METHODOLOGY. Mani Misra¹, Anamika Nag², Mukta Singh³.
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The present exploratory study was undertaken with an objective to analyse the removal of toxicity of BOAA in *Lathyrus sativus* by using various laboratory procedures and to manage up the *Lathyrus sativus* to fight against protein - energy malnutrition at very low cost. *Lathyrus sativus* is rich in protein but it contains toxin i.e. BOAA and it is being used as an adulterant with various foodstuffs. The toxin BOAA causes crippling disease in human beings. So the main aim was to remove the toxicity and utilize this valuable legume in preventing protein shortage in developing countries at very cheap cost for people who are below poverty line. For this, analytical studies were done and to find the percentage of toxicity of BOAA removed from *Lathyrus sativus*. An attempt was made during this short term study to validate the above objectives. The study revealed that while using various treatments the toxic content of BOAA was removed in considerable amount, which does not affect the human health if it is being consumed.

PSEN-08 EVALUATION OF ACTUAL ANTIOXIDANT CAPACITY OF WHEAT (TRITICUM AESTIVUM) USING IN VITRO GASTROINTESTINAL MODEL. Anjali Bhatt and Vinayak Patel. PG. Department of Home Science, Sardar Patel University, Vallabh Vidyanagar, Gujarat, India. Email: patelvh2004@yahoo.co.in

Wheat is an important food commodity worldwide and is consumed as a staple cereal in most Indian states. There are growing evidences indicating that whole wheat intake is associated with health benefits which are attributed to the phytochemicals. Most reports on cereal antioxidant capacity are based on extraction of

antioxidants using polar solvents but the enzymatic treatments during digestion hydrolyse starch and protein, which may favour the release of polyphenols. Therefore, the release of antioxidant compounds in the gastrointestinal tract is not only quantitatively, but also qualitatively different to the one in the chemical extraction. Present study involves the extraction of wheat and chapatti (unleavened roasted whole wheat bread) by both chemical and enzymatic digestion followed by determination and comparison of the antioxidant potential determined by chemical extraction as mentioned in the literature and the actual antioxidant capacity measured by enzymatic digestion. The Total Phenol and Flavonoid content showed a significant decrease ($p < 0.05$) in response of cooking whereas *in vitro* digestion showed a marked and significant increase ($p < 0.05$). Total antioxidant capacity measured by different methods was not affected much by cooking but increased significantly ($p < 0.05$) by *in vitro* digestion as compared to their chemical extracts. In conclusion, wheat provides a measurable amount of antioxidant after digestion.

PSEN-09 A NEW PREDICTIVE EQUATION TO CALCULATE RESTING ENERGY EXPENDITURE OF ELITE SOUTH INDIAN POWER SPORTSPERSONS. *Mini Joseph*¹, *Prema L*², *Mercy Inbakumari*³, *Nihal Thomas*⁴. ¹Department of Home Science, Govt. College for Women, Kerala, India, ²Kerala Agricultural University, Kerala, India; ³Department of Endocrinology, Diabetes and Metabolism, CMC Hospital Vellore, Tamil Nadu, India. Email: rejumini@msn.com

Various equations are present to compute the Resting Energy Expenditure (REE) using anthropometric variables. These equations may not hold well amongst this population. This cross-sectional study was done on 30 elite male weightlifters aged 17-28 years, competing at the National levels. The objectives of this study were one to measure REE using the gold standard –Indirect calorimetry and another to compare the measured REE (mREE) with 8 published formulas (pREE) - Harris-Benedicts, Mifflin-St Jeor, FAO/WHO/UNU, ICMR, Cunninghams, Owen, Katch-McArdle and Nelson. The Intra-class Correlation Coefficient (ICC) between the mREE and pREE show statistically significant agreement. The ICC estimate of Nelson's (1992) equation was 0.557 indicating highest agreement. However, all 8 predictive equations underestimated the REE. The highest mean difference was 636kcal/day (Owen, 1986) and lowest difference was 375kcal/day (Cunninghams). This deficit is of nutritional significance. Pearson Correlation Coefficients between mREE and anthropometric variables showed positive significance with Supra iliac skin fold thickness, Lean Body Mass (LBM), Waist circumference, Hip circumference, Bone Mineral Mass and Body Mass. Stepwise Multiple Linear Regression done showed LBM as the only significant determinant of REE. A new equation using LBM as the independent variable for calculating REE was computed. REE for weightlifters = $-164.065 + 0.039 (\text{LBM})$ [C.I. -1122.984, 794.854]. This new equation reduced the mean difference with mREE by 2.36 ± 369.15 kcal/day (S.E=67.40). We conclude that in the absence of Indirect calorimetry, the REE equation developed by us, using LBM is a better predictor for calculating REE of Professional Male Weightlifters of this region.

PSEN-10 ASSESSMENT OF CHANGES IN ANTHROPOMETRY AND BODY COMPOSITION WITH PROGRESSION OF AGE AMONG OCCUPATIONALLY SEDENTARY ADULT WOMEN. *Gurpreet Kaur*¹, *Kiran Bains*¹ and *Amrit Kaur*². Department of Food and Nutrition¹, Department of Mathematics and Statistics², Punjab Agricultural University, Ludhiana, Punjab, India. Email: Gurpreet_kaur881@yahoo.com

A cross-sectional study was conducted on 152 occupationally sedentary adult women comprising of students, research fellows, assistant professors, associate professors and professors from Punjab Agricultural University, Ludhiana. The subjects were divided into four age groups i.e. 21-30, 31-40, 41-50 and 51-60 years to assess changes in anthropometry and body composition with progression of age. Basic anthropometric measurements such as height, waist and hip circumference measurements were taken using standard methods. The derived anthropometric measurements viz. body mass index and waist and hip ratio were calculated. Weight and Body composition of the subjects were determined using bioelectrical impedance. A gradual increase ($p \leq 0.05$) in anthropometric and body composition parameters such as weight, waist circumference, hip circumference, body mass index, fat mass and visceral fat rating was observed with the advancement of age. The lean body mass was decreased significantly ($p \leq 0.01$) as the age progressed, the values for four age groups being 74.9, 68.9, 62.8 and 60.9 %, respectively. Contrary to this, fat mass increased with age, the corresponding values for four age groups being 15.7, 21.4, 26.6 and 29.2 kg, respectively. Sarcopenia and Sarcopenic obesity was observed in 7, 14, 43 and 57 % of subjects in group I, II, III and IV, respectively. Prevalence of central obesity in four groups ranged between 36-86 %. The youngest age group showed the highest value of TBW%. Age was found to be a crucial

factor associated with anthropometry and body composition of the subjects. Therefore, preservation of muscle mass and prevention of sarcopenia through appropriate diet and exercise can be a useful strategy to increase functional independence and to decrease the prevalence of age associated chronic diseases among population with sedentary life style.

PSEN-11 EFFECT OF FORMULATED HAEMOVITAL SYRUP - IRON SUPPLEMENT FOR ADOLESCENT GIRLS. Anbuselvi R and Bavani S. Department of Food Processing and Quality Control, V.V.Vanniaperumal College for Women, Virudhunagar, Tamil Nadu, India. Email:anbuselvramar@gmail.com

Iron deficiency anaemia is widely prevalent among weaned infants and young children in India. The haemoglobin levels in severe and moderately severe anaemic cases, may range from 5 to 9g/100 ml .Iron supplementation through food is important strategy for prevention and treatment of iron deficiency anaemia. It was proved in various studies that the nutraceutical effect of iron rich foods will increase the haemoglobin level. This motivation helps researcher to develop this syrup. The baseline survey was conducted with 50 adolescent girls and 20 were found out as anaemic. In this study the researcher has developed Haemovital syrup using iron and vitamin-C rich foods such as Amla, Dates, and lotus stem dried etc. Three different samples of haemovital syrup were developed using the same ingredients at various proportion and then it was subjected to organoleptic evaluation with panel members. Sample C got overall acceptability than other samples. Haemovital syrup was subjected in biochemical analysis; the syrup contains high iron and Vitamin-C content as 53 mg and 155 mg /100 ml respectively. The shelf life of syrup was studied in two different types of bottles at two different conditions like refrigeration and ambient temperature. Pet bottle storage at refrigeration condition showed high quality than other samples. The prepared supplemented syrup was given as supplementation to the selected adolescent anaemic girls for three months. After 3 months of supplementation, the haemoglobin level of those girls was increased. Thus food based strategy is suitable to overcome the problem of iron deficiency anaemia.

PSEN-12 A COMPARITIVE STUDY ON THE ANTIOXIDATIVE POTENTIAL OF GLUTATHIONE REDUCTASE AND LYCOPENE *IN VITRO*. K Mary Anne Preetha* and S John Mary**. Department of Food Chemistry and Food Processing, Loyola College, Chennai, Tamil Nadu, India. *annerjr@gmail.com

Antioxidants are provided to living organisms to protect them from damage caused by uncontrolled production of ROS and the concomitant lipid peroxidation, protein damage and DNA-strand breaking. When the mechanism of antioxidant protection becomes unbalanced by exogenous and endogenous factors, it results in inflammation, diabetes, genotoxicity, cancer and accelerating ageing. Antioxidant supplements or foods containing antioxidants may be used to help the human body reduce oxidative damage. Synthetic antioxidants such as BHA, BHT, PG and TBHQ are commonly used in processed foods. However, they have been suspected of being responsible for liver damage and carcinogenesis in laboratory animals. Hence, the development and use of more effective natural antioxidants are desired. Therefore the main intent of this study is to evaluate and compare the anti-oxidative potential of the natural antioxidants GR and Lycopene under *in vitro* conditions and also to formulate a juice with increased bioavailability of GR using fruits rich in glutathione since it is said that oral supplements does not increase the GR levels in the blood but is best absorbed from natural sources. GR and Lycopene were extracted from frozen tomato peel and tomato ketchup by Enzyme and Solvent extraction method. Their antioxidant potential was evaluated using DPPH radical scavenging and Reducing power assay. Based on the data obtained from this study, GR was found to be an effective free radical inhibitor or scavenger, when compared to lycopene, as well as a primary antioxidant that reacts with free radicals, which may limit free radical damage occurring in the human body.

Abbreviation : DPPH - 2,2 - Diphenyl - 1 - Picryl Hydrazyl, ROS - Reactive Oxygen Species, BHA -Butylated Hydroxy Anisole, BHT - Butylated Hydroxy Toluene, PG - Propyl Gallate, TBHQ - Tertiary butyl hydro quinone, GR - Glutathione Reductase.

PSEN-13 NUTRIENT PROFILE AND ACCEPTABILITY OF READY-TO-SERVE (RTS) FRUIT JUICE BLEND UTILIZING POMEGRANATE AND GRAPES. *VR Bharathi Dhevi* and Rashmi Kapoor. Dept. of Food Science and Nutrition, Sri Sathya Sai University, Ananthapur, AP. Email id: vrbd_1@yahoo.com

India with its diverse, but favourable agro climatic conditions produces a wide range of tropical fruits and vegetables. Fruits contain high amounts of water ranging from 80 – 90%. Only 0.5% of fruits are being processed. It is for this reason the fruit processing technology came into existence. The present study had been undertaken to develop a ready-to-serve (RTS) fruit juice blend utilizing Pomegranate and Grapes. The proximate analysis of the juice along with the components were also undertaken. Addition of natural and chemical preservatives such as guava leaf extract at 2.5 and 5 % levels and sodium benzoate at 0.15 % level were done and the juice was stored both in ambient and refrigerated temperatures for a period of 7, 14, 45 and 60 days. The storage stability, the sensory evaluation and microbiological analysis of the stored sample along with fresh sample were also carried on. The present investigation showed the chemical composition of the components having the highest moisture and lipid contents for black grapes; protein content for gymnema sylvestre; crude fibre content for pomegranate. Pomegranate and black grapes were found to be very good sources of poly phenols implicating to produce variety of health benefits. The anti-oxidant enzymes namely catalase and peroxidase were higher in pomegranate. The retention of vitamin C and other chemical treatments, namely titrable acidity, phenolic content and carbohydrate analysis could be seen both in ambient and refrigerated temperatures upto the storage period of 14 days. Over all, it can be stated that the juice could be effectively stored and preserved upto 15 days, irrespective of the storage temperatures, namely ambient and refrigerated.

PSEN-14 IMPACT OF GARDEN CRESS SEEDS (*Lepidium sativum*) AND NIGER SEEDS (*Guizotia abyssinica*) INCORPORATED CHIKKI SUPPLEMENTATION IN THE MANAGEMENT OF BREAST CANCER PATIENTS. Uma Iyer, Venus Ratnani and *Shonima Venugopal*. Department of Foods and Nutrition, Faculty of Family and Community Sciences, The Maharaja Sayajirao University of Baroda, Vadodara, India. Email: shonima118@yahoo.co.in

Breast cancer is the most common cancer among women worldwide. Iron rich food supplements can be beneficial to anaemic breast cancer patients. There is dearth of data on clinical trials with dietary components conducted among women suffering with breast cancer. The study was thus planned with an objective to study the impact of garden cress seeds and niger seeds chikki supplementation for a period of 20 days on the general health, haemoglobin levels, weight, lipid profile and the protein status of breast cancer patients receiving chemotherapy. The cancer subjects were selected purposively from Nayak hospital at Vadodara (N=8) and Kailash cancer hospital at Waghodia village (N=9). The subjects acted as self controls. The intervention given was 40 g chikki/day for a period of 20 days. The prevalence of anaemia was high among the subjects (82.35%). A significant rise of 0.44g/dl was seen in the mean haemoglobin levels ($p < 0.001$) in the experimental group after supplementation while such a change was not observed in the control group. In the experimental group the prevalence of anaemia was reduced by 11.77%. Most of the subjects had greater than 80% compliance. The chikki was accepted by the subjects despite the fact that most of them suffered from anorexia (88.24%). Significant increase ($p < 0.05$) in weight was observed as an impact of chikki supplementation in the breast cancer subjects. No changes were observed in the lipid status and protein status of the subjects. Thus Garden Cress seeds - Niger seeds chikki can be effectively propagated as a functional food to improve the haemoglobin status of anaemic cancer subjects.

PSEN-15 *IN SILICO* APPROACHES IN UNDERSTANDING OBESITY. *Kalaiselvi Senthil* and N Santhi. Department of Biochemistry, Biotechnology and Bioinformatics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu, India. kalaiselvi_bc@avinuty.ac.in

Obesity is a complex, heterogeneous group of disorders that is determined by genes, environmental factors and interaction between genes and environment. The integration of computational biology and “omics” science facilitate an understanding of the mechanism of disease in an integrative way, including elucidation of complex network of genes and proteins along with their regulatory network (Wang et al., 2009, Mori et al., 2010). The human genome contains ~25,000 predicted coding genes. Most of these genes are differentially expressed in space and/or time in response to environmental or pathological conditions. As a result, each cell/tissue/organ in the body expresses a different subset of the total gene collection. Large scale molecular profiling technologies

have enabled measurements of mRNA and protein expression on the scale of whole genomes. In order to gain deeper understanding of obesity, it is necessary to convert the information from dataset obtained from HTP to structured pathway and their regulatory network via the predefined pathway. In this study, we propose a general framework to study obesity via networking pathways. It is hypothesized that, FTO gene will play a central role or be a key gene in controlling the Gene Regulatory Network related to obesity. The association of SNPs in FTO gene to obesity has been reported recently by Ramya *et al.*, (2011) in South Indian population. Therefore, in the present study, we are proposing to associate the available expression data with a selected population. The results obtained will be discussed.

PSEN-16 RELIABILITY OF MODIFIED MINI NUTRITIONAL ASSESSMENT SCALE IN RURAL SETUP OF A TERTIARY HEALTH CARE HOSPITAL IN CENTRAL INDIA. *Gaiki VV, Wagh VV, Sharma MM, Mathur M and Goyal RC.* Department of Community Medicine, Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences, Sawangi (Meghe), Wardha, Maharashtra. email: dr_varungaike@yahoo.co.in

Health of an individual is the result of various criteria like healthy nutritional status, excellent functional capacity, favourable environmental conditions. The nutritional status plays a vital role in determining the health seeking behaviour and the limitation of functional capacity. So, this 3 month cross sectional study was aimed at determining the reliability of mini nutritional status scale in the field practice area of rural health training centre of Jawaharlal Nehru Medical College, Wardha, Maharashtra, using two pre trained observers. Prior trained, two nurses, visited the elderly who had utilised the health care services from the rural health training centre in the last one month duration, by house to house visit, and recorded the information as per MNA scale. The follow up visit, after the first visit of ANM, was done exactly after one month and again the data was recorded in the form of MNA scale. The data collected was analysed for inter-observer variations, using kappa statistics. Prior approval was sought from the Institutional ethics committee of JNMC and oral consent was obtained from the participants. Mean score was 19.6 and 20.4, with standard deviation of 2.45 and 3.05 respectively. According to kappa index, test-retest reliability for a stratified total MNA was 0.78, for 18 ordinals, it was nominal items, it was almost perfect, or substantial in 12 items, in 5 items, it was moderate to fair, and in 1 item it was slight. Conclusion: MNA has a good level of reliability and reproducibility, according to its internal consistency.

PSEN-17 STUDY ON THE HYPOCHOLESTEROLEMIC EFFECT OF THE SELECTED HERB ON ADULT PATIENTS SUFFERING FROM MILD HYPERCHOLESTEROLEMIA. *Anooja Thomas and Meghna.M,* Department of Home Science, C.M.S College, Kottayam, Kerala, Email: anoojam@gmail.com

Hypercholesterolemia is an area where major health gains can be made through the implementation of primary care interventions and basic public health measures. Herbs, formulated, are free of side effects or reactions. The herbs that have medicinal quality provide rational means for the treatment of many internal diseases, which are otherwise considered incurable in other systems of medicine. The study was conducted by using the herb mango ginger. The main objectives of the study were: To select herb with hypocholesterolemic properties, Supplementation of the selected herb to the selected samples, evaluation of the impact of supplementation of the selected herb on cholesterol level. (N=16) samples were selected for the study including 8 males and 8 females. Supplementation of 10g mango ginger powder daily for a period of 45 days and impact of supplementation was evaluated by lipid profile level before and after supplementation. Mean lipid profile of the selected samples had shown significant difference at 5 percent level that is serum cholesterol level decreased both in females and males respectively after supplementation. The high density lipoprotein level also shows significant at 5 percent level both the samples, low density lipoprotein and triglycerides shown significant difference at 5 percent level. Thus the present study proved to be beneficial to cholesterol reduction in both the sex.

PSEN-18 NUTRITIONAL STATUS AND IMPACT OF FUNCTIONAL FOOD SUPPLEMENT ON THE PERFORMANCE OF ATHLETES. *Mary Jenefer Sharmila P and Uma Mageshwari S.* Department of Food Service Management and Dietetics, Avinashilingam Institute for Home Science and Higher education for Women- University, Coimbatore, Tamil Nadu, India. Jeni_tulips@rediffmail.com.

Sports are an essential part of a healthy life and the importance of nutrition in sports has wide spread acceptance. Functional foods are an important lifestyle that includes a balanced diet and physical activity and

sports nutrition is the well documented example. The experimental study was carried out to assess the nutritional status of the athletes, to evaluate the impact of functional food (toffee) on the performance of athletes and haemoglobin status. Fifty male athletes were selected by purposive sampling and were divided equally into experimental and control group. The back ground information, anthropometry, body composition, dietary and health status was assessed. A toffee was prepared with the functional food sweet potato which has quercetin. The toffee was analysed for its antioxidant activity, energy, carbohydrate, protein, fat and iron using standard procedures. Acceptability tests were carried out and supplemented to the experimental group athletes for a period of six weeks. The impact of supplement on sports performance was studied measuring endurance, speed, blood haemoglobin level and weight gain. The functional food supplement had a positive impact on the performance of athletes in terms of endurance, speed and haemoglobin status. Increase in body weight was negligible.

PSEN- 19 EVALUATION OF ANTIOXIDANT POTENTIAL OF WHEY PROTEIN ISOLATE DERIVED THROUGH CROSS FLOW MICROFILTRATION ON MALE ALBINO RATS. *Chagam Ch. Koteswara Reddy, Gothainayaki, Sundaramoorthy Haripriya. Department of Food Science and Technology, Pondicherry Central University, Puducherry. Email:koteswarreddychagam@gmail.com*

Antioxidant plays a vital role in the destruction of free radicals and reaction oxygen species. The best and most natural source of glutamyl cysteine, which is the cells major antioxidant compound comes from the dietary protein. The objective of the study was to evaluate the antioxidant potential of whey protein isolate derived through cross flow microfiltration. Male albino rats (n=12) were divided randomly into two groups of six each. Group A(n=6) formed the experimental group and Group B(n=6) formed the control group. Group A was fed with 10 g of whey protein isolate (WPI) along with the standard feed diet. Group B was fed only with standard feed diet for the period of 42 days. The statistical t test proved one per cent significant between the initial and final values of experimental group in serum reduced glutathione level ($3.85 \pm 0.05 \mu\text{mol/g}$), reduced glutathione ($4.9 \pm 0.02 \mu\text{mol/g}$), Glutathione S-transferase ($3.61 \pm 0.30 \mu\text{mol/g}$), $\mu\text{mol CDNB conjugated / min/mg protein}$ (4.16 ± 0.03). The initial and final values of the blood parameters measured in group B were not found to be significant. The supplementation of WPI to the male albino rats proved to be acting as a potential enhancer of the antioxidant status in the male albino rats.

PSEN- 20 EVALUATION AND COMPARISON OF CARDIOPROTECTIVE ACTIVITY OF A NUTRACEUTICAL FORMULATION WITH ITS INDIVIDUAL CONSTITUENTS- OMEGA 3 FATTY ACIDS, RESVERATROL AND COQ10 USING ISOPROTERENOL INDUCED MYOCARDIAL INFARCTION MODEL. *Desai SK and Godhia S. Department of Pharmacology, Prin. K. M. Kundnani College of Pharmacy, Mumbai, India. Email: suchitragodhia@yahoo.com.*

Cardiovascular diseases (CVDs) are one of the major causes of deaths worldwide. Although modern drugs are effective in preventing these disorders, their use is often limited because of their adverse drug reactions. Consumers are turning massively to food supplements enriched with antioxidants, omega-3 polyunsaturated fatty acids and polyphenols to improve well being where pharmaceuticals fail. Keeping in mind this information, a nutraceutical formulation (NF-1011) containing Omega 3 Fatty Acids, Resveratrol and CoQ10 was evaluated for its Cardioprotective activity using Isoproterenol induced Myocardial infarction model. *In vitro* antioxidant activity was evaluated by Hydrogen peroxide radical scavenging activity, Reducing Power assay and *In vitro* inhibition of Lipid Peroxidation models. Acute toxicity studies were performed as per OECD-423 guideline. Cardioprotective activity study was carried out on albino Wistar rats. Animals were pretreated with the test drugs for 21 days. Toxicity was induced by Isoproterenol (85 mg/kg, i.p.). Animals were humanely sacrificed and hearts were dissected out aseptically, weighed and used for estimation of various Glutathione enzyme levels (GSH, GR, GPx and GST). Heart weights were used for estimation of heart to body weight ratio of the animals. Our findings showed that NF- 1011 (800 mg/kg), Omega 3 fatty acids and Resveratrol significantly restored most of the alterations in the antioxidant i.e. glutathione enzyme levels in the rat's myocardium and these results showed a good correlation with *in vitro* antioxidant studies and heart to body weight ratio of the animals.

PSEN-21 **EVALUATION OF ROHU (*Labeo rohita*) FISH EGGS AS POTENTIAL SOURCE OF NUTRIENTS AND ANTIOXIDANT ACTIVITIES.** M Chalamaiah¹, T Jyothirmayi², K Bhaskarachary³, R Hemalatha⁴, Prakash V Diwan⁵ and B Dinesh Kumar^{1*}. ¹Food and Drug Toxicology Research Centre, ³Department of Food Chemistry, ⁴Division of Microbiology & Immunology, National Institute of Nutrition (ICMR), Hyderabad, India. ²Central Food Technological Research Institute (CSIR), Resource Centre, Hyderabad, India. ⁵Lalitha College of Pharmacy, Ghatkesar, Hyderabad. E-mail: nindinesh@rediffmail.com

The fish is one of the largest consumed food source. It is estimated that approximately more than 60 % of fish is considered as waste which include skin, liver, viscera, eggs and bones. These fish wastes, except eggs, are converted to protein hydrolysates which are reported to have biological activities (antioxidant, antihypertensive, immunomodulation) and exploited commercially. With our earlier experience of preparing protein hydrolysates from *Mrigal* fish eggs, in the current investigation we have made an attempt to prepare similar type of protein hydrolysates from Rohu (*Labeo rohita*) egg. The preliminary analysis suggests that hydrolysates have high protein content with good source of essential amino acids. In addition, the potential antioxidant profile has also been evaluated by using different *in vitro* methods such as DPPH (2,2 diphenyl-1-picrylhydrazyl) radical scavenging activity, ABTS⁺ (2,2'-azino-bis(3-ethylbenzthiazoline-6-sulfonic acid) radical scavenging activity, ferric reducing antioxidant power (FRAP), ferrous ion (Fe²⁺) chelating ability and hydroxyl radical (OH[•]) scavenging activity. In view of the above, these hydrolysates can be further investigated for their quality and safety so as to promote fish egg waste as a value added product.

PSEN-22 **PASTING BEHAVIORS OF STARCH AND PROTEIN IN SOY FLOUR ENRICHED COMPOSITE FLOURS ON QUALITY OF BISCUITS.** Devi Karuthapandian¹ and Sundaramoorthy Haripriya². ^{1,2}Department of Food Science and Technology, Pondicherry University, Puducherry, India. Email: devi.karuthapandian@gmail.com

The pasting characteristics of starch and protein in soy flour enriched composite flours were studied comparatively to wheat flour towards the quality of biscuits obtained from them respectively. RVA analysis on starch and protein pasting behaviours of wheat flour (V1), ragi flour (V2), soy flour (V3) and soy flour enriched composite flours were found to produce the biscuits with the quality comparable to control biscuits, namely, wheat – soy composite flour with the substitution of 5 percent soy flour alone (V4) and wheat flour composited with 5 percent soy and 10 percent ragi flours. The protein pasting viscosity of V4 and V5 was found to be comparable (P>0.05) to V1 with the significant variation (P<0.05) in their starch pasting viscosity coinciding the result that showed the quality of biscuits from V4, V5 comparable to that from V1. This result set the hypothesis that contribution of protein pasting may be more than starch in the quality of biscuits from V4, V5 comparable to V1 and it can be further studied focusing on the interaction between starch and protein in soy flour like protein rich legume flour based composite flour technology in the quality of biscuits.

PSEN-23 **PROCESS DEVELOPMENT FOR THE PRODUCTION OF DRY FRUIT FROM JACKFRUIT (*ARTOCARPUS HETEROPHYLLUS*) BY OSMOTIC DEHYDRATION.** S Santhalakshmy and S John Don Bosco, Department of Food Science and Technology, Pondicherry University, Puducherry, India. Email: santhalakshmys@gmail.com

The present study has been conducted to optimize the process for the development of dry fruit from jackfruit by osmotic dehydration followed by hot air drying. The osmotic medium in the study was prepared by using different water sugar ratio (1:0.75; 1:1; 1:1.25 and 1:1.5). For increasing the rate of osmotic dehydration, salt of one, two and three percent was also added in the medium. The jackfruit bulb was cut into 20x20, 30x30 and 40x40 mm² sizes. For all treatments the ratio of osmotic medium to sample was maintain as 4:1. The duration of osmotic dehydration used was 30, 60, 90 and 120 minutes. The loss in weight was calculated after osmotic dehydration in all treatments. Due to osmotic dehydration, the mean moisture content of the fruit slices was brought down from 72% (w.b) to 50% (w.b). The osmotically dehydrated slices were dried in hot air tray drier. The moisture content of the dry fruit after hot air drying was observed as 13.5% (w.b) which is more ideal moisture content for the packaging too. Physicochemical analyses, Nutrient analyses, Microbial analyses and Sensory evaluation were carried out and there was no significant difference between fresh and dried fruit except sugar level. Rehydration study was carried out by checking the weight of the fruit after immersed in water at time

intervals of 5 minutes respectively. After about 35 minutes of rehydration the dehydrated jackfruit gained its original texture of the fresh fruit.

PSEN-24 MATERNAL SUPPLEMENTATION OF OMEGA 3 FATTY ACIDS TO MICRONUTRIENT IMBALANCED DIET IMPROVES LACTATION IN RAT. *Kamini D Dangat, Anvita A Kale, Sadhana R Joshi.* Interactive Research School for Health Affairs, Bharati Vidyapeeth University, Pune, India. E-mail: sadhana.joshi@bharativedyapeeth.edu, srjoshi62@gmail.com

The present study aims to examine the effect of maternal supplementation of omega 3 fatty acids on a micronutrient (folic acid and vitamin B₁₂) imbalanced diet on gastric milk volume and long chain polyunsaturated fatty acid composition. Pregnant female rats were divided into 6 groups at 2 levels of folic acid both in the presence and absence of vitamin B₁₂. Both the vitamin B₁₂ deficient groups were supplemented with omega 3 fatty acid. Gastric milk volume and long chain polyunsaturated fatty acids were analysed. Our results for the first time indicate that imbalance in maternal micronutrients reduces gastric milk volume and milk docosahexaenoic acid levels ($p < 0.01$ for both) as compared to control. Supplementation with omega 3 fatty acids to this diet imbalanced in micronutrients increases ($p < 0.01$) milk docosahexaenoic acid level as compared to control. Imbalance in maternal micronutrients during pregnancy can alter milk fatty acid composition which may ultimately affect infant growth and development.

PSEN-25 NERVE GROWTH FACTOR, BIRTH OUTCOME AND PREECLAMPSIA. *Anitha Kilari¹, Savita Mehendale², Kamini Dangat¹, Hemlata Pisal¹, Sadhana Joshi¹.* ¹Department of Nutritional Medicine, Interactive Research School for Health Affairs, ²Dept of Obstetrics and Gynecology, Bharati Medical College Hospital, Bharati Vidyapeeth University, Pune, India. E-mail: sadhana.joshi@bharativedyapeeth.edu, srjoshi62@gmail.com

The present study compares nerve growth factor (NGF) levels between preeclamptic (PE) (n=86) and normotensive (NT) women (n=105) and their associations with blood pressure and infant size. Maternal plasma NGF levels were reduced ($p < 0.05$) in the PE group as compared to the NT group. Furthermore, NGF levels were reduced in PE mothers delivering low birth weight babies (LBW) as compared to NT mothers delivering LBW babies. Maternal NGF levels were negatively ($p = 0.029$) associated with blood pressure in preeclamptic mothers. Cord NGF levels were negatively associated ($p = 0.026$) with birth weight in the normotensive group. NGF levels are differently regulated in preeclamptic and normotensive mothers delivering LBW babies. Our earlier studies have shown reduced levels of long chain polyunsaturated fatty acids (LCPUFA) in preeclamptic women (Mehendale *et al.*, 2008; Dangat *et al.*, 2010) and mothers delivering low birth weight babies (Kilari *et al.*, 2010). Evidence suggests that LCPUFA especially DHA regulates neurotrophins. Future studies should investigate the mechanisms involved in the regulation of neurotrophins by LCPUFA in pregnancy complications. Follow-up of babies born to mothers with pregnancy complications is necessary to better understand the role of NGF in brain development in later life.

PSEN-26 EFFECTS OF SUPPLEMENTATION OF OMEGA-3 FATTY ACIDS TO IMBALANCED MATERNAL MICRONUTRIENTS (FOLIC ACID AND VITAMIN B₁₂) ON GLUTATHIONE PEROXIDASE LEVELS IN WISTAR RATS. *Suchitra Roy, Kamini Dangat, Asmita Kulkarni, Sadhana Joshi.* Interactive Research School for Health Affairs, Bharati Vidyapeeth University, Pune; Email: sadhana.joshi@bharativedyapeeth.edu, srjoshi62@gmail.com

Precise balance between processes generating reactive oxygen species generated during placental and fetal developmental processes and antioxidants is critical for normal embryo development. Glutathione peroxidase (GpX) is important antioxidant enzyme which is a scavenger of lipophilic hydroperoxides. During pregnancy, GPx deficiency leads to abnormal embryo development. Our earlier studies have shown increased oxidative stress in mothers with pregnancy complications. We have recently described interactions of folic acid, vitamin B₁₂ and docosahexaenoic acid in one carbon metabolism that is considered to play a key role in regulation of oxidative stress. Further, it is suggested that altered maternal micronutrients (folic acid, vitamin B₁₂) are at the heart of intra-uterine programming of adult diseases. The present study examined the effect of imbalance in maternal micronutrients (folic acid and vitamin B₁₂) and maternal omega 3 fatty acid supplementation on maternal glutathione peroxidase levels. Pregnant female rats were divided into six groups at two levels of folic acid both in the presence and absence of vitamin B₁₂. Both the vitamin B₁₂ deficient groups were supplemented with omega 3

fatty acid. GPx activity was analysed in dam at d20 of gestation. Our results for the first time indicate that imbalance in maternal micronutrients (excess maternal folic acid supplementation on a B₁₂ deficient diet) reduces ($p < 0.05$) GpX levels in dams. Omega 3 fatty acid supplementation was able to restore ($p < 0.05$) the levels of GpX in both the vitamin B₁₂ deficient groups. Our data has implications for better pregnancy outcome since micronutrients and DHA are important role in combating oxidative stress by improving antioxidant status.

PSEN-27 EFFECTS OF ALTERED MATERNAL MICRONUTRIENTS (FOLIC ACID AND VITAMIN B₁₂) AND OMEGA 3 FATTY ACIDS ON S-ADENOSYL METHIONINE (SAM) AND S-ADENOSYL HOMOCYSTEINE (SAH) LEVELS IN RATS. *Vinita Khot*¹, *Aparna Rakhe*², *Pankaj Pawar*³, *Sadhana Joshi*¹, ¹Interactive Research School for Health Affairs, Bharati Vidyapeeth University, Pune , ²Rajiv Gandhi Institute of IT and BT, Pune, ³North Maharashtra University, Jalgaon. *Email: sadhana.joshi@bharatividyaapeeth.edu, srjoshi62@gmail.com*

Maternal micronutrients (Folic acid, Vitamin B₁₂) and Omega-3 fatty acids are important determinants of fetal growth and essential for cellular methylation reactions. SAM and SAH are components of the one carbon metabolism and biomarkers for methylation reactions. Altered micronutrients during fetal development influence methylation patterns and result in epigenetic programming via mechanisms like DNA methylation and histone modification, increasing susceptibility to diseases. Our earlier studies have shown, altered maternal micronutrients leads to altered global methylation patterns in the placenta. The present study for the first time examines the effects of maternal folic acid supplementation at normal and excess levels both in the presence and absence of vitamin B₁₂ on SAM and SAH levels in Wistar rats. Our results show decreased SAM levels due to alterations in the levels of maternal micronutrients at end of pregnancy. Supplementation of omega 3 fatty acids to vitamin B₁₂ deficient diets increased the levels of SAM to control levels. Omega 3 fatty acid supplementation may have increased demand for methyl groups leading to increased production of SAM. Our findings for the first time suggest that the alteration in micronutrients during pregnancy alters levels of dam liver SAM and SAH and beneficial effects of omega 3 fatty acids on a vitamin B₁₂ deficient diet. Further studies need to measure more components of the methylation cycle to validate our conclusions.

PSEN-28 MURRAYA *Koenigii* LEAF EXTRACT INHIBITS PROTEASOMAL ACTIVITY AND RETARDS CANCER CELL GROWTH. *N Bindu*, *Raghunath M* and *Ayesha Ismail*, Division of Endocrinology and Metabolism, National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, India. Email: bindu.37@rediffmail.com

Cancer is the third leading cause of death in developing countries like India. The incidence of breast, prostate and colon cancer are on the rise in urban India due to the adaptation of western life style and changing food habits. Cancer cells have high proteasome activity needed for their survival. Inhibition of proteasome activity leads to cancer cell death. Therefore, proteasome inhibition has emerged as an attractive approach to anticancer therapy in recent years. The objective of the study was to assess the growth and proteasome inhibitory [Pr-Inb] potential of the curry leaf [*Murraya koenigii*] extract in two breast cancer cell lines – MCF-7 and MDA-MB-231. The total phenolic content of the methanolic extract was estimated by Folin-Ciocalteu method and expressed as Gallic Acid Equivalents (GAE). The methanolic extract from *Murraya koenigii* potently inhibited the growth (as assessed by the MTT assay) of MCF-7 and MDA-MB-231 cells in a concentration dependent manner with an IC₅₀ of 37.5 µg GAE in MCF-7 and 15 µg GAE in MDA-MB-231 cells respectively. The proteasomal inhibitory activity was done by measuring the Chymotrypsin-like (Ch-L) and Trypsin-like (T-L) enzyme activities specific to the 26S proteasome in both intact cells and proteasome-enriched cell extract. In MCF-7 and MDA-MB-231 intact cells, 50% proteasomal inhibition (Ch-L) was observed at 45 µg GAE and 37.5 µg GAE respectively. On the other hand, the proteasome-enriched extract showed a 50% inhibition at 30 µg GAE (MCF-7) and 22.5 µg GAE (MDA-MB-231) respectively. There was a positive correlation between the cell death and Pr-Inb activities in both cell lines ($p < 0.01$). Studies are currently in progress to decipher the probable mechanism(s) of cell death.

PSEN-29 ANTIOXIDANT PROPERTIES OF *PIPER betle* Linn. landraces. *Shweta Trpathi* and *Nikhil Kumar**. Betel Vine Biotechnology Lab. National Botanical Research Institute, Lucknow, Uttar Pradesh, India. *Email: nkumar1650@gmail.com

Piper betle Linn. is one of the important Pan-Asiatic plant with several known medicinal properties. Globally its consumption is second to coffee and tea. In India more than hundred landraces are known to be under

cultivation. Phenolics are the most important antioxidants in plants. The antioxidant activity of phenolics is mainly due to their redox properties, which make them, act as reducing agents, hydrogen donors and singlet oxygen quenchers. Though antioxidant properties have been shown in *P. betle* there is lack of information in different landraces. Here we present our findings on the antioxidant properties of five important landraces representing different locations in India. The landraces used in this study were Bangla Mahoba (BM), Deshi Bangla (DB) and Khasi Shillong (KS), Kapoori Vellaikodi (KV) and Madras Pan Kapoori (MPK). The analysis of these landraces revealed that the total phenol content ranged from 475 to 236mg/gm extract. The phenol content was present in the ascending order in DB>BM>KS>KV>MPK landraces. Antioxidant activity of *P. betle* landraces assayed as inhibition of superoxide radicals, hydroxyl ion and DPPH radical activity and the trend was similar to total phenol content DB>BM>KS>KV>MPK. Thus, it is important to explore the antioxidant activity of *P. betle* landraces so that its antioxidant potential may be utilized in formulations preparation for human use.

PSEN- 30 A MATHEMATICAL MODEL FOR THE HEMOGLOBIN RESPONSE TO IRON INTAKE, BASED ON IRON ABSORPTION MEASUREMENTS FROM RICE BASED INDIAN MEALS. Prashanth Thankachan¹, Suneeta Kalasuramath¹, Alison L Hill B², Tinku Thomas¹, Kishor Bhat¹, Anura V Kurpad¹. ¹Division of Nutrition, St John's Research Institute, St John's National Academy of Health Sciences, Bangalore, India, ²Program in Biophysics and Harvard-MIT Division of Health Sciences and Technology, Harvard University, Cambridge, MA, USA. Email: prashanth@sjri.res.in

Iron deficiency (ID) and iron deficiency anemia (IDA) modulate iron (Fe) absorption dynamically. The amount of Fe absorption from rice based Indian meals, its modulation by ID and the time course of the response of hemoglobin (Hb) to Fe intake in ID is not known. Stable isotope Fe absorption studies were performed in IDA(n=15) and iron replete (IR) women(n=15). Fe absorption was measured by the erythrocyte incorporation of the isotope label at 14 days. A dose-response curve for Fe absorption versus the Hb level for rice based meals was constructed from measured Fe absorption at different Hb levels as an input for a mathematical model that examined the Hb response to different Fe intakes in normal or anemic women. Mean fractional iron absorption from the standard rice meal in IR and IDA women was 2.7 and 8.3% respectively. From the mathematical model, it would appear that a range of Fe intakes, between 20 - 55 mg.d⁻¹ would result in stable and optimal levels of Hb in women eating these low bioavailability Indian diets.

PSEN- 31 EFFECT OF IRON STATUS ON IRON ABSORPTION IN DIFFERENT HABITUAL MEALS IN YOUNG SOUTH INDIAN WOMEN. Suneeta Kalasuramath, Prashanth Thankachan, Anura V Kurpad. Division of Nutrition, St John's Research Institute, St John's National Academy of Health Sciences, Bangalore, India .Email : sunivinu50@gmail.com

Iron deficiency (ID) affects a large number of women in India. An inverse relationship exists between Iron (Fe) status and Fe absorption. Individual dietary inhibitory and enhancing factors exert a profound influence on bioavailability of Fe. This study aimed to determine Fe absorption from a range of habitually consumed South Indian diets and to evaluate the interaction of Fe status with absorption. Four Fe absorption studies were performed on 60 apparently healthy young women, aged 18-35 years. Based on blood biochemistry 45 of them were ID and 15 were iron replete (IR). The habitual meals assessed were rice, millet & wheat based meals in the ID subjects and rice based meal alone in the IR subjects. Each subject received the test meal labeled with 3 mg of ⁵⁷Fe and Fe absorption was measured based on erythrocyte incorporation of isotope label 14 days following administration. Mean fractional Fe absorption from the wheat and millet based meals in the ID subjects were 11.2% and 4.6% respectively. In rice-based meals it was 2.5% in IR and 8.3% in ID subjects. Fe absorption was significantly up regulated and higher by on average 3 times in the ID group when compared to the normal Fe status subjects (P<0.05). Fe absorption is dictated by Fe status from low bioavailability diets. Millet based diets have the lowest bioavailability, while the rice and wheat based meals had moderate to good bioavailability.

PSEN-32 MICROBIAL QUALITY ASSESSMENT OF STREET FOODS SOLD IN JAIPUR CITY. Mukta Agarwal¹ and Gargi Saxena². P.G. Department of Home Science, University of Rajasthan, Jaipur, India. Email: muktadr@hotmailcom, saxena_agam@rediffmail.com

Street foods are sold mainly on the streets in crowded public places. The street food vendors generally stand in cluster at unhygienic place and crowded areas where facilities of water and waste disposal are not proper. Among various street foods sold in Jaipur city, *Gol gappa* and *Bhelpuri* are very commonly sold. *Gol gappa* is a traditional *chat* product and is preferred widely. It comprises of 3 different articles, i) *gol gappa* /*patasha* /*puri*/*papri* ii) filling/*masala* iii) spicy water. '*Bhelpuri*' consists of a mixture of various ingredients viz '*bhel*' or puffed rice, boiled and chopped potatoes, chopped tomatoes, onions, green coriander, green chillies, '*papri*' or '*puri*' made from refined wheat flour or semolina, two different types of *chutneys* (coriander and sweet and sour *chutney*), spices, roasted peanuts, *sev*, etc. The *gol gappa* and *bhelpuri* samples were procured from street food vendors located at six different areas of Jaipur city. Twelve samples of each were collected aseptically and microbial quality was assessed by SPC, total Coliform count, total staphylococcal count and hazard analysis. Five pathogenic bacterias' were also isolated. All the samples analysed were heavily contaminated by bacteria's. *E.coli* was isolated from all the samples. *Staphylococcus aureus*, *Bacillus cereus* and *Shigella* were reported in majority of samples. *Salmonella* was not present in *gol gappas* but was reported in 8.33% of *bhelpuri* samples. The hazard analysis of *gol gappa* samples reported that potato filling or *masala* was the hazardous stage. In the case of *bhelpuri*, the chopped raw vegetables were found to be the culprit of causing food poisoning. Thus, the result revealed that *gol gappa* and *bhelpuri* sold by street food vendors of Jaipur city was highly contaminated by pathogenic bacterias' because of unsafe handling of food right from gathering raw materials to serving to the consumers.

PSEN-33 ROLE OF NUTRITION IN THE PREVENTION AND TREATMENT OF STROKE- A CASE STUDY. Ankita Yadav and Archana Kushwaha. Department of Foods and Nutrition, College of Home Science, G.B.P.U.A. & T, Pantnagar, U.S. Nagar, Uttarakhand, India. Email:ankitayadav17@gmail.com

A case study was conducted for a period of five days in Christian Medical College (CMC), Ludhiana, Punjab, to determine the effect of nutrition and lifestyle on the general condition, serum cholesterol, obesity, hypertension, diabetes and stroke. The patient was a female, aged 56 years with BMI-27.3kg/m². The patient was diagnosed with stroke which was non-hemorrhagic infarct and had a past history of diabetes and hypertension for past 5 years. The symptoms reported were left sided hemi-paresis, inability to walk, assist movement along with slurring of speech. The objective of study was to provide adequate nutrition, to prevent further complications and raised cholesterol levels, low sugar and low salt diet of because of diabetes and hypertension. Diet history revealed high intake of fatty foods and junk items on regular basis. In the present investigation, the patient was given diet, and also physiotherapy (active assisted exercise and strengthening exercise) for 5 days. The physical examination, renal, liver function test, lipid profile and blood sugars were checked from time to time. The patient was given 60g protein, 35g (visible+invisible) fat, 1.5g salt, 200g complex carbohydrate diabetic diet and daily record (i.e. from morning to dinner) of her diet was maintained. The average nutrient intake of five days was calculated and compared with the hospital diet. Implementation of proper diet resulted in changes in lipid profile(TG levels changed from 641 to 172, cholesterol levels improved from 373 to143) blood (269mg/dl FBS initial to 105mg/dl final) and physical parameters (changed from 160/90mmHg to 140/80) came to normal range. Diet resulted in improved condition of the patient.

PSEN-34 DEVELOPMENT OF HERBAL COMPOSITE AND ITS CONSEQUENCES ON BLOOD PRESSURE OF HYPERTENSIVE SUBJECTS. Vinitha Mamilla, Tasneem Naheed Khan and Vijaya Nalwade, Department of Foods and Nutrition, College of Home Science, Marathwada Agricultural University, Parbhani, Maharashtra, India. E mail: vinithamamilla@gmail.com

Herbs are the source of great economic value all over the world and also a source of phytochemicals that may have a useful role in the prevention of chronic diseases. These phytochemicals prevent disease through their functions as antioxidants, anticarcinogenic, hypoglycaemic, hypolipidemic properties and as a source of dietary fibre. Herbal composite was developed by utilizing Safflower petals (*Carthamus tinctorius* L.), Curry leaves (*Murraya koenigii*), Tulsi leaves (*Ocimum sanctum*) and Amla (*Emblica officinalis*) and studied its impact on blood pressure of hypertensive subjects. The herbal composite was prepared by taking an amount of 10%, 2.5%, 5%, 50%, 12.5% and 20% of Safflower petals powder, Curry leaves powder, Tulsi leaves powder, Amla juice, Honey

and jaggery respectively. Twelve hypertensive subjects were selected and divided into two groups i.e. experimental group (06) and control group (06). The developed herbal composite was supplemented to the experimental group for a period of 60 days and control group did not receive any supplement. The observations of anthropometric parameters and blood pressure of both experimental and control group were recorded at 0, 30 and 60 days of experimental period. The results of the supplementation of herbal composite to experimental group showed non significant impact on body weight and body mass index. On the contrary the supplementation exerted a significant decrease in mid arm circumference, tricep skin fold, systolic and diastolic blood pressure at 60 days of supplementation. Hence it is concluded that with the increase in the period of study the systolic as well as diastolic blood pressure decreased progressively. Thus the use of herbal composite can occupy a firm and definite role in therapeutic aspects of hypertensive subjects in reduction of blood pressure.

PSEN-35 EVALUATION OF THE ANTHELMINTIC ACTIVITY OF EMBELIA TSJERIAM-COTTAM, AN AYURVEDIC RASAYANA HERB, USED IN THE TREATMENT OF ANEMIA (PANDU). Padma Venkatasubramanian, Ashwini Godbole and *Vidyashankar R*, Centre for Pharmacognosy, Pharmaceutics and Pharmacology, Institute of Ayurveda and Integrative Medicine, Bangalore-560106. Email: vidyashankar.rvs@gmail.com

Iron deficiency anemia is the most common and widespread nutritional disorder in the world affecting 2 billion people – over 30% of the world's population. The main cause of iron deficiency is poor iron content in the diet and additionally poor iron absorption because of frequent exacerbation of various infections. Intestinal worm infestation is one of the major causes of poor iron absorption which can lead to anemia. World health Organisation (WHO) has recommended various drugs to tackle worm infestation, Helminthiasis. One of the major setbacks-in the use of such drugs is genetic resistance development in the parasites. This highlights a need for developing alternative drugs for worm infestations. The use of natural herbs in treatment of disease has been a part of human civilization for centuries. Rasayana, a separate specialty in Ayurveda, speaks about the importance of 'opening up the body channels' to facilitate nutritional absorption. In Ayurveda, worm infestation is considered as an impediment in bio-absorption that can lead to diseases, including anemia (Pandu). Vidanga is an herb that is described in Ayurveda that possess Krimighna (anthelmintic) property. Four different plant species namely, *Embelia ribes* Burm.f., *Embelia tsjeriam-cottam* (Roem. & Schult.) A. DC., *Myrsine Africana* L. and *Maesa indica* (Roxb.) DC. are used as Vidanga. *E. tsjeriam-cottam*, the most commonly traded Vidanga species, was evaluated in the current study using *Caenorhabditis elegans*. *C. elegans* is a non-parasitic nematode, which is a well-known model organism used in the screening of anthelmintic drugs. Ethyl acetate extract of *E. tsjeriam-cottam* (500µg/ml) fruits demonstrated a significant anthelmintic activity on L1 larvae of *C. elegans*, by causing 90% lethality in 3 hrs. This was 30 times better than conventional anthelmintic drug, Levamisole at 15mg/ml treated for 3 hrs.

Key words: Ayurveda, Rasayana, Anemia, anthelmintic, *Embelia tsjeriam-cottam*

FOOD SCIENCE

PSFS-01 STANDARDISATION OF BAKERY PRODUCT (BISCUITS) WITH RAW, ROASTED, GERMINATED AND DEFATTED FENUGREEK POWDERS. Santhi Sri KV, *Ravi Teja Mandapaka*, Prasanna Kumar K. Department of Foods and Nutritional Sciences, Acharya Nagarjuna University, Nagarjuna Nagar, Guntur, Andhra Pradesh, India. Email: ravitejamandapaka@hotmail.com

Objectives: Development of biscuits by using debitterized and germinated fenugreek powders. *Methodology:* Fenugreek seeds were collected from local market and cleaned for exchanges matter. Fenugreek seeds were debitterized by solvent extraction method with alcohol for 24 hours at 45-65°C. Powder was prepared by drying the seeds and stored in plastic tins for further analysis. Biscuits were prepared by using debitterized fenugreek seed powder. *Results and Conclusion:* Defatted fenugreek powder was incorporated into biscuit composition at 5%,10%,15%, 20% and 25% respectively. The highest was 2.72 obtained at 5% level of incorporation, at 10%,2.52, at 15%, 2.54, at 20%, 2.48 and 25%, 2.48 respectively. There was no significant difference between control and defatted at 5%, p-value. So, it can be concluded that, defatted fenugreek powder incorporated into biscuits at 12.5% level was well accepted by panel members.

PSFS-02 **VIABILITY OF PROBIOTICS IN FLAVOURED YOGHURTS MADE WITH DIFFERENT STARTER CULTURE DURING STORAGE.** Madhu¹, P Yasoda Devi¹, N Krishnaiah² and M Shiva Prakash³.
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The introduction of yoghurt with added probiotics could play a significant role in national health care programs especially in developing countries, where diarrhoea and gastrointestinal problems are common. The aim of the study was to investigate the changes in microbiological properties in mango and pineapple yoghurts made with different probiotic cultures during storage. Six different yoghurts were prepared with mango pulp and pineapple essence and sugar combination with *Lactobacillus bulgaricus*, *Streptococcus thermophilus*, *Lactobacillus acidophilus*, *Lactobacillus sporogens*, *Bifido bifidum*, *Bifido longum*, and *Bifido infantis* as starter culture. Three types of yoghurts were developed under each flavours, with different combination of probiotics and termed as A₁, B₁, C₁, A₂, B₂ and C₂. A₁, B₁, C₁ were mango yoghurts and A₂, B₂ and C₂ were pineapple yoghurts. Statistically significant difference was found in viable counts from 7th day to 14th day (P<0.05) in all yoghurts except in A₂ and C₂. The difference of viable counts from 0 day to 7th day was also found to be significant (P<0.05) in A₂ and C₂. No significant difference was found from 14th day to 30th day in all yoghurts as 90- 96 % viability loss of probiotics was observed by 14th day in all yoghurts. Pineapple yoghurt with probiotic blends of *Lactobacillus bulgaricus*, *Streptococcus thermophilus*, and *Lactobacillus sporogens* i.e., B₂ had higher viability, among the different types of yoghurts developed.

PSFS-03 **APPLICATION OF ANNATTO, A NATURAL PIGMENT IN GOLD FINGERS AS A REPLACEMENT FOR SYNTHETIC AZO DYES.** PG Prabhakara Rao, MB Prabhavathy, A Nagender, K Balaswamy and A Satyanarayana. Central Food Technological Research Institute, Resource Centre, Hyderabad, India. Email: rao.pamidighantam@gmail.com

Gold fingers are the extruded products from bakery flour in the form of small tubes which on frying are relished by people of all ages. Synthetic azo dyes namely tartrazine yellow and sunset yellow dyes are applied indiscriminately in gold fingers to yield products of bright yellow and orange- red shades respectively. An attempt is made to evaluate the application of annatto dye formulations in gold fingers. Annatto dye formulations, namely water soluble carbonate and water/oil soluble propylene glycol (PG) formulations were blended in to the dough and extruded in a single screw extruder to obtain tubes of 1 cm diameter which are cut into 2 cm length pieces and sun dried. The dried tubes were analysed for recovery of norbixin, colour units of yellow, red in a Lovibond tintometer and were also assessed for storage stability for a period of 3 months. The extractability of dye into solvents was only 20% of the applied levels as the dye was having tendency to bind with starch molecules. Norbixin from gold fingers prepared using carbonate formulations could be extracted in higher proportions than PG formulations. It was observed that between the two formulations tried, 40 mg/kg propylene glycol formulation yielded product with identical colour units (R- 9.8; Y-11.0) of the product made using synthetic sunset yellow (R- 9.9; Y-10.0) with good eye appeal. Application of lower concentrations (10 mg/kg) of both formulations yielded products with light orange shade and were significantly different from the product made with tartrazine yellow.

PSFS-04 **DEVELOPMENT AND QUALITY EVALUATION OF PUMPKIN 'TUTTY FRUITY'.** K Sathiya Mala, G Narsing Rao, PG Prabhakara Rao, A Satyanarayana. Central Food Technological Research Institute, Resource Centre (Council of Scientific and Industrial Research), Hyderabad, India. Email: sathiyamala@yahoo.com

Tutty-fruity is a preserve/candy product made from fruits or vegetables and artificial colours are generally applied to improve their eye appeal. In the present study, Tutty fruity was prepared by using fresh pumpkin (*Cucurbita maxima*) with an objective to utilize it as a source of carotenoids by eliminating the use of synthetic colourants and to study the effect of storage on the quality. Fresh unripe pumpkins were cut into cubes of 1.0 cm thickness and treated with 0.5% calcium chloride and blanched. The treated cubes were subjected to osmotic dehydration using successively 40, 50, 60 and 70° brix sugar syrups added with 0.1% citric acid and 400 ppm potassium metabisulphite (KMS) at room temperature (28 ± 2°C). The prepared tutty fruity was packed in

polyethylene (PE) pouches and assessed at regular intervals for overall sensory and physico-chemical quality during storage for six months at room temperature. The fresh tatty fruity had 19.3 % moisture content which decreased to 18.1% after 6 months storage. The non-enzymatic browning index (NEB) decreased from an initial value of 0.199 to 0.126 and the total carotene content decreased from 633 to 326 µg/100 g, which may be attributed to its sensitivity to light and oxygen. A gradual decrease in acidity and SO₂ was also observed during storage. The reducing sugars increased from negligible quantities to 8% and total sugars decreased slightly from 78% to 76.8%. However, the product could be safely preserved for 6 months.

PSFS-05 **CHEMICAL COMPOSITION, MINERAL CONTENT, SORPTION STUDIES OF STEVIA LEAF POWDER AND APPLICATION OF ITS AQUEOUS EXTRACT IN POMEGRANATE AND JAMUN RTS BEVERAGES.** K Balaswamy, G Narsing Rao, PG Prabhakara Rao, A Satyanarayana. Central Food Technological Research Institute, Resource Centre (Council of Scientific and Industrial Research), Hyderabad, India. Email: narsing72@sify.com

Stevia (*Stevia rebaudiana*) leaf powder was analysed for chemical composition, mineral content, sorption behavior and compatibility of its aqueous extract in the preparation of pomegranate (*Punica granatum*) and jamun (*Syzygium cumini*) ready to serve (RTS) beverages as a low calorie sweetener were investigated. The leaf powder was rich in mineral matter (8.68%), fibre (9.84%), protein (9.8%) and polyphenols (5.6%). Minerals viz., iron, calcium and phosphorous were present to an extent of 127, 60 and 527 mg/100g respectively. Sorption studies revealed that the powder had an initial moisture content of 5.8%, which equilibrated at 50% relative humidity (RH). Hence, the powder is non-hygroscopic in nature, which infers that simple polyethylene packaging is suitable for storage. The critical moisture content was observed to be 9.0%, which equilibrated at 69% RH. Stevia leaf aqueous extract was prepared by boiling in water maintaining a leaf powder to water ratio of 1:10 (w/v). The aqueous stevia extract was applied in pomegranate and jamun RTS beverages at 1-3% v/v and its suitability were compared with control beverages prepared with sugar (10%). Optimal levels of stevia leaf aqueous extract in pomegranate and jamun RTS beverages were 2.5 and 1.5% respectively. Overall organoleptic quality scores for RTS beverages were 7.5 for pomegranate and 8.0 for jamun, when compared with controls (8.5 and 8.2). The study indicated the suitability of aqueous stevia leaf extract in the preparation of low calorie beverages.

PSFS-06 **DEVELOPMENT AND EVALUATION OF GARLIC INCORPORATED READY-TO-EAT EXTRUDED SNACKS.** Haritha Devanand¹, V Vijaya Lakshmi¹, K Aparna², K Dhana Lakshmi³. ¹Department of Foods and Nutrition, ²Post-Graduate & Research Centre, ³Department of Veterinary Microbiology, College of Home Science, ANGRAU Hyderabad, India. Email: haritha.devanand@yahoo.com

Garlic has been used as a medicinal ingredient for thousands of years. Garlic has the potential to be used in ready-to-eat extruded snacks as a natural preservative, flavouring agent with medicinal and functional components. The objective of the present study were therefore to develop and evaluate ready-to-eat extruded snacks which were incorporated with garlic powder at various levels of 5%, 10%, 15% and 20% with a co-rotating twin screw extruder by HTST method. The sensory attributes like flavor, texture, colour, odour, expansion and overall acceptability for the developed garlic incorporated ready-to-eat extruded products were evaluated by a panel of 15 judges using 100 point composite scoring method and the well acceptable products were selected. The physical properties and the shelf life studies were conducted for the well acceptable products by using various methods. Garlic incorporated products at 0%, 5% and 10% levels were selected by the organoleptic evaluation of the developed snacks for the further studies. The physical properties showed significant changes with incorporation of garlic powder at 0%-10% level. The products were packed by ordinary, nitrogen and vacuum packing and stored for 2 months. The increase in the moisture content was low in nitrogen packed products where as the microbial load decreased with increase in the percentage of garlic incorporation. Garlic powder can be incorporated at 5% and 10% levels in ready-to-eat extruded snacks with well acceptability and can be stored for a period of 2 months with nitrogen packing as an effective packaging.

PSFS- **SWEET MEAT OF INDIA – A NUTRITIVE FRUIT BASED PUFA ENRICHED SHRIKHAND.**
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This study was conducted for development of fruit based PUFA enriched shrikhand (FBPES). Standard Shrikhand (SS) and Fruit based Shrikhand (FBS) was developed before development of FBPES. For development of SS, 3 different starter-culture concentrations i.e. 1%, 1.5%, 2% were standardized by sensory evaluation using 9-point hedonic scale. 1% starter culture was best acceptable in which milk, sugar and cardamom was added for development of SS. Mean sensory scores were ranged between 7.8 to 8.1 revealed that SS liked very much. For development of FBS fruit pulp (apple, banana, pomegranate) was added in 3 different concentration i.e. 10%, 15%, 20% and mean overall values for sensory attributes were 7.4, 7.2, 6.3 respectively have Statistically significant. FBPES was prepared by addition of PUFA (Saffola-oil) in selected FBS (10% fruit pulp). Different concentration of PUFA i.e. 6%, 7%, 8%, 9%, 10%, 11% was added and mean overall values for sensory attributes were 7.4, 7.4, 7.4, 7.4, 7.8, 7.4 respectively, have Significant difference was and 10% was selected as FBPES. Keeping quality of SS and FBPES was also assessed at 0th, 2nd, 4th, 6th, 8th day by sensory evaluation for all attributes. Sample was stored in refrigerator. Mean value of overall acceptability for both Shrikhand were 8.1 indicated liked very much on 0th day. On 8th day mean score of S.S and FBPES was 5.8 and 5.6 respectively shows liking slightly. Nutrition content of SS was, moisture (28.8%), ash (0.2%), total solid (71.8%), protein (1.2%), fat (1.45%), pH (4.88%), and PUFA (0.43%). However FBPES contain 43.3% moisture, 0.7% ash, 56% total solid, 1.78% protein, 13.1% fat, 43.3% pH and PUFA 5.38% have significant difference. PUFA content of SS was 0.43% while FBPES content 5.38%, which make it moderate source of PUFA. Hence the developed FBPES was rich, thick and creamy in texture and can be consumed by all age groups.

PSFS-08 **EFFECT OF FRYING TELEBHajas ON THE QUALITY CHARACTERISTICS OF LOCALLY PROCESSED UNBRANDED MUSTARD OIL.** *Banani De* and Atashi Sarkar. Food and Microbiology Laboratory, J. D. Birla Institute, Kolkata, India. Email: bosebanani@gmail.com, mailmeatashi@rediffmail.com

Telebhaja, a popular Bengali street-vended snack item is oil-fried batter coated vegetable. Deep frying of these items in an open air fryer lead to accumulation of a substantial amount of residual oil, subjected to high temperature. This surplus oil is reused for next day's frying with fresh oil top-ups whenever required. Thus though served hot and just-fried telebhajas still have a potential threat to the consumer public health owing to the abuse of the frying medium. In Bengal the popular frying medium for these items is mustard oil. In this study quality characteristics of an unbranded mustard oil were evaluated after deep-frying of *piyajji* and *dal vada* separately without replenishment of oil for seven successive times, at an interception of two days. The thermal stability indices of mustard oil determined by drawing out aliquot from the fryer after each frying operation were colour, refractive index, viscosity, saponification, iodine, acid, peroxide, *p*-anisidine, thiobarbituric acid, hehner, conjugated diene-triene, organoleptic value and total polar material. On subsequent frying these values increased in both items recording maximum deterioration in *piyajji*-oil with an accumulation of sulphur from onion. Reduction in hehner value signified degradation of long chain fatty acid to smaller homologues. Malonaldehyde, a non-volatile aldehyde product of oxidation was surprisingly decreasing in *piyajji*-oil with each frying though the others correlate positively with peroxide value. Constituent of food items along with moisture acted as a vector in frying instability of oil. Formation of smoky flavour and bitter taste was reported after 3rd and 7th frying.

PSFS- **EFFECTS OF PROCESSING ON PHENOLIC CONCENTRATION, ANTINUTRITIONAL AND NUTRITIONAL ACTIVITIES OF GUAVA AND PINEAPPLE JUICES.**
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Processing effects on polyphenol concentrations, antinutritional and nutritional activities in fruits like guava and pineapple and their commercial juice products were investigated. Experimental juice was extracted by hand press and mixer method. Processed juice was a single-strength commercial juice by different companies. The antinutritional activity was evaluated using protein precipitating assay with bovine serum albumin. Nutritional

activities were evaluated employing Ferric reducing ability and antibacterial effect by disc diffusion susceptibility and MIC/MBC [minimum inhibitory concentration/minimum bactericidal concentration] studies. Fresh guava (0.499%) showed highest percentage of tannin and packed pineapple PKD3 [packed 3] (0.231%) showed the lowest. Guava juice had the highest level of condensed and hydrolysable tannin, while pineapple had the lowest. The protein precipitation was effective with processed guava juice than fresh guava and all pineapple varieties. PKD2 [packed 2] and PKD3 of guava showed maximum protein binding affinity (> 50%). Fresh and packed guava juice (75%) showed potential reducing activity than pineapple varieties (25%). Based on the experimental outcome of the antibacterial effect, fresh guava and pineapple were the most potent (IZD [Inhibition Zone Diameter] 1.2-1.9 cm; MIC 20 µl/ml; MBC 40 µl/ml), followed by packed pineapple (IZD 1.0-1.7 cm; MIC 40 µl/ml, MBC 160 µl/ml) and least were packed guava juice (IZD 0.7-1.5 cm; MIC 80 µl/ml, MBC >160 µl/ml).

PSFS- 10 DEVELOPMENT OF VITAMIN C ENRICHED FRUIT DRINK. G Simritha, Zubaida Azeem, P Ashlesha and *Shruti*. Department of Food and Nutrition, Osmania University College for Women, Hyderabad, India. Email: shruti_837@yahoo.com

Amla is highly nutritious and is an important dietary source of vitamin C, minerals and amino acids. The present study was conducted to develop vitamin C enriched fruit drink from amla that contribute significant amount of vitamin C. The juice was prepared using amla and two variations were prepared using different concentrations of amla, apple concentrates, water melon juice, ginger extract and sugar in the ratio of (v1 45:25:15:1:15) (v2 35:30:20:1:15). The juices were standardized and then subjected to sensory evaluation. The results were statistically analysed to be insignificant in comparison to basic except for variation 2 of vitamin C enriched fruit drink, which was more acceptable. Vitamin C was estimated from the sample. In vitamin C enriched fruit drink the vitamin C content was significantly high (87.9 – 147.2mg in basic and variations). The study provided a scope to conduct supplementation trials for vitamin C using amla.

PSFS- 11 DEVELOPMENT AND EVALUATION OF READY-TO-EAT EXTRUDED SNACKS BY INCORPORATING ROOTS AND TUBERS. *M Kavya Reddy*, Faculty of Home Science, Department of Food Science and Technology, Acharya NG Ranga Agricultural University, Rajendranagar, Hyderabad, India.

The subject of extrusion cooking is a major importance in food and feed processing. Currently limited extruded snacks with added roots and tubers are available. Hence an attempt was made to formulate extruded snacks in combination with corn grits, black gram dhal, roots and tubers like potato (*Solanumtuberosum*), yam (*Dioscoreaspp.*), sweet potato (*Ipomoea batatas* L.), Colocasia (*Esculenta*) and beet root (*Beta vulgaris*) to increase their utility. Corn, black gram dhal and roots and tubers were added in the 60:20:20 ratios respectively and subjected to extrusion cooking to produce puffed snacks. Process variables (barrel temperature, screw speed, feed rate) of a single screw extruder were kept constant ($120 \pm 5^\circ\text{C}$, 200 ± 10 and 25 ± 5 kg/hr). The physico-chemical characteristics of the extrudates were studied and compared. Extrudates with beet root incorporation had the least expansion ratio of 3.4 and highest bulk density of 0.15 g/cm^3 . The internal structure of the control sample is more porous, but the size of the pores is small, while in potato the pores are big in size and less in number when observed under Scanning Electron Microscope (SEM). The initial moisture content of the extrudates ranged from 2.1 to 3.3 % g. Protein content was maximum (11.9) in product made from corn, black gram dhal and beetroot and minimum (10.4) in sweet potato incorporated extruded snacks. The ash content ranged from 0.5 to 3.3 g. Fat content of the developed extrudates ranged from 5.09 to 12.8 g. Among different formulations the most accepted products were extrudates made by incorporating corn and black gram dhal alone and corn, black gram dhal and potato. During storage period of 2 months deterioration in texture and mouth feel were observed in extrudates made with beet root and sweet potato. The extruded snacks were stored in Metalized Polyethylene Terephthalate (MPET) for a period of 2 months and the moisture content after storage period was observed to be increased in control and potato snacks. Hence the result of study revealed that most acceptable root and tuber based extruded snacks can be prepared. The product can be explored for commercialisation as an innovative snack food using roots and tubers thus increasing its utility.

PSFS-12 **OPTIMIZATION OF PHYSICO-CHEMICAL CONDITIONS FOR LUTEIN STABILITY BY RESPONSE SURFACE METHODOLOGY.** *Bhatiwada Nidhi*¹, Ramasamy Ravi² and V Baskaran¹.
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Ingestion of lutein is associated with a reduced incidence of age-related macular degeneration (AMD) and cataracts. However, its bioavailability is limited due to various physiological factors. Previously, we have shown influence of various dietary factors on bioavailability and degradation of lutein *in vitro* and *in vivo*. This raises concern about the factors affecting the stability of lutein in upper GI tract. Hence, this study determine the influence of independent physiological variables - pH (2 -10), incubation temperature (25 - 85 °C) and incubation time (0 - 5 h) on lutein stability under simulated gastric digestion employing central composite rotatable design (CCRD), along with response surface methodology (RSM). Each independent variable was studied at five coded levels (-1.682, -1, 0, +1, +1.682). Results demonstrated that the incubation temperature and pH significantly play a role in lutein stability during gastric digestion. Applying the optimization analysis, the optimal conditions for maximizing lutein stability by minimizing the percentage lutein loss (9.8 %) were at pH 2.0, incubation temperature 43.3 °C and incubation time 0.25 h. Thus, RSM data revealed the critical parameters at which lutein is more stable during simulated gastric digestion. Hence, these parameters can be considered vital for food formulations with lutein, which in turn, may help in modulating AMD.

PSFS-13 **EFFECT OF SPICES AND HERBS ON THE SENSORY ATTRIBUTES OF APPLE – DATE JAM.**
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The present study was undertaken with the objectives to find out the feasibility of preparing apple date jam, to evaluate the effects of spices and herbs on sensory attributes of the apple date jam, to determine the physico-chemical properties of the prepared products. The apple date jam was prepared incorporating herbs and spices namely ginger, cardamom and *tulsi* at 3, 4 and 5 percent respectively. The sensory attributes were evaluated using the nine point hedonic scales, Chemical analysis (TSS, pH, acidity, Vitamin C and moisture) was done using standard AOAC procedures and the data were analysed statistically using analysis of variance technique and critical difference techniques. Organoleptically apple date jam with 4 percent cardamom powder (TC₂) scored highest regarding colour and appearance, consistency, taste and flavour and overall acceptability. Apple date with 3 percent ginger extracts (TG₁) scored highest regarding colour and appearance, consistency, taste and flavour and overall acceptability. Apple date jam with 3 percent tulsi extract (TT₁) scored highest regarding taste and flavour and overall acceptability whereas control (T₀) scored highest regarding colour and appearance and consistency. With regard to chemical analysis in case of apple date jam with 4 percent cardamom powder scored highest regarding TSS (71.5 %), acidity (0.68%), pH (3.8), Vitamin C (4.3mg/100g), and moisture (20.26%). TG₁ scored highest regarding TSS (70.1%), acidity 0.68%, pH(3.8), Vitamin C (4.3mg/100g) and moisture (20.26%). TT₁ scored highest regarding TSS(70.5%), acidity(0.64%), pH(4.2), vitamin c(4.8mg/100g) and moisture (21.26%). On comparing all three products that is apple date jam with ginger extract was found to have maximum benefit cost ratio (1.68:1) regarding all treatments.

PSFS-14 **ACCEPTABILITY TRIALS USING CAROTINO OIL.** *Ramya Siva Selvi M* and Kowsalya S. Department of Food Science and Nutrition, Avinashilingam Institute for Home Science and Higher Education for Women (University), Coimbatore, Tamil Nadu, India. Email ID: manorani87@gmail.com

Organoleptic qualities play an important role in evaluating the quality of food products. Since carotino oil is new to the Indian food market, it was thought of interest to study the acceptability of commonly consumed recipes using carotino oil. A total of 15 recipes namely lemon rice, sambar, rasam, potato masial, chutney (tomato and coconut), chappathi, omelette, poori, potato chips, dhal vadai, pappad, omapodi, pappad and vadagam were prepared (different cooking methods) using carotino oil. A numerical score card was used to measure the acceptability in terms of criteria appearance, colour, flavour, texture and taste with five scores for each criteria. A group of 20 trained panel members in the age group of 20 -30 years evaluating the recipes. The acceptability scores given were excellent (5), very good (4), good (3), fair (2) and poor (1) with a total score was 25. For comparison purposes standard recipes using refined groundnut oil were prepared. The results of acceptability

trials indicated that both the standard and carotino recipes obtained a mean score in the range of 21.5 - 24 out of 25. When compared to the standard, the carotino recipes were more acceptable in terms of criteria namely appearance, colour, flavour and texture. With regard to taste, the carotino recipes scored higher compared to the standard recipes. Therefore, carotino oil may be recommended for use in different method of preparation.

PSFS-15 FORMULATION AND STORAGE STABILITY OF ANTIOXIDANT RICH CHOCOLATE. *Vasanthi S* and *Vithya R.* PG Department of Human Nutrition and Nutraceuticals, Fatima College (Autonomous), Madurai, Kamaraj University, Madurai. Email: srivasanthi14@gmail.com

Antioxidants play an important role in inhibiting and scavenging free radicals, thus providing protection to humans against infections and degenerative diseases. Chocolate contains high levels of beneficial chemicals and antioxidants such as serotonin, phenyl ethylamine and flavonoids. Herbal powder incorporated chocolate was explored as an effort to increase the antioxidant content of chocolate. The objective of the exploration was to formulate antioxidant rich herbal chocolate and assess its sensory characteristics on cooking and storage stability. Antioxidant rich six herbs such as, *Terminalia catappa*, *Tinospora cordifolia*, *Tribulus terrestris*, *Achyranthes aspera*, *Trichosanthes cucumerina*, *Trichopus zeylanicus* and rice bran were selected and powdered. Chocolate bar was melted and the selected herb powder was mixed in the ratio of 5 per cent, 10 per cent and 15 per cent. The formulated chocolates such as ARHIC1 (5%), ARHIC2 (10%), ARHIC3 (15%) were organoleptically evaluated and ARHIC2 gained the highest score of acceptability (4.68/5) and it was selected for further storage study. The chocolate ARHIC2 were wrapped in aluminum foil and covered by high density polyethylene cover then stored in Refrigerator Temperature (RF) and Room Temperature (RT). Storage stability was assessed in terms of sensory evaluation, nutrient analysis and microbial analysis for every 15 days over a storage period of 0th day to 45th day. In the present study results shows that antioxidant rich herb powder incorporated chocolate stability was venerable both in room and refrigerator temperature. Yet refrigeration storage was commendable when compared to room temperature.

PSFS-16 FORMULATION, STANDARDIZATION, SENSORY EVALUATION AND NUTRITIONAL LABELLING OF HEALTH MIX USING GARDEN CRESS SEEDS. *S Ponmozhi* and *T Thangarathi.* Department of Foods and Nutrition, R.V.S College of Arts and Science, Sulur, Coimbatore, Tamilnadu. Email: Ponmozhi5@yahoo.in

Garden cress seeds (*Lepidium sativum*) are excellent source of iron, protein, and B-Vitamins. 100g of garden cress seeds provide 100 mg of iron. It is fast growing edible herb and it is from *brassicaceae* family. Consumption of garden cress seeds decreases the risk of anaemia, lowers the Glycemic response, Asthma, cancers, osteoporosis, and muscular pain in the body. Garden cress seed are used to make different products namely Carotene nutri drink mix, Beetroot slush beverage mix, Caffeine free coffee powder were formulated and subjected to sensory analysis, shelf life study and microbial analysis. Garden cress seed powder, milk powder, sugar powder, carrot powder, beetroot powder are used to prepare the products. The products are fortified with carrot and beetroot powder. The products are made different variation. According to the sensory evaluation the products are finalized. Estimation of nutrient composition of three best recipes selected confirmed its high nutrient composition. The Carotene nutri drink mix contains 32.67 mg of iron, 291.5mg of calcium. The Beetroot slush beverage mix contains 32.57mg of iron, 176.2mg of calcium. The Caffeine free coffee powder has 86.2 mg of iron, 300mg of calcium. The caffeine free coffee powder has high amount of nutrient compared to other products. The Microbial analysis was done for a 15th day. Cost estimation was also done. There was not much different in the cost between standard and selected product. Nutrition labels promote and protect public health by providing information so that consumer can make informed dietary choices. The nutritional label was formulated for selected three products.

PSFS-17 **DEVELOPMENT AND QUALITY ANALYSIS OF FUNCTIONAL FOODS INCORPORATED CHIKKIES.** *Angel Mary V* and *Gandhimathy R. P.G.* Department of Human Nutrition and Nutraceuticals, Fatima College (Autonomous), Madurai Kamaraj University, Madurai. Email: Jesus.angelmery@yahoo.co.in

Functional foods have been defined as foods with ingredients (either, naturally occurring or added), that provide a health benefits beyond the traditional nutritive value of food. The herbs are identified is largely useful for the treatment of immune disorders or compromised immune system. Some herbs like *Arabinoxylon*, *Tinospora Cordifolia*, *Trichopus Zeylanicus*, *Tribulus Terrestris*, *Terminalia Catappa*, *Acyranthes Aspera*, and *Trichosanthes Cucumerina* are proved to be improving the immune system, have antioxidant activity and improve the CD4 cells. The functional foods incorporated chikkies were prepared by three different proportions 10, 15 and 20% respectively. The developed products were evaluated by using the panel judges and 5point hedonic scale. Twenty per cent of the functional foods incorporated chikkies was highly acceptable when compared to other two concentrations and this 20% of the functional foods incorporated chikkies was selected for the study. The nutrient content was analyzed for 20% functional foods incorporated chikkies. The microbial load was noted to analyze the keeping quality of the functional foods incorporated chikkies for every fifteen days. The products were packed in three different packaging like 100 and 200 gauge polyethylene packaging and vacuum packaging. In three packaging, the microbes were found after 45th day. The findings from this study suggest that the functional foods incorporated chikkies was rich in nutrients that are helpful to improve the immune system.

PSFS-18 **EFFECT OF PROBIOTIC SUPPLEMENTATION ON LIPID PROFILE IN OBESE SUBJECTS.** *Anusha Mantha*¹, *M Shiva Prakash*², *R Hemalatha*². ¹II Year M.Sc. (Applied Nutrition), ²Division of Microbiology, National Institute of Nutrition, ICMR, Hyderabad.

Introduction: Obesity is a significant worldwide problem in developing and developed countries particularly in India and US etc. It is estimated that there are roughly 40 to 50 million overweight subjects in India. The morbid obesity has reached epidemic proportions in India affecting 5% of the country's population. The overweight individuals have increased risk of health problems such as cardiovascular disease, hypertension, diabetes and lipid profile abnormalities. Therefore, keeping the above information in view the present study was conducted to see the effect of supplementation of probiotic curds fermented with *Lactobacillus acidophilus* on lipid profile in obese subjects. *Methodology:* Obese subjects (30) were selected based on their BMI status. They were divided into 2 groups. The Group A(18) (supplemented group) individuals were supplemented with 200 gms of dahi cultured with *Lactobacillus acidophilus*(1×10^7 CFU/gm) along with the regular diet. Group B(12) (non – supplemented group) individuals were allowed to take regular diet. Blood samples were collected at 0, and 15 days respectively and investigated for parameters viz., Lipid profile (TC, TG, HDL), Calcium and Phosphorous. *Results:* There was a significant decrease from 144.98 ± 27.35 to 136.94 ± 29.95 in the cholesterol levels in obese subjects after supplementation with curds at 15 days when compared to control obese subjects (non-supplementary group) where there was significant increase from 152.0 ± 28.0 to 180 ± 18.0 which was statistically significant at $P < 0.05$. There was also significant decrease from 157.75 ± 82.7 to 120.24 ± 52.79 in the triglyceride levels in obese subjects after supplementation with curds at 15 days when compared to control obese subjects (non-supplementary group) where there was significant increase from 179.46 ± 88.89 to 190.16 ± 23.33 which was statistically significant at $P < 0.05$. The HDL cholesterol levels tremendously and significantly increased from 34.53 ± 7.43 to 38.16 ± 7.53 after 15 days supplementation in the obese subjects. *Conclusion:* There was a significant change in the lipid profile parameters in the obese subjects after supplementation with Probiotic Dahi. Therefore, it is concluded that regular intake of probiotics may contribute to maintenance of good health status of obese individuals.

PSFS-19 **PROCESS PARAMETERS FOR PREPARATION OF HIGH PROTEIN, CHOLESTEROL FREE SOYBUTTER.** *Dipika Agrahar Murugkar.* Agro Produce Processing Division, Central Institute for Agricultural Engineering, Nabibagh, Bhopal, India. Email: dipikaagrahar@yahoo.com.

Soy butter is made from roasted whole soybeans. It is remarkably similar to peanut butter in taste and texture but has significantly less total and saturated fat than peanut butter and is cholesterol free. Soy butter offers an alternative for those with nut allergies. The optimised processing conditions to prepare soy butter were soaking whole soybeans (4h), blanching (30min), roasting (100°C for 2h), milling, addition of peanut oil (10%), salt and sugar to make a smooth paste. This soy butter contained 39% protein, 38% fat, 0.2% free fatty acids, 3.7mg%

trypsin inhibitor, good emulsion stability and colour attributes. The overall acceptability of the butter on a 9-point hedonic scale is also high (7.2). Under refrigerated conditions soy butter contained 6.5% moisture, 37% fat and 0.8% fatty acid after a period of 60 days. Under ambient conditions (25-43°C) soy butter contained 7.5% moisture, 37% fat, 0.9% fatty acid after a period of 45 days. Therefore it has a shelf life of 45 days under ambient conditions and 60 days under refrigerated conditions. Soy butter being nutritionally superior (higher protein, lower fat) to peanut butter and also free from peanut allergens is recommended for consumption as a nutritious food.

PSFS-20 DEVELOPMENT AND QUALITY ASSESMENT OF FINGER MILLET INCORPORATED PASTA.

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Finger Millet is an indispensable traditional crop of Jharkhand. In recent years, finger millet has gained importance, because of its nutritional strength in terms of dietary fibre, functional fibre, starch pattern, as well as high calcium and iron contents. Utilization of finger millet in the daily dietary at present is largely confined to rural areas and that too is also declining due to rapid urbanization, changing food preferences and social status attached to fine cereals. The food uses of millet are not popular in urban areas of Jharkhand probably due to non – exposure of these grains as well as unavailability of products suiting to the taste of urban dwellers. The further promotion of finger millet requires diversification of products in terms of health food, ready to eat foods, pasta products etc. keeping in this view an attempt was made to develop three types of pasta by incorporating finger millet either alone or in combination with soy and green gram flour. All three types of pasta were liked very much by the panellists. Protein content varied from 10.76 – 12.53 percent and addition of green gram and soy flour increased the protein content. Significantly higher ash, fibre, calcium, and iron content was observed in finger millet incorporated pasta and supplementation of soy flour and green gram flour further improved the nutrient content. Finger millet flour in combination with green gram and soy flour to the extent of fifty percent can be successfully incorporated for development of nutritious pasta.

PSFS-21 STUDIES ON PREPARATION OF DIFFERENT INSTANT MIXES AND BISCUITS OF *ELEUSINE*

CORACANA. *Monica Yadav*, Swapnika B, Komali Lalithakala P and Ravinder A. Department of Food Technology and Management, Loyola Academy, Secunderabad, AP, India. E-mail: monica_cham23@yahoo.com

Objective: Eleusine Coracana, commonly called as Ragi, is having high nutritive value. From this Ragi, the different types of instant mixes and biscuits are prepared and nutritive effects of these products are studied in our Clinical Research Lab by using *Albino Wisters Rats*. *Methodology*: A suitable recipe was formulated and standardized for different instant mixes and biscuits keeping consumer acceptance and nutritional point of view, which included other cereal grains, pulses and spices. No preservatives and artificial substances are added. The different proportion of Ragi is used in instant mixes as follows: dosa mix (60%), sankati mix (80%), idly mix (45%) and for biscuits (60%). The sensory evaluation of all these mixes and biscuits was carried out by Hedonic Scale by using a panel of trained judges. *Results and Conclusion*: These different instant mixes and biscuits are prepared to a different health groups. For example: Biscuits are prepared with sugar and without sugar and it was evaluated for its physico-chemical, sensory and microbiological profile. The instant mix and biscuits was found to have a moisture content <10% and <5% with a water activity(a_w) of 0.90 and percent acidity 0.31%. The product was found microbiologically safe and organoleptically highly acceptable for upto 3 months when stored at Room Temperatures (23-32°C), Low Temperatures (5±1°C), besides 37°C. No significant changes in colour values were observed during the storage period of the product. The instant mix could deliver a ready dosa, idly and sankati by adding water to the mix, then blending and simmering or steamed. Continuous feeding of it as a breakfast for 30 days and effect of this nutritious food was studied by using *Albino Wisters Rats* (Control/Healthy, Normal, Diabetics). This convenience product has high nutritional value and can be consumed by health groups. A simple technology is involved and makes it suitable for any kind of industrial scale.

PSFS-22 A STUDY ON COLOURED FOODS SOLD IN THE SCHOOL ZONES OF GREATER VISAKHAPATNAM. Praveena K¹, EUB Reddi¹, A Jyothi². ¹Department of Environmental Sciences, Andhra University, Visakhapatnam, ²SPMVV, Tirupathi, Andhra Pradesh. E-mail id: praveena_k23@yahoo.co.in

Colour is one of the influencing factors in decision making by consumer. In order to lure the consumers, synthetic colours are added to foods. Synthetic colours especially non-permitted colours are well known to their health risks and even consumption of high levels of permitted colours also causes adverse health effects. In general children are more affected because they are more attracted to coloured foods than adults. Hence this study is contemplated to investigate the type and extent of synthetic food colours added to foods available in school zones in the urban and rural areas of Visakhapatnam. A Total of 128 kinds of foods were collected from the shops around the schools and analysed for synthetic colour pattern. Out of the total 128 samples, 71% contained permitted colours, 5% contained a combination of permitted and non-permitted colours and 24% contained dangerous non-permitted colours. However 72% of the foods with permitted synthetic food colours exceeded 100 ppm a level prescribed by Prevention of Food Adulteration act of India and 28% were within prescribed levels. Among the permitted colors the foods contain erythrosine 29%, tartrazine 28%, and then followed by ponceau4R 10%, carmoisine 3% and sunset yellow 3%. The maximum concentration was detected in jellies (20,823ppm), chewing gums (4,164 ppm), *nimma billalu* (530 ppm), hard candy (409 ppm) and some miscellaneous foods (1,735 ppm). Among the non-permitted colours, rhodamine and sudan red are commonly used. Some of the foods like almond milk, khoa, chekodi, boondi, pakodi and creamed bun, which are not supposed to contain even permitted colours as per the PFA Act, were found to contain non-permitted colours. Consumption of this kind of foods is mainly affecting the children health. Constant vigilance is needed to ensure that manufacturers comply with the regulations on food colours.

PSFS-23 NUTRITIONAL QUALITY EVALUATION OF FORMULATED SOYCHAKALI. Rajkumar M Kamble and Nalini Ghatage, Dept. of Home Science, Rajaram College, Kolhapur, Maharashtra, India, E-mail: rmkamble@hotmail.com

Soybean is one of the nature's wonderful nutritional gift legume oil crop. Soybean has found more nutritional significance and high nutraceutical properties. Hence, it is recommended for the formulation and preparation of many by products to combat major health problems and diseases. Soychakali was formulated in three different combinations by soyflour with rice flour i.e. 40:40, 50:50 and 40:60. Soychakali was prepared by using different variations in terms of required ingredients and procedure and evaluated organoleptically. High scored soychakali was analysed for its nutritional quality and evaluated to their keeping quality. Soychakali formulated and prepared with 40:60 combination of soyflour : rice flour with use of 2.0 g of cumin seed powder per 100 g as a flavouring agent and 2.0 g of turmeric powder per 100 g as a colouring agent which were frying on medium flame for 8 minutes scored high by their sensory qualities. Major nutrients like carbohydrates (g), proteins (g) and fats (g) are reported as 154.6, 32.1 and 20.1 respectively. B complex vitamins such as thiamin (0.45 mg), riboflavin (0.39 mg) and niacin (1.69 mg) were observed significantly decreased after 2 months of storage in polythene package. Minerals like calcium, iron and zinc noted as 159.9, 7.01 and 4.05 mg per 100 g respectively. Soychakali packed in tetra package for one month period found preserve more organoleptic qualities.

PSFS-24 DEVELOPMENT AND EVALUATION OF PROBIOTIC YOGURTS CONTAINING LACTOBACILLUS ACIDOPHILUS AND STREPTOCOCCUS THERMOPHILUS. Mann HK^{*1}, Sachdeva R¹ and Kapoor S². Department of Food and Nutrition¹, Department of Microbiology², Punjab Agricultural University, Ludhiana, India Email*. harjotkaurmann@gmail.com

Probiotics, which means "for life", have been used for centuries as natural components in health promoting food. They have a long history of association with dairy products because some of the same bacteria that are associated with fermented dairy products also make their home in different sites in the human body. Activation and Growth kinetics of the probiotic microorganisms using standardized microbiological techniques in their respective broths i.e. deMann Rogosa Sharpe Agar (MRS) for *L.acidophilus* and Nutrient Agar for *S.thermophilus*. It was found that *L.acidophilus* had long lag phase of 12 hrs whereas *S.thermpophilus* started growing within 6 hrs of inoculation. Two types of Probiotic Yogurt were prepared with low fat milk one containing *L.acidophilus* and other containing *L.acidophilus* along with *S.thermophilus*. Different inoculum rates (0.5%, 1.0% and 1.5%) were used. Physiochemical properties of yogurt [Brix, pH; acidity (%lactic acid); Brix acid rates; total plate count]was

done over the period of three days under the constant temperature of $25\pm 2^{\circ}\text{C}$. Palatable acidity was maintained even after 72 hr of storage period. The fermented product were standardized after formulation and evaluated organoleptically. Among the products yogurt containing single strain of *L.acidophilus* at 1.5% inoculum rate was most accepted with overall acceptability of 8.37 ± 0.12 . In case of yogurt containing both the strains of *L.acidophilus* and *S.thermophilus* yogurt with 1.0% had highest score of 8.30 ± 0.11 . Probiotic fermented food products can play a dual role in transforming milk into a diverse array of fermented dairy products (yogurt, cheese, kefir, etc.), and contributing to the important role of colonizing bacteria. A dairy product containing probiotics makes a healthy "functional food package" along with its therapeutic properties.

PSFS-25 DIETARY FIBRE IN DISEASE PREVENTION AND HEALTH PROMOTION. Zigiriza Lucia^{*1}, S Amutha¹, G Hemalatha¹, AR Mohamed Haroon². Home Science College and Research Institute¹, Agricultural College and Research Institute², Tamil Nadu Agricultural University, Madurai, India. Email: zigiriza@gmail.com

The dietary pattern of humans has shifted towards a diet in which refined grains, meat, added fats and sugar are common and vegetable protein and fibre intake is low. Processed foods and fast foods have become mainstay of typical diets in modern society. In developing countries like India, rapid urbanization, industrialization, globalisation as well as increasing number of women workforce have resulted in rapid inclination towards fast foods. This change in diet and the shift to a sedentary lifestyle is largely responsible for the increased prevalence of obesity and chronic diseases including type 2 diabetes, heart disease and cancer. Over the past forty years, traditional dietary approaches have been investigated as a remedy to these chronic diseases. Dietary fibre, nutritionally important non-nutrient roughage has been recognized for health benefits. Both soluble and insoluble fibres serve different functions in the body; they can be obtained from fruits, vegetables, legumes, cereals, pulses and seeds. Individuals with high intakes of dietary fibre appear to be at significantly lower risk for developing coronary heart disease, stroke, hypertension, diabetes, obesity, and certain gastrointestinal diseases. Increasing fibre intake lowers blood pressure and serum cholesterol levels. Increased intake of soluble fibre improves glycaemia and insulin sensitivity in non-diabetic and diabetic individuals. Fibre supplementation in obese individuals significantly enhances weight loss. Prebiotic fibres appear to enhance immune function. Dietary fibre intake provides similar benefits for children as for adults. More effective communication and consumer education is required to enhance fibre consumption from foods or nutritional supplements.

PSFS-26 NUTRITIONAL QUALITY OF READY TO EAT ROASTED PRODUCTS OF CHICKPEA. Mukta Agrawal¹, Sanjita Sharma², Varsha Goyle³, Prerna Jha¹ and Sumitra Meena¹. ¹Department of Home Science, University of Rajasthan, Jaipur, ²Rajasthan Veterinary University, Jaipur, ³Department of Chemistry, ICG, The IIS University, Jaipur, India. E mail: muktadr@hotmail.com

Roasted products of chickpea are very popular among people because of their easy availability, low cost and pleasing flavor. These are considered healthy because these are not fried. But these products are spicy and may contain high sodium. The present investigation was undertaken to know the nutritional value of ready to eat products of chickpea. Four types of ready to eat products of chickpea namely roasted chickpea with husk, roasted chick pea without husk, spiced chick pea without husk and *chana zor garam* were studied. Standard AOAC methods were used to estimate proximate components, iron, phytates, sodium and potassium. The fat content of these products ranged from 3.95 - 8.50%. The highest fat content was observed in samples of *chana zor garam* while roasted chickpea had the lowest fat content. The highest value for energy ($388.30\pm$ kcal) was found in *chana zor garam* followed by roasted chick pea with husk and spiced chick pea without husk. Protein content varied from 16.05% to 21.22% which was highest in roasted chick pea with husk and lowest in *chana zor garam*. Fibre content ranged from 0.77 (spiced chick pea without husk product) to 1% (roasted chickpea with husk product). Iron and antinutritional factor phytate ranged from 5.09 to 9.79 mg/g and 156.5 to 165 mg/g respectively. Potassium content of all the products was very high but sodium content of spiced chickpea without husk and *chana zor garam* was high.

PSFS-27 HEAT TREATMENT EFFECT ON CHARACTERISTICS OF PALMYRAH SEED SHOOT FLOUR "PANANKILANGU". S Pramila and T Poongodi Vijayakumar. Department of Food Science, Periyar University, Salem, Tamilnadu, India. Email: premila.pr@gmail.com, poonvija@gmail.com

The present study was framed to characterize and study the effect of cooking conditions (boiling and grilling) on quality characteristic of palmyrah seed shoot flour. The selected palmyrah seed shoot (*Borassus flabellifer* L) was subjected to heat treatments such as boiling and grilling, dried and milled into flour. The raw and heat treated palmyrah seed-shoot flour were assessed and compared for their properties like physical, nutritional, functional, total polyphenol content, antioxidant activity, colour value and qualitative chemical composition (FTIR). The maximum significant reduction in bulk density and true density was noted during boiling. The reduction in water absorption capacity, oil absorption capacity and swelling power at different temperatures was significantly higher in grilled sample than boiled sample. Both boiling and grilling improves the available protein. Total polyphenol content was significantly lower in grilled sample than boiled sample which was significantly lower than the raw sample at $p < 0.001$. The total antioxidant capacity (in comparison with ascorbic acid standard) of boiled sample was significantly higher than grilled sample which was significantly higher than raw sample at $p < 0.001$. The grilled flour sample became darker and reduced lightness than boiled sample which was little darker than raw sample at $p < 0.001$. The free amino acids were exhibited during boiling and grilling whereas the functional groups like cyclopentadienyls, secondary tertiary alcohols and monothiol ester were lost during heat treatment. Thus it was proved that the consumption of palmyrah seed shoot flour as boiled/grilled may have important techno-functional and health benefits.

PSFS-28 GLUTEN FREE SNACKS FOR CELIAC DISEASE PATIENTS: SENSORY AND NUTRITIONAL EVALUATION. *Shiwali Mittal*, Paramjit Chawla and Kiran Bains, Department of Food and Nutrition, Punjab Agricultural University, Ludhiana, Punjab, Email: shiwali_mittal@yahoo.com

Gluten free products were developed for celiac patients substituting the wheat flour and semolina with oats, sorghum, soya flour, rice flour, and corn flour and were organoleptically evaluated. Data revealed that cake was highly acceptable at 35% level of oats, scoring 7.6 and 7.9 for taste and overall acceptability respectively. Biscuits were highly acceptable at 30% level of oats scoring 7.78 and 7.72 for taste and overall acceptability respectively. Namakpare were moderately acceptable at 25% level of oats scoring 7.23 and 7.29 for taste and overall acceptability. In all the three products sorghum was acceptable at 20% level. The control and the most acceptable test sample were analysed for proximate composition. The highest moisture content was found in cake (5.8%) followed by namakpare (5.1%) and biscuits (1.1%). Ash content in cake and namakpare was 1.6% whereas in biscuits was 0.62%. Highest protein content was found in namakpare (19.25%) followed by cake (13.25%) and biscuit (10.5%). Highest fibre content was found in cake (5.1%) followed by namakpare (3.1%) and biscuits (2.5%). Highest fat content was found in biscuits (33.8%) followed by namakpare (31%) and cake (27.4%). Highest carbohydrate content was found in biscuits (51%) followed by cake (47%) and namakpare (39%). Gluten free products like cake, biscuits and namakpare were acceptable at 35%, 30% and 25% level of oats respectively.

PSFS-29 VALUE ADDED BUN WITH JAMBULINA SEED POWDER. ***KV Sucharitha*, KP Swapna, M Umarani, N Rajani*. ***Department of Home Science, Sri Venkateswara University, Tirupati, *Department of Home Science, Sri Padmavathi Women University, Tirupati.*

An increase in the prevalence of life style diseases due to improved economic status is quite evident in the recent years. Lifestyle diseases like diabetes and hypertension posing a huge health risk India. A study on 522 overweight, middle aged, sedentary work subjects with elevated sugars were studied. These individuals who reduced their weight by limiting their intake of fat increasing their intake of fiber and engaging in physical activity had a 58 percent reduction in the development of diabetes. This shows that lifestyle is directly related to the diabetes. Black berry or jambulina is an evergreen tropical tree which is widely grown in India it is used to control many diseases and is used in ayurvedic since 500BC. Jambulina seeds have long been used in eastern medicines and are gaining interest in the west for treatment of diabetes. Jambulina is considered beneficial and cheaper way to control diabetes. The glucoside in jambulina stops conversion of starch into glucose and this helps in controlling blood sugar. Fresh powdered seed in a dose of 0.5 -1 g, 3 times a day is used in treating diabetes mellitus. Bakery products are one of the most attracting items in the market these products gives energy to some extent ready to consume with out any kind of pre-processing. In recent years, value added bakery products have become quite popular in all over the world. Food habits are also changing in the present day lifestyle. More of convenience are used now-a-days at work places. Hence the present study was planned to develop a convenient food for diabetes. Three trials were carried out for standardizing bun by using the basic ingredients and jambulina seed powder 8, 7 and 6 g respectively. Sensory evaluation was carried out with six point hedonic scale using trained panel members. Among the three trials, the sample in the third trial was

accepted by all the panel members where 6 gms of jambulina seed powder was used. It was good in all parameters such as taste, appearance, colour, flavour, texture over all acceptability. Hence the study indicates that the value addition with jambulina seed powder to bun was accepted. The product was taken as standard product for supplementation to diabetes to study the effect of supplementation.

NUTRITION EDUCATION

PSNE-01 **KNOWLEDGE, ATTITUDE, AND PRACTICE OF ADOLESCENT GIRLS ON HEALTH, NUTRITION, ENVIRONMENT AND SOCIAL ISSUES IN SELECTED VILLAGES OF MEDAK DISTRICT OF ANDHRA PRADESH: SCOPE FOR EDUCATIONAL AND VOCATIONAL INTERVENTION.** *PVVS Murty*¹, Mahtab S Bamji¹, M Vishnuvardhana Rao². ¹Dangoria Charitable Trust, Hyderabad, India. ²National Institute of Nutrition, Hyderabad, India. E-mail: dangoriatrust@yahoo.com

A KAP study of Adolescent girls was done on above-cited issues before developing educational and vocational intervention strategies. Study area was five villages of Narsapur mandal in Medak district of Andhra Pradesh. Adolescent girls were enumerated and 240 girls age 12-18 years were selected by random sampling for the KAP survey. Semi-quantitative, family diet survey was also done. There was almost total rejection of gender preference for boys and dowry system. However gender roles in work were accepted. There was good understanding of age at menarche, physical changes during adolescence, need for more food during adolescence, appropriate age for marriage, importance and timing for breast feeding and complimentary feeding, etc. However scientific understanding of nutrients and their functions; diseases and their causes and physiology of reproduction was very poor. Mean per capita consumption of dal, vegetables and fruits, and animal products, was very low. Mixed cereal/millet diet was common practice. Educational strategies are being built to narrow the knowledge gap. Vocational training includes farm and non-farm technologies such as, green methods of farming, nursery raising, horticulture, back-yard poultry, food processing and tailoring and embroidery. Hitherto 228 home gardens, 37 vermiculture beds, and 35 back-yard poultries have been established. Twelve girls have received training in tailoring and embroidery and a few have purchased sewing machines. The project is supported by the National Institute of Public Cooperation and Child Development, Bangalore.

PSNE-02 **AN AWARENESS STUDY OF SOY AMONG MENOPAUSAL WOMEN AND DEVELOPMENT OF SOY BASED HEALTH FOOD.** G Swathi, Zubaida Azeem and *P Ashlesha*. Department of Food and Nutrition, Osmania University College for Women, Koti, Hyderabad, India. Email: ashleshapendli@gmail.com

The menopause is the cessation of menstruation at the end of women's reproductive life. Isoflavones are natural phyto estrogens, which treat the menopausal therapy in a natural way. Among the legumes soybean is the richest source of isoflavone and is found to be useful in reducing the hormone related complaints of menopause. The present study was conducted to develop soy-based health food (biscuits) for menopausal women and to evaluate its acceptability. Knowing the symptoms of menopause nutrition education was given to the subjects for awareness of soy and its products. Three variations were prepared using different proportions of ingredients and most accepted was variation 1. The result of acceptability trials was found to be significant (3.1, 3.2). The results of soy awareness were found to be insignificant. The nutritive value of the biscuits developed using soya and oats contained significant amounts of nutrients. The study provided scope after educating the subjects about soy and its products.

PSNE-03 **PROMOTION OF FRUIT AND VEGETABLE CONSUMPTION AMONG ADOLESCENTS GIRLS.** *Kalpana CA* and Anusha R. Department of Food Science and Nutrition, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu. Email: kalp_paul@yahoo.co.in

Adolescence is a period of rapid altered body composition, reproductive maturation and psychosocial development. In this period nutrient requirements are increased to meet the demands of growth and development. At present, low consumption of fruits and vegetables and increased consumption of fat rich snacks

and high calorie drinks are commonly found among adolescents. Hence a study was conducted to promote their fruit and vegetable consumption. 230 adolescent girls in the age group of 17-20 years which included 116 Non-Nutrition students and 114 Nutrition students were selected for the study. An interview schedule was specially designed to elicit information on personal information and socioeconomic profile and dietary pattern. Food intake was assessed by 24 hour recall method before and after nutrition education and their nutrient intake was calculated. A food use frequency questionnaire was also administered. The nutritional knowledge of the adolescent girls was assessed by administering a developed questionnaire. Each group of adolescent girls was educated using power point presentation for forty minutes. Pamphlets and booklets were also distributed to enrich their nutritional knowledge. The mean scores of nutritional knowledge before education were 11.04 and 10.19 which increased to 16.19 and 16 for nutrition and non-nutrition students respectively. Imparting nutrition education to adolescent girls irrespective of nutrition and non-nutrition students had a positive impact in promoting vegetable and fruit consumption among adolescent girls.

PSNE-04 PREVALANCE OF HYPERTENSION IN DIABETES MELLITUS AND IMPACT OF DIET COUNSELING. *Kumudini R Dhole, Anjali A Rajwade, Sangita Kherde and Amruta Gokhale. Smt. Radhadevi Goenka College for Women, Akola, Maharashtra, India. Email: kumudini22@gmail.com*

An investigation was undertaken on 55 diabetic subjects selected from three leading hospitals in Akola city. The requisite information was obtained from the selected diabetic patients with the help of well structured interview schedule. The results revealed that out of the selected subjects 58 per cent were males and 42 per cent females, performing sedentary work. The 56.25 per cent male and 69.56 per cent female subjects were consuming vegetarian diet. Three-time diet pattern was followed by 40.62 per cent male and 34.78 per cent female subjects. The 81.25 per cent of male and 86.95 per cent female subjects had above normal intake of carbohydrates, 71.87 per cent male and 73.91 per cent female had above normal intake of sodium and 75 per cent male and 86.95 per cent females had above normal total calories. The prevalence of hypertension was found in 62.5 per cent male and 43.48 per cent female subjects. The 40 per cent male and 60 per cent female subjects were in the range of 180 to 210 mg per cent fasting blood sugar level. After counselling it was found in the range of 160 to 180 mg per cent in both male and female subjects. A significant effect of counseling was observed in respect of knowledge about nutrition, nutritional practices, reduction in blood glucose level and blood pressure levels. So, it was concluded that diet counselling is an effective measure in the management of hypertension and diabetes.

PSNE-05 DIET AND LIFESTYLE IMPACT ON OBESITY PREVALENCE-INTERVENTION OF FOOD TECHNOLOGIES TO ADDRESS OBESITY. *Suneetha C and Manjula K. Food Technology, Dept. of Home Science, S.V.University, Tirupathi, Andhra Pradesh, India. Email: svu.ft2011@gmail.com*

With the advancement in technology, life today has become more sedentary. This lifestyle along with increased consumption of more energy-dense, nutrient-poor foods with high levels of sugar and saturated fats, combined with reduced physical activity, have led to rise in the obesity rates. Obesity is a complex condition with serious social and psychological dimensions affecting virtually all ages and socioeconomic groups. The obesity epidemic is not restricted to the industrialized societies. This increase is often faster in developing countries than in the developed world. Globally, there are more than 1 billion overweight adults, at least 300 million of them are obese. Obesity and overweight pose a major risk for chronic diseases, which includes type 2 diabetes, cardiovascular diseases, hypertension, stroke, musculoskeletal disorders and certain forms of cancer. The key causes are increased consumption of energy-dense foods high in saturated fats and sugars and reduced physical activity. Obesity is a major contributor to the global burden of chronic disease and disability. Hence the present study is aimed to prevent or reduce the risk of obesity by designing new food products which are having functional components to address Obesity. These designer foods, in general, provide essential nutrients for health maintenance that actually promote good health as evidenced by clinical trials. Such foods contain physiologically active components effective in preventing or treating disease and aid in promoting optimal health.

PSEN-06 STRESS AND ANXIETY REDUCTION IN SCHOOL-GOING ADOLESCENTS THROUGH DIET MODIFICATION AND POSITIVE THERAPY. *Rohini Tiwari* and C Yegammai. Department of Food Science and Nutrition, Faculty of Home Science, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, India. E-mail: rohini_t2001@yahoo.com

Adolescence is a stage of rapid physical, psychological, sexual and emotional growth. Majority of adolescents are fraught with stress and anxiety due to examinations, academic pressures, parental expectations, peer-interactions and self-image. Stress leads to malnutrition, both over and under, eating disorders, sleep disturbance and behavioral problems. The amino-acid tryptophan is a precursor of the neurotransmitter serotonin in the brain, known to enhance mood, relieve symptoms of stress, anxiety and improve sleep quality by producing melatonin, a sleep-regulating neurohormone. Serotonin production is dependent on levels of 5-hydroxy tryptophan in blood, which is determined by the ratio of tryptophan and five other Long-chain Neutral Amino Acids (LNAA). The objective of the present study is to relieve stress, anxiety and improve sleep quality by altering the dietary pattern and compare its efficacy with other interventions like positive therapy and nutrition education. The selected school-going adolescents were divided into 3 experimental groups and a control. Prevalence of stress, anxiety, daytime sleepiness, sleep-debt, nutritional status and eating habits were assessed prior to half-yearly exams (initial) and after intervention of 7 months, prior to final exams (final). Significant reduction in stress, anxiety and daytime sleepiness was observed in the experimental group with diet-modification as compared to the other two experimental groups that had positive therapy and nutrition education; as well as with the control. There was also a marked improvement in the nutritional status and food habits of these subjects such as increased intake of milk, green leafy vegetables and fruits and reduction in skipping of meals.

PSEN-07 DEVELOPMENT OF CAULIFLOWER LEAVES ENRICHED DEHYDRATED PRODUCTS. *Meera M* and Sai Ramya A, Department of Home Science, Sri Sathya Sai Institute of Higher Learning, Anaparthi-515001. Email: meeramanik@yahoo.com

Snack foods have little or no nutritional value with growing concern for diet and general health. Efforts are made to eat healthier and natural snacks. Dehydrated foods offer a better alternative approach for the nutritional therapy being cheap and affordable at low prices. Therefore developing foods to enhance the nutritive value of the product is very essential. Dehydrated foods are more concentrated source of minerals than any other preserved form of foods. Therefore, an effort is made to develop dehydrated products with the incorporation of cauliflower leaf powder to cereal pulse combination at 15 and 20 percent. The physical characteristics of the products eg; rolling properties, batter characteristics; diameter, hand feel and percent expansion after frying were assessed by ISI methods. Proximate, mineral composition, antioxidants, anti nutrients, and shelf life of the developed products were studied for 4 months by using AOAC methods. The iron, calcium and phosphorus content of the products with dehydrated cauliflower leaf powder were significantly higher than the respective controls. The organoleptic properties were judged by 15 semi trained panellist using nine point hedonic scale. The products with 15 percent cauliflower leaf incorporation scored the maximum sensory scores. Thus value addition with underutilised dehydrated cauliflower leaf powder would add a new dimension to overcome nutritional deficiency and make the product wholesome and nutrient dense.

PSNE-08 STUDY ON AWARENESS OF CALCIUM AND ITS SOURCES IN ADOLESCENT GIRLS. R Jyotsna, P Ashlesha and P Suma. Department of Food and Nutrition, Osmania University College for Women, Hyderabad, India. Email: kanchisuma80@gmail.com

Calcium is an important nutrient in our diet. It is very important for body and skeletal development. Adolescence is the most crucial stage of ones life where most of the body development takes place. To know how aware are the adolescents about this vital nutrient a survey was conducted where a sample of 50 adolescent girls are chosen randomly. A food frequency questionnaire was prepared and was used to know the awareness among the adolescents. The results of the study have shown that mostly adolescents are aware of the calcium and its importance in their diet. They even include the sources of calcium in their diet. Around 74% of girls knew calcium as the vital nutrient in the diet. 87% of them agree that it helps in skeletal growth and 95% agree that it deficiency leads to osteoporosis. 95% agree milk, as important source of calcium and 92% knew the calcium rich foods. Thus, the study revealed that adolescents are aware of calcium and its sources.

PSNE-09 **HEALTH AND NUTRITIONAL PROFILE OF LATEX WORKERS AND THE IMPACT OF NUTRITION EDUCATION.** Pavitra Krishna KU and Thangaleela T, Department of Food Science and Nutrition, Avinashilingam University for Women, Coimbatore, Tamil Nadu. Email: ushpavi@yahoo.co.in

India is the third largest producer, fourth largest consumer of natural rubber in the world. Latex contains variable amounts of proteins that can cause allergic reactions like hand dermatitis, blisters, sneezing, watery eyes, asthma in rare cases death among health care workers and workers in glove manufacturing plants. Diet surveys carried out in India have shown that the diets consumed by the industrial workers especially female are inadequate and lack in protective foods. Kanam Latex Industries Private Limited (KLIP), the major unit for production of gloves with 1000 workers located at Kanyakumari District was selected for this study. Totally 398 female workers between the age group of 20-40 years as manufacturers (50), chlorinators (30), sorters (146) and packers (172) were selected as samples by purposive sampling method. Their socio – economic background, occupational status, occupational hazards, life style, dietary pattern, health and nutrition status were assessed. From this 40 latex workers, 10 from each category were selected as sub samples for haematological studies such as WBC, ESR (Erythrocyte Sedimentation Rate), eosinophil count. Information on food and nutrient intake was taken through 3 day food recall method. Nutrition education was given for a period of 3 months with the interval of 10 days, using various educational modules such as nutrition booklet, audio – visual aids and nutrition exhibition. The impact of nutrition education was evaluated by KAP (Knowledge Attitude Practice) after a period of 3 months. Nutrition education to the women for a period of 3 months brought about significant improvement in nutritional status. Hence these findings highlight the need for nutrition education to improve the health status of women.

PSNE-10 **AWARENESS AMONG URBAN HOME-MAKERS ABOUT PREPERATION METHODS OF TRANS FAT FREE HALWA.** Anuradha C Ghuikhedkar, Department of Home science, Sant Gadge Baba Amravati University, Amravati, Maharashtra, Email: anu_desh3 rediffmail.com

Trans fat is specific type of fat formed when liquid oils are processed. *Trans* fat are found in foods maid it with or fried in partially hydrogenated oil. *Trans* fat are found in foods maid it with or fried it in partially hydrogenated oil. *Trans* fat affect our in body and increase LDL cholesterol level and decreases HDL cholesterol level. The training programme is an important tool for the awareness of *trans* fat and decrease the *trans* fat level in the body. Education given through method demonstration of preparation of *trans* fat halawa of beetroot, carrot, suji, pumkin, gourd. Objectives were to study effect of educational programme about *trans* fat free halwa for home makers. Hundred urban home makers were selected from Amravati city by random sampling technique. System approach of training was applied to provide training to home makers. Dependent Variables were change in knowledge and practice about *trans* fat halwa. Assess the significant difference between before and after training “Z” test applied and it was found highly significant at 0.1 % level of probability for knowledge and practice. The means of knowledge (62.36%) of the training respondents after exposing them to training found to be much higher than the means of knowledge (32.54). We designed training programme based on the need of the home maker’s results in gain in their knowledge and practices. They were found aware about *Trans* fat halwa and its importance in making the family healthy.

PSNE-11 **IMPACT OF HOLISTIC NUTRITION EDUCATION PACKAGE ON DIABETES MELLITUS CONTROL IN MIDDLE AGED MEN.** Anjali Rajwade, Home-Science Department, Radhadevi Goenka College for Women, Akola, India. Email : arajwade28@yahoo.com

Diabetes mellitus (DM) adversely affects productivity and health in middle aged men. DM is a life style disorder aggravated by nutritional imbalance, lack of exercise and absence of focused approach. The objectives of the present study were therefore, to prepare a holistic nutrition education package (HNEP) for DM and to use it to assess its impact in DM control in a group of middle aged men (MAM). A HNEP for DM was designed. From a larger group of diabetic MAM, a study sample of 60 with non insulin dependent diabetes (NIDDM) and having Glycosylated haemoglobin (HbA1c/GHb) more than 7 was formed. Data about dietary practices, exercise, BMI, focused approach was collected before and after HNEP administration. Education session was repeated fortnightly for six months. HbA1c levels were reassessed at 4 months and 6 months. Assessment at the end of 6 months revealed that adoption of breakfast + lunch + snacks + dinner pattern was 8.33% before and 90.00% after the HNEP. Lunch + dinner pattern was 65.00% before which shifted to 1.67% after HNEP showing significant positive change in healthy dietary practices. Food intake as per Recommended Dietary Allowances

(RDA) improved from 30.00% to 95.00% and fatty food consumption decreased from 80.00% to 16.67% whereas roughage food consumption increased from 20.00% to 86.67%. Regular exercise regime adoption improved from 16.67% to 78.33% due to HNEP. BMI assessment showed significant reduction in overweight category from 46.67% to 20.00% and normal weight category had positive shift from 16.67% to 56.67%. Blood test for GHb level revealed that 25% respondents achieved normal levels at the end of 4 months and 53.33% achieved normal level at the end of 6 months of HNEP application. DM was perceived as a nutrition related disorder and not a disease by 96.67% respondents and 100% respondents agreed that the trio of diet + exercise + determination is the main determinant of diabetes control. HNEP has a positive, wide ranging and sustainable impact in DM control.

PSNE-12 KNOWLEDGE AND ADOPTION OF IMPROVED MUSHROOM PRODUCTION AND PROCESSING TECHNOLOGY IN FARMWOMEN OF CHHATTISGARH. *Sandhya Verma*, Arts & Commerce Girls' College, Devendra Nagar, Raipur, Chhattisgarh, India.

Mushroom production in Chhattisgarh has been proved as an important activity to alleviate malnutrition and generating self-employment regarding nutritive value of mushroom. Mushroom contains 63% carbohydrate (which is starch free), 25% protein (includes essential amino acids), 4% fat, 8% minerals, vitamins (like thiamine, niacin, riboflavin and folic acid), which are an important nutrient of nutritive diet are also supplied by mushroom. Its protein is of very high biological value than vegetable protein and is equal to animal protein. With the development in cultivation technology and enthusiasm of the growers next step will be processing of mushroom to maintain supply and demand in market. Post-harvest preservation and storage of mushroom is a very delicate problem because of infection of microorganisms, spoilage by enzymes and unfavourable atmosphere. Processing technology helps in extension of shelf life of edible mushroom for pretty long period of time. In Chhattisgarh, most of the village children were found to be under nourished and rural women are facing the problem of unemployment. For the upliftment of socio-economic condition of farm women, active participation in agriculture is needed, as alternative income generation from agriculture is today demand. Mushroom can be grinded and successfully utilized in weaving and several value added products. Mushroom can be processed as dried powder, pickles, papad, badi (noodles) murku, biscuits, sev, chakli etc. without affecting the nutrient value. Mushroom can be blended in atta, dalia or dal for improving the food nutritional quality and value. These blended foodstuff can be added in mid-day meal for school children. In this way, mushroom processing activity may help in generating of income, alleviation of malnutrition and increases overall living standard of farm women.