



# ANNUAL REPORT

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# RESEARCH HIGHLIGHTS

## 1. COMMUNITY STUDIES

### 1.1 NNMB second tribal repeat surveys: Diet and nutritional status of tribal population in India time trends

It was observed that there was no significant change in the dietary patterns of tribal population in the last three decades. However, consumption of income-elastic foods like pulses, GLVs, Sugar and Jaggery has marginally gone up. Prevalence of severe undernutrition has significantly come down from 19.7% in 1985-87 to 7.9% in 2007-08 among both the rural and tribal communities. However, there was a notable shift from moderate to mild malnutrition indicating betterment of nutritional status. Nutritional status of tribes of MP, Maharashtra and Orissa were poor compared to those in the other states.

### 1.2 Evaluation of Bio-effect of ultra rice on iron status of beneficiaries of mid day meal (MDM) programme – A study in a primary school of Ranga Reddy District, Andhra Pradesh

It was found that the rice fortified with iron when given in the mid-day meal to the school children for over a year, resulted in a significant improvement in their haemoglobin levels and iron stores. However, it was also observed that the children in control group who did not receive ultra rice but got supervised meal as per the norms of MDM Programme also showed Hb improvements with no change in iron status.

### 1.3 Nutritional status of <3 year children and infant & young child feeding practices among mothers in Medak, Andhra Pradesh: A situational analysis of Sankalp Programme

Government of Andhra Pradesh in collaboration with UNICEF initiated developmental programme “**Sankalp**” in Medak district of Andhra Pradesh. A situational analysis of infant and young child feeding practices and care giving practices among 805 mothers of <3 years children, indicated a significant association between nutritional status and different socioeconomic & demographic variables such as literacy and occupation of parents and presence of sanitary latrine with underweight and stunting, use of LPG and presence of electricity with underweight and wasting.

### 1.4 Study on relationship between Body Mass Index (BMI) and percent body fat in urban adults

Studies on relationship between Body Mass Index and percent body fat in urban adults indicated that cut-off levels of BMI to indicate Overweight/Obesity, derived based on 25% body fat among men and 30% among women using ROC (receiver operating characteristic) curves, were found to be similar to the cut-off values for Asian Indians suggested by WHO ( $BMI \geq 23 \text{kg/m}^2$ ).

## 2. MICROBIOLOGY AND IMMUNOLOGY

### 2.1 Allergenicity evaluation of a Bio-preservative skimmed milk fermentate (SMF)

NDDB in association with National Dairy Research Institute (NDRI) Karnal has developed skimmed Milk Fermentate (SMF-Bact) a Bio Preservative, which can be used to increase



shelf life of milk products. Allergenicity evaluation of SMF suggested that it had no allergenicity potential in the concentration tested.

## **2.2 Immune status of WNIN mutant obese rats with reference to leptin and obesity**

It was observed that there were altered T cell subsets and B cells in both the sexes of the strains of mutant rats studied. However, the splenic proliferative response to mitogen decreased in male rats of one strain.

## **3. BASIC STUDIES**

### **3.1 Isolation and characterization of human milk factor that enhances iron absorption: An exploratory study**

In yet another study, enzyme Ferric Reductase activity has been demonstrated in human milk fraction which explains the reason why iron is better absorbed through human milk.

### **3.2 Studies on mechanism of cytoprotective effect of zinc in Caco-2 cell intestinal model**

Results indicated that Zinc inhibits oxygen induced iron uptake and signaling and thus elicits its cytoprotective effects. This also explains the inhibitive effect of zinc on iron absorption.

### **3.4 Metabolic programming of insulin resistance: Role of maternal and peri/postnatal chromium status in the offspring – Adiposity, glucose and lipid metabolism**

Chronic maternal chromium deficiency increased body fat, especially central adiposity in offspring. It altered adipocyte cytokine levels in circulation. It altered lipid metabolism with increased circulating triglycerides and free fatty acid levels. However, it did not alter gene expression. It caused impaired glucose tolerance and increased insulin secretion. Rehabilitation could partially correct these changes.

### **3.5 Health beneficial effects of plant foods commonly consumed in India: nuts and oil seeds**

Very strong correlation was observed between the phenolic content and FRAP and DPPH scavenging activities indicate that phenolics were significant contributors to the anti-oxidant activity of nuts and oilseeds commonly consumed in India.

### **3.6 Importance of $\gamma$ -crystallin heteropolymer in the eye lens: Oligomeric size, polydispersity and stability**

Chaperone-like activity (CLA) of the small heat shock protein  $\gamma$ -crystallin is essential for the maintenance of eye lens transparency. The eye lens  $\gamma$ -crystallin is a heteropolymer, composed of two homologous subunits, A and B. In most vertebrates the ratio of A to B in heteropolymer is 3:1. However, the physiological significance of 3:1 heteropolymer is not known. The current studies have shown that under normal conditions B-homopolymer exhibits higher CLA than A-homopolymer. In contrast, under stress conditions 3:1 heteropolymer displayed greater CLA. It was further demonstrated that B-crystallin homopolymer is not only less stable and contributes to light scattering due to aggregation, but it could also be involved in coaggregation of other lens proteins in the absence of A-crystallin. Thus, existence of A and B in 3:1 ratio in lens might have evolved as an advantageous combination to preserve eye lens transparency under diverse conditions to prevent cataract.



### **3.7 Expression of $\alpha$ -crystallins under hyperglycemic conditions: Role of oxidative stress, transcription factors and dietary anti-oxidants**

Expression of small heat shock proteins,  $\alpha$ A- and  $\alpha$ B-crystallins has been shown to be elevated under various stress and pathological conditions. Diabetes is known to be associated with various metabolic stresses including oxidative stress. For the first time, it has been reported that hyperglycemia induced stress leads to increased expression of  $\alpha$ B-crystallin in lens, heart, muscle and brain and  $\alpha$ A in retina. Further, it was shown that transcription factor HSF1 could be responsible for up regulation of  $\alpha$ -crystallins under hyperglycemic conditions. While increased oxidative stress appears to be a major stimulus for the enhanced expression of  $\alpha$ B-crystallin in tissues of diabetic rats, feeding of a dietary antioxidant (curcumin) to diabetic rats attenuated the enhanced expression of  $\alpha$ B-crystallin.

### **3.8 Characterization and significance of a novel fatty acid elongase, ELOVL4, of the eye**

ELOVL4 (Elongation of Very Long Chain Fatty Acid 4) is a novel member of human fatty acid elongases whose functional role is currently not known. ELOVL4 gene is expressed in the photoreceptor cells of the retina in a number of species and a mutation (5-bp deletion) in ELOVL4 gene can cause a particular form of macular degeneration. The current studies have shown that expression of this novel elongase is higher in retina compared to lens in many vertebrate species. A comparison of fatty acid profile between lens and retina of given species has enabled us to cling on to the elongation reaction of ELOVL4 that it might be involved in the elongation of fatty acids with a chain length greater than C28. Studies also indicated that expression of ELOVL4 in retina is positively modulated by dietary long-chain polyunsaturated fatty acids, which in turn is associated with the maintenance of integrity of retinal morphology.

## **4. EXTENSION AND TRAINING**

### **4.1 A study on approaches to nutrition communication**

Case studies on approaches taken by various organizations for nutrition communication in different sectors (Government, NGO and R&D) indicated that Nutrition communication activities lack proper planning, monitoring and evaluation components. This makes it difficult to attribute any change in behaviour to a particular communication process.

The selection of specific communication approaches is not primarily based on normative value of the approach but purely based on institutional factors and expectations including organisation's goals, bureaucratic dynamics and budgetary constraints

### **4.2 A study on coverage of nutrition related topics in print media**

The study revealed that the vernacular (Telugu) dailies covered more number of nutrition related articles than the English newspapers and most of these were more on conventional foods rich in nutrients. English dailies published more articles on lifestyle foods like chocolates, beverages, ice-creams etc.

## **5. FOOD AND DRUG TOXICOLOGY**

### **5.1 Microbiological risk assessment of street foods with special reference to poultry products**

The study indicated that 50-70% of samples of poultry foods were found to be contaminated with disease carrying bacteria like *Bacillus cereus* and *Staphylococcus aureus*. The vegetable salads were found to be contaminated with *Salmonella* due to improper handling.

## **5.2 In vitro chelating potential of thiamine with lead**

Earlier studies indicated that thiamine can chelate and thus reduce the uptake of lead in intestines. This was confirmed using in vitro human intestinal cell lines. Therefore correcting thiamine deficiency itself would reduce the risk of lead toxicity in populations at risk.

## **6. PRE-CLINICAL TOXICOLOGICAL STUDIES**

### **6.1 Safety evaluation of AB-FN-02 having potential anti-osteoarthritic activity**

Safety evaluation of a polyherbal drug, AB-FN-02 having potential anti-osteoarthritic activity indicated that it was non-toxic when administered in traditional method with milk and was found toxic when administered as a drug otherwise.

## **7. NATIONAL CENTRE FOR LABORATORY ANIMAL SCIENCES**

The first phase of the Indo-US project to find out the nature of mutation in the obese rats developed in the center was completed, with the crossing of WNIN/Ob rats with that of Fischer 344 rats and the preparation of DNA samples from Fo, F1 parents and F2 progenies.

## **8. OTHERS**

Total number of publications by scientists in national and international journals was over 40 with an average impact factor of 2.5.

# I. COMMUNITY STUDIES

## 1 NNMB SECOND TRIBAL REPEAT SURVEYS: DIET AND NUTRITIONAL STATUS OF TRIBAL POPULATION IN INDIA AND TIME TRENDS

The National Nutrition Monitoring Bureau (NNMB) since its inception in 1972 under the Indian Council of Medical Research (ICMR) in the States of Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra, Gujarat, Madhya Pradesh, Orissa, West Bengal and Uttar Pradesh has been carrying out diet and nutrition surveys on a regular basis and the results are being published as technical reports. In order to study the time trends in the food and nutrient intake patterns and the nutritional status of individuals in tribal areas, the Bureau carries out repeat surveys once in 5 years by visiting the same set of villages. In case of tribal areas, the baseline survey was carried out during 1985-87, first repeat survey was carried out during the year 1998-99 and the second repeat survey i.e. the present survey was carried out during 2007-08.

### GENERAL OBJECTIVE

To assess the current diet and nutritional status of tribal population living in ITDA areas in all 10 NNMB States and to study the time trends. In addition, it is also proposed to assess the prevalence of obesity and hypertension among adult men and women of 20 years of tribal population, as was done in the latest rural surveys.

### SPECIFIC OBJECTIVES

1. To assess the food and nutrient intake among different age/ sex/ physiological groups.
2. To assess the nutritional status of individuals in terms of Anthropometry, clinical examination for nutritional deficiency signs.
3. To assess the history of morbidity for previous fortnight among all the individuals covered for anthropometry.
4. To assess the time trends, if any, in the diet

and nutritional status of tribal population.

5. To assess the prevalence of obesity and hypertension among the adult men and women (20 years), and
6. To assess awareness about hypertension among adults (20 years) of the tribal community.

### COVERAGE

The National Nutrition Monitoring Bureau (NNMB) has carried out second repeat survey in ITDA areas during 2007-08 in 75% of the villages (90) which were already surveyed during 1985-87 and 1998-99 and 25% of the new villages (30), to assess the current diet and nutritional status and time trends among 95,590 individuals and food consumption pattern (34,544) and assessed the prevalence of hypertension among adult men and women (20 years) from 851 villages. Due to logistic problems, the survey could not be completed in the States of Uttar Pradesh and West Bengal.

The following are the salient observations:

- ✎ The mean intake of most of the foodstuffs was below the RDI and there was no significant change observed over a period of time
- ✎ The consumption of income elastic foods such as green leafy vegetables, milk and milk products, fruits, sugar and jaggery increased marginally.
- ✎ The extent of deficit was more for vitamin A, iron, calcium and folic acid among children and pregnant women.
- ✎ About 30% of the preschool and school age children had adequate intakes of both protein and calories.



- ✎ The overall prevalence of undernutrition (<Median – 2SD) in the form of underweight, stunting and wasting among infants was 36%, 36% and 22% respectively, while it was higher among preschool children (66%, 58% and 22% respectively).
- ✎ The time trends indicated that there was significant reduction in the prevalence of severe degree undernutrition (<60% of weight for age of NCHS standards) in preschool children (19.7% to 7.9%).
- ✎ The prevalence of chronic energy deficiency was about 40% and 49% among men and women respectively.
- ✎ There was also reduction in nutritional

deficiency signs like kwashiorkor, marasmus, vitamin A and B-complex deficiencies among preschool children.

- ✎ The prevalence of hypertension (SBP 140 mm of Hg and /or DBP 90 mm of Hg) was about 25% among men, while it was 23% among women. About 41% of men and 33% of women were aware of hypertension. About 35% men and 29% women were aware of diabetes mellitus.

Therefore, there is an urgent need to sensitize the community regarding the causes and consequences of undernutrition and obesity, HTN and DM and to educate them about the need for adopting appropriate life styles and dietary habits.

## 2 EVALUATION OF BIO-EFFECT OF ULTRA RICE ON IRON STATUS OF BENEFICIARIES OF MID DAY MEAL (MDM) PROGRAMME – A STUDY IN A PRIMARY SCHOOL OF RANGA REDDY DISTRICT OF ANDHRA PRADESH

Iron Deficiency Anaemia (IDA) is a major micronutrient deficiency disorder of public health significance affecting millions of women and children in India. Surveys carried out by National Nutrition Monitoring Bureau (NNMB) in 8 States viz., Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra, Madhya Pradesh, Orissa and West Bengal have shown that the prevalence of IDA is about 70 to 80% among different age, sex and physiological groups.

The major aetiological factor of IDA is dietary inadequacy of iron. The NNMB studies have shown that in about 60% of the rural households the average intake of dietary iron is less than 50% of recommended levels. The Presence of substances such as phytates and tannins in high amounts that interfere with iron absorption in the Indian dietaries, and lack of absorption promoters such as vitamin C, further compound the problem.

The PATH-USA has developed technology of fortification of rice using Ultra Rice (UR), a premix of extruded rice flour having iron as iron pyro-phosphate and proposes to transfer the technology to developing countries, including India. However, the bio-effect of this technology in improving iron status has not been proved in the Indian context. It was hypothesized that consumption of rice fortified with iron UR by 5-11 year old school children, at a level to bridge the deficit in the dietary intake of iron, through MDM over a period of 9 months will have positive impact on iron status of the beneficiaries.

During the year 2006-07, a placebo controlled randomized double blind feeding trial was carried out by National Institute of Nutrition, Hyderabad, to assess the impact of consumption of rice fortified with iron UR through Mid Day Meal (MDM) on haemoglobin and ferritin status of beneficiaries of the programme in a primary school in *Ranga*

Reddy district of Andhra Pradesh. The study revealed that i) the rice fortified with iron UR is acceptable among the MDM beneficiaries, ii) there was no loss of iron due to pre-cooking and cooking processes, iii) feeding trial was operationally feasible, iv) an effective mean feeding days of 76 per child was achieved, which was inadequate to demonstrate an impact conclusively. Based on these results, it was decided to conduct the impact evaluation afresh during the academic year of 2007-08, for an effective duration of 9 months, by adopting similar protocol in the same school.

## **HYPOTHESIS**

Consumption of rice fortified with iron UR by 5-11 year school children, at a level to bridge the deficit in the dietary intake of iron, through MDM over a period of 9 months will have positive impact on iron status of the beneficiaries.

## **OBJECTIVE**

To assess the impact of consumption of rice fortified with iron UR on iron status of beneficiaries of the MDM programme, over a period of nine months.

## **STUDY DESIGN**

The study was a placebo controlled randomized double blind feeding trial carried out among children in the age group of 5+ to 11+ years in a primary school, where MDM programme is being implemented.

## **SAMPLE SIZE**

A sample size of 70 children per group was calculated, assuming an expected overall mean increment of 0.56 g/dL in haemoglobin with an SD of 1.04 g/dL (based on the results of the previous study), 95% confidence interval, 80% power of estimate, and 20% of attrition.

## **SAMPLING PROCEDURES**

The current study has been carried out in the same government primary school in *Keesara* village of *Keesara* Mandal, Ranga Reddy district, Andhra Pradesh, where the

earlier study was implemented during the academic year 2006-07. Necessary permission for carrying out the study was obtained from the Department of District Education, Andhra Pradesh during July, 2007.

The selected school had 230 children, consisting of 83 boys and 145 girls of 5+ to 11+ years age group. Of the 230 children, 70 were newly admitted to the school during the current academic year of 2007-08, while the rest were old students.

## **Inclusion Criteria**

Apparently healthy children in the age group of 5+ to 11+ years participating regularly in the MDM programme, having haemoglobin levels of  $\geq 7$  g/dL, those with weight for age, height for age and weight for height  $\geq$  median – 3 SD of NCHS reference values were considered for inclusion in the study (n=146).

## **Exclusion Criteria**

Children who were severely anaemic with haemoglobin levels of  $< 7$  g/dL (n=4), undernourished (weight for age, height for age and/or weight for height  $<$  Median – 3SD of the NCHS reference values) (n=3), not participating in MDM (n=10) or participating irregularly in MDM (n= 65) were excluded from the study.

## **BASE LINE SURVEY**

### ***Institutional Diet Survey***

Institutional diet survey by weighing method was carried out on two days with different menu (Tamarind rice, and rice with *sambar* and egg). Average consumption of MDM by the children was assessed in both the groups. In addition, individual intake of MDM was assessed among a sub-sample of 24 randomly selected children (12 in each group) belonging to different age/gender strata from both the groups.

## **ANTHROPOMETRY**

The heights and weights of the children were measured by using anthropometer rod



and Seca electronic balance, by adopting standard methodology.

## **BLOOD CHEMISTRY**

Two millilitres of blood samples were drawn from ante-cubital vein of selected children for estimation of haemoglobin by cyanmethae-moglobin method, serum ferritin by an in-house ELISA method and C-reactive protein by a commercial ELISA kit (Abazyme, LLC, MA, USA).

## **INTERVENTION**

Intervention was carried out from the month of August 2007 to April 2008. The children of both the groups received the respective coded rice along with common regular side dishes on all school working days (excluding Sundays and holidays). Care was taken to cook and serve the fortified and unfortified rice separately and ensured that both the groups received their respective coded rice. The entire process was monitored by field staff under the supervision of research investigators from NIN.

## **MORBIDITY AND SIDE EFFECTS**

Morbidity and side effects, if any, were assessed and recorded every day and compiled once in every 15 days.

## **END LINE SURVEY**

At end line, i.e. in the 2<sup>nd</sup> week of April, the anthropometric measurements of children were taken, institutional diet survey was carried out and blood samples were collected from the children for estimation of haemo-globin, serum ferritin and C-reactive protein.

## **Data analysis & statistical models used**

Data was analyzed using SPSS version 15.0 for Windows to assess the impact of intervention on iron status of children. Descriptive statistics were computed to analyze the central tendencies and dispersions. Paired t-test and Wilcoxon Signed Ranks test were carried out to see the difference between baseline and end line for

each group of haemoglobin and ferritin. Student 't' test was carried out and 95% confidence intervals of increments in haemoglobin and ferritin were computed to study the efficacy of intervention. In addition, following three types of linear regression analysis were performed to evaluate the effect of intervention on haemoglobin and ferritin levels.

## **RESULTS**

At the end of the analysis decoding was done by the Director, NIN. It was observed that the group 'B' was control and 'Y' was experimental Group. The results of the analysis are given below:

1. The analysis revealed that the iron content of ultra rice premix was  $10.9 \pm 0.1$  mg/g on dry weight basis and was same as that used in the preliminary study.
2. It was observed that the mean iron content was about 2 mg in unfortified and 20 mg in fortified rice. Iron content of fortified and unfortified rice showed minimal variation during the study period.
3. The mean age of boys and girls was similar in both the control and experimental groups. There was a mean increment of about 4 cm in height and about 3 kg in weight in both the groups.
4. Though not statistically significant, there was a decline in the prevalence of underweight while stunting and wasting remained similar in control and experimental groups.
5. The mean Hb and serum ferritin levels among children were comparable between the two study groups at base line. A significant ( $p < 0.001$ ) increase in mean Hb levels was observed in both the groups at end line. However, the extent of change was not significantly different between the two groups.
6. The mean serum ferritin levels increased significantly ( $p < 0.001$ ) from 24.7 to 32.9

µg/L in the experimental group after intervention. In control group the levels decreased marginally.

7. The mean CRP levels remained similar between and with in groups both at baseline and end line of the study.
8. The total number of child feeding days achieved was 8667 in the experimental and 8632 in the control groups. The mean number of child feeding days achieved was 133 per child in the control group and 138 per child in the experimental group, indicating compliance rate of about 80%.
9. The average intake of rice ranged from about 103 to 111 g per child per meal and was comparable among the study groups both at base line and end line. The average intake of iron ranged from 1.9 to 2.1 mg per child per meal in control group and experimental group.
10. There was a mean increment of about 1g/dL in control and experimental group. No significant difference in the increments of haemoglobin was observed between groups.
11. The mean change in the ferritin levels was significantly ( $p < 0.001$ ) higher in the experimental group (8.2 µg/L) compared

to the control group (-3.0 µg/L), with 95% CI of 5.9 – 16.5 µg/L. Similar results were made even after excluding the data of children with C reactive Protein levels of  $> 0.8$  µg/L (indicative of infection).

12. The change in Haemoglobin and ferritin values between base line and end line was assessed by three methods of regression analysis. All the three models viz. absolute changes, analysis of covariance and Residual change yielded similar results for haemoglobin as well as ferritin. The change was statistically significant with respect to ferritin ( $p < 0.001$ ).
13. The proportion of children falling sick reduced significantly ( $p < 0.001$ ) at end line in both the groups with the extent of decrease being significantly higher ( $p < 0.01$ ) in the experimental group compared to the control group.

## CONCLUSIONS

The findings of the study indicate that rice fortified with iron UR improves the iron stores, reduces the morbidities among school children participating in the mid-day meal programme suggesting that fortification of rice with iron ultra rice through mid day meal programme can be considered as a strategy to prevent iron deficiency among children.

## 3 ASSESSMENT OF NUTRITIONAL STATUS OF <3 YEARS CHILDREN AND INFANT AND YOUNG CHILD FEEDING AND CARING PRACTICES IN MEDAK DISTRICT OF ANDHRA PRADESH

Government of Andhra Pradesh, with UNICEF assistance, 'SANKALP' is being implemented in the district of Medak. The objective of the programme was to reduce undernutrition and morbidity among <3 years children by improving quality of care at Anganwadi centres, making the centers more child attractive and empowerment of parents

of <3 year children and community. The programme is already being implemented in various blocks in the district at various levels.

Therefore, a situational analysis was carried out to know the current status of undernutrition and Infant and Young Child Feeding (IYCF) Practices.



## GENERAL OBJECTIVES

To assess the current nutritional status of <3 year children, infant and young child feeding practices among women, extent of coverage of beneficiaries under antenatal care, immunization, supplementary feeding, micro-nutrient supplementation Programmes etc. in Medak district of Andhra Pradesh.

## SPECIFIC OBJECTIVES

The specific objectives of the study are to assess:

1. Extent of antenatal care (ANC),
2. Prevailing infant and young Child feeding practices among mothers
3. Extent of recording of birth weight and growth monitoring,
4. Nutritional status of <3 year children,
5. Incidence of morbidities such as fever, diarrhoea, dysentery & acute respiratory infections among <3 year children,
6. Participation of the target beneficiaries in supplementary feeding, immunization and supplementary nutrition programmes,
7. Personal hygiene, psycho-social care behaviours of mothers, and knowledge and practices of service providers.

## METHODOLOGY

It was a cross sectional community based study carried out by adopting systematic random sampling procedure, 40 Anganwadi center villages were covered for various investigations in the district by proposition of Anganwadi centre in each block. About 20 children under 3 years were covered from each AWCs. The data on various parameters such as ante-natal care (ANC) during pregnancy, breast feeding and caring practices, anthropo-metrical measurements, immunization etc were collected.

The following are the salient observations:

- ✎ A total of 805 mothers and children of <3 years were covered for this survey. Of

which, 49% were boys and 51% were girls.

- ✎ About one third of HHs (33%) belonged to either schedule caste (25%) or schedules tribes (8%).
- ✎ About 60% were nuclear and extended nuclear families and 41% of fathers and 60% of mothers of index children were illiterate.
- ✎ About 30% of HHs did not possess any agricultural land and were engaged in either agricultural or other labour (50%). About 30% of the mothers of index children were housewives. A large proportion of HHs (79%) lived in semi pucca houses.
- ✎ About half of the HHs (49%) was using free flowing salt and 60% were using adequately iodized salt.
- ✎ Majority (96%) of pregnant women undergone ANC services of which about 89% had  $\geq 3$  ante natal check-ups. About 70% of deliveries took place either in govt. or private hospitals and majority (65%) was conducted by a medical doctor.
- ✎ About 85% mothers feed colostrum to the new born. About 22% of mothers each initiated breast feeding within 1 hour and 1-3 hours of delivery and about 36% initiated after 24 hours of delivery.
- ✎ Pre-lacteal feeds such as glucose water, honey etc was given to 45% of infants. Only 41% children received exclusive breast-feeding for 6 months.
- ✎ About 91% of children were completely immunized. About 49% of children received one dose and 31% received two doses of massive vitamin A during the previous one-year. The prevalence of underweight, stunting and wasting was 38.6%, 29.6% 22.3% respectively according to new WHO standards.
- ✎ Literacy of parents, occupation of parents and presence of sanitary latrine were

found to be significantly associated with under weight and stunting ( $p < 0.01$ ).

- ✎ About 50-80% of AWWs were aware of all the objectives of ICDS, about 73% villages had trained birth attendant. Anganwadi workers were present in about 88% villages, while LHV in 33% and ANM in 15% of villages.

## RECOMMENDATIONS

Improving the knowledge of AWWs about child care, regular growth monitoring, improved immunization services, promoting breast-feeding and timely complementary feeding as well as improvement in socioeconomic and literacy of parents will help in improving the nutritional status of children.

## 4 STUDY ON RELATIONSHIP BETWEEN BODY MASS INDEX AND PERCENT BODY FAT IN URBAN ADULT POPULATION

Obesity is a condition of excessive fat accumulation in the body to the extent that health and well being are adversely affected. In view of its convenience and high specificity in detecting subjects with a high percentage of body fat, body mass index (BMI) has been frequently used as an indicator of relative fatness and classification of obesity. Studies have documented that relationship between BMI and percent body fat varies with age, gender and ethnicity. Moreover, Asian Indians have had higher morbidity at lower BMI values than Caucasians. The criteria currently being used to classify overweight or obesity is BMI and waist circumference in adult Europeans, but the same cut-off levels may not be appropriate for Asian Indians.

BMI has a limitation that it can not distinguish between fat mass and fat free mass. This limitation may become important issue when comparing ethnic groups with distinctively different body proportions or physique. The BMI is unable to distinguish into Fat Free Mass Index (FFMI) and Fat Mass Index (FMI). The potential advantage is that only one component of body weight i.e., FFM or FM is related to height squared. These indices are not yet wide applications, probably because appropriate reference standards are yet to be established.

In the present study an attempt was made to study the relationship between body mass

index (BMI) and percent body fat (PBF) and also to assess the levels of FFMI and FMI by age and gender in urban adult population.

### GENERAL OBJECTIVE

To study the relationship between body mass index and percent body fat in an urban adult population of Hyderabad.

### SPECIFIC OBJECTIVES

1. To assess the body mass index and percent body fat among 20-60 years adults of different income groups.
2. To study the relationship between the BMI levels and percent body fat among individuals by income group.
3. To assess the levels of Fat Free Mass Index and Fat Mass Index by age and gender.
4. To assess the fasting blood sugar levels and lipid profile in a sub sample of subjects selected for the study.

### METHODS

#### Study Design

It is a community based cross sectional study among adult men and women of 20-60 years age group in different income groups.

#### Computation of sample size

Assumed a correlation ( $r$ ) of 0.7 between BMI and percent body fat, at 5% level of significance, with 80% of power, the required

sample size arrived at was 14. Hence, 14 individuals in each BMI unit (from BMI of <20 to 30 kg/m<sup>2</sup>), a total of 168 individuals for each gender are required. The study was carried out in various socio-economic groups in the city of Hyderabad.

## INVESTIGATIONS

Information on socio-economic and demographic particulars such as community, family type, size & income, literacy status of the selected subjects and their history of morbidity, such as diabetes, hypertension and CHD was also collected. Anthropometric measurements including height, weight, fat folds at triceps, biceps, sub-scapular, supra-iliac, waist and hip circumference were taken on all the selected subjects. The sum of all the skin folds were used for calculating body density using standard equation by Durnin and Wommersley (1974) and percent body fat was calculated using Siri's equation (1956). The fat mass and fat free mass indices are equivalent concepts to the BMI.

### The salient observations are as follows:

A total of 1032 individuals i.e., 278 from HIG, 365 from MIG and 389 from LIG were covered for the present study including both men and women, spread over different BMI units (<20 kg/m<sup>2</sup> to ? 30 kg/m<sup>2</sup>). The mean annual family income was Rs 595914, 221636, and 96936 among men of HIG, MIG and LIG respectively. Similarly the mean annual income was Rs.750608, 205327 and 95004 among women of HIG, MIG and LIG respectively. Among men, the prevalence of hypertension (SBP $\geq$  140 and/or DBP $\geq$  90mm Hg) was about 22%, 10% and 16% among HIG, MIG and LIG respectively, while it was 16%, 11% and 10% among women respectively.

✎ The diabetes (FBS ? 126mg/dL) was reported by 16.2%, 13.6% and 5.5% of men in HIG, MIG and LIG respectively, while it was 7.5%, 7.5% and 5.5% respectively among women.

✎ About 3% of men in HIG, 1.3% in MIG and nil in LIG reported CHD, while it was 0.4% among women of LIG.

✎ A significant correlation was observed between BMI and percent body fat, waist circumference, waist to Hip ratio among both men and women of different socioeconomic groups.

✎ No significant differences were observed in the mean fasting blood glucose levels, serum triglycerides and total cholesterol in different income groups.

✎ The appropriate cut off levels of BMI (Men: 23kg/m<sup>2</sup>, sensitivity: 86.9%; specificity: 69.7% and women: 22kg/m<sup>2</sup>, sensitivity: 88%; specificity: 90%) to indicate overweight, derived based on 25% body fat among men and 30% among women by using ROC analysis, which are similar to that suggested by WHO cut off values for Asian Indians (BMI: >23kg/m<sup>2</sup>).

✎ Similarly, the waist circumference cut off levels was also derived as 85cm for men and 71cm for women when all the income groups were pooled, which are marginally even below that of WHO cut off levels suggested for Asian Indians (men: 90cm and women: 80cm).

✎ The mean values of Fat Mass Index (FMI) are increased with increase in age. The median fat mass index was 4.4 among men of 20-30years, followed by 6.7 in 30-40-30years, 7.4 in 40-50years and 8.4 in 50-60years. Females had higher fat mass than males and is ranged from 6.5 in 20+ yrs to 10.6 in 50+ yrs.

✎ The median Fat Free Mass Index (FFMI) is 17.6 in 20-30years, 19.2 in 30-40, 17.9 in 40-50years and 17.3 in 50-60 years. Similar trend was also observed among women.

✎ According to ROC analysis, the FMI value at 25% body fat is 6.3 kg/m<sup>2</sup> (Sensitivity 88% specificity 93%) among men and at 30% body fat it is 6.64 kg/m<sup>2</sup> (sensitivity 95% specificity 97%) among women.

The fat mass index at different BMI values were relatively higher compared to healthy Caucasian adults.

## **5 ENDEMIC KIDNEY DISEASE IN THE VILLAGES LOCATED IN THE MICA BELT OF NELLORE DISTRICT, ANDHRA PRADESH- A PILOT STUDY**

The global End Stage Renal Disease (ESRD) patient population continues to grow at an alarming rate due to a number of factors. The etiology of chronic kidney disease sited in Indian studies was chronic interstitial nephritis apart from diabetes & hypertension. Chronic interstitial nephritis is presumed to be due to drugs or environmental toxins, and the possible environmental toxins include water and food related toxins. Several studies have shown that there was a strong association between Silica and kidney disease. Inhalation of silica dust during the mining process lead to the development of nephropathy.

Experimental studies on animals have shown that high levels of Silica in drinking water cause kidney disease.

Therefore, it is proposed to carry out a pilot study to assess the approximate prevalence of kidney disease, which will be useful in calculation of sample size for the proposed comprehensive study in mica belt of Nellore district.

### **RATIONALE OF THE STUDY**

In response to print and electronic media reports of 4 deaths and large number of people suffering from kidney diseases at Uchapally village, located in mica belt of Nellore district, National Institute of Nutrition (NIN) and Nizam's Institute of Medical Sciences (NIMS), Hyderabad carried out a rapid exploratory cross-sectional survey to know the extent of the kidney disease in Mica belt of Nellore district. The rapid assessment study revealed that, about 92% the study subjects (48 out of 52 subjects) were in different stages of kidney disease. When projected to the total population of the village, the prevalence of kidney disease was 10%.

On the basis of the results a detailed study proposal was presented before the NIN

scientific advisory committee during 2008.

The SAC members recommended to carry out a pilot study in a four villages to arrive at the prevalence of kidney disease, which would be utilized to compute sample size for the comprehensive study proposal.

The pilot study was carried out in four (2 village where mica mine are located and 2 villages in mica area, where the ground water was the source of drinking water) villages located in mica belt.

### **OBJECTIVE**

To study the prevalence of kidney disease based on estimation of Glomerular Filtration Rate (GFR) among the adult population from the selected villages located in the mica belt.

### **INVESTIGATIONS**

1. Household Demographic and Socio-economic particulars.
2. Clinical examination, including measurement of BP
3. Estimation of GFR from serum creatinine using the MDRD Study equation. This equation uses serum creatinine in combination with age, sex and race to estimate GFR.

### **RESULTS**

A total of 493 (Men: 234 & Women: 259) adult subjects were covered for the survey. The mean age is 46 years (18-82 years). The major occupation either agricultural (41.4) or non-agricultural (20.9%) labour, while in 14% of households, agriculture was the major occupation. About 36% of the subjects were working in the mica mines, where the mines are located in and around the villages, while 8% in villages are without mica mines. The main source of drinking water is bore well (86%) where mica mines are absent, while

open well (66%) is the major source in the villages where mines are present.

In general, the history of consumption of NSAIDS (Pain killers) was reported by 26% of subjects, while its consumption was reported higher (37%) in the villages where the main source of drinking water is bore well. About 14% and 4% of subjects reported that they were suffering from hypertension and diabetes, respectively.

However, on recording the blood pressure, the prevalence of hypertension was 20%, and significant differences were reported between both types of villages.

The percent of subjects suffering from breathlessness was 28% where the mines are located in and around the village, while this proportion was 12% in villages without mica mines. Similarly, about 28% of subjects reported that they had back pain/knee pain/ankle pain.

In about 18% (87) of subjects the serum creatinine was reported high (>1.5 mg/dl). The proportion of subjects with proteinuria was 21%, while the urinary sugar was positive in about 6% of subjects. In general, the prevalence of kidney disease was about 34%.