ABSTRACT

Children are the most vulnerable segment that suffers from various kinds and grades of malnutrition and nutritional deficiencies. Childhood inadequacies will certainly have irreversible and serious consequences in the adulthood. Any deviations from the growth parameters and deficiencies in childhood are easily detectable. If these are assessed at the earliest, remedial measures can be introduced to improve their nutritional status, as this is a period where in dietary deficiencies can be improved more easily than in later years. Intervention at the right juncture and subsequent rectification will thus relieve the humanity from the burden of both physical and mental agony from the resultant under nourishment.

The concern for children health has assumed a special significance in developing countries. There are numerous factors that contribute to its widespread prevalence. Realizing this fact the present cross sectional study was undertaken among 2582 children (1218 boys and 1364 girls) aged 5 to 15 years studying in 1st to 10th standards in the selected schools of Aligarh city. It was designed with the following objectives: (1) To assess the status of growth and development of school children both boys and girls by using anthropometric measurements. (2) To evaluate age and sex wise prevalence of underweight, stunting and wasting among school children. (3) To assess the differences in nutritional status by child, family and social factors. (4) To study the dietary habits and nutritional intake and examine association of food intake and nutritional status. (5) To assess the magnitude of nutritional deficiency diseases among school children by general clinical observation. (6) To assess the prevalence of Iodine deficiency disorders by clinical and biochemical examination of urine iodine excretion level. and (7) To study the association between the prevalence of Iodine deficiency disorders by child, family and social factors.

The study has identified anthropometrical variations in children, which is indicative of under nutrition. It also ascertained the different grades of nutritional status prevailing in children. The relevant data on child, family and social status has revealed the degree and extent of cause effect relationship of these variables on
nutritional status of the children. The clinical examination of children has revealed the extent of various deficiency diseases prevailing in children. The in-depth clinical examination of children indicated the presence of different grades of goitre prevalence. The data analysis revealed the magnitude of various social factors influencing the goitre prevalence. The biochemical analysis has shown iodine content in urine and revealed the current iodine status of the children.

The children were screened for anthropometric measures and for other child, family and social status related information. The majorities of children were either first or second born and had family size of four members or less. The families were found to be mostly nuclear. The per capita monthly income of the majority group was less than Rs 1769 per month. Most fathers of the children were college educated and belong to the service class. A very low percentage of mothers of the children had college education and percentage of the working mothers was also low.

The study has indicated that the mean weight of boys was consistently lower than ICMR well to do children differing from 2.5 kg to 9.43 kg across the ages. When compared with ICMR standard, the boys weighed 71.4 to 87.01 percent of ICMR standards. The mean weight of girls was also lower than well to do children differing from 3.43 kg to 13.97 kg across the ages and they weighted 67.43 percent to 89.72 percent of ICMR standards. Mean weight of the boys was marginally better than that of the girls. Nevertheless, the boys were found to be heavier than girls up to 9 years and from 10 to 12 years, the differences between boys and girls were very marginal and then from 13 years onwards boys surpassed girls in weight.

Results on height of boys indicated that boys were shorter than well to do boys of ICMR by 2.95 cm to 9.33 cm from 5 year to 15 years and were measuring 93.03 to 98.31 percent of ICMR standard. Similarly, the girl's stature differed on the negative side ranging from 2.18 to 12.79 cm and showed 88.6 to 96.61 percent of ICMR standard statures. On comparison between the mean height of boys and girls, the result shows that boys have significantly higher height than girls except for the age group 7, 8, 9, 11 and 12 years. Adolescent spurt of growth appeared from the 9th
year onwards in girls and from 10th year onward in boys. Maximum gain in height occurred between 10 to 12 years in girls and from 13 to 15 years in boys.

On comparison between the mid arms circumference of girls and boys, the study revealed that the boys had significantly higher mid arm circumference than the girls at age 8, 9, 11, 12, 14 and 15 years. A reverse trend was observed in case of the triceps skin fold thickness of girls which showed a significantly greater values than those of boys for all ages except at 10 years age group, where the triceps skin fold of girls were marginally lower than boys due to the onset of pre-adolescent period which occurred earlier in girls than boys.

The study depicts a true image of the health status of school children of Aligarh. The children had lower height and weight as compared to most international and national studies. Their growth standards, however, are equally comparable to figures only from very few studies reported.

The findings revealed a direct correlation between nutritional status and confounding factors like increased birth order, literacy and educational level of mothers, inadequate health related knowledge, occupational status of mothers, poor hygiene conditions, occupation of both fathers and mothers and income level. These factors in turn affect the socio-economic conditions and have significant bearing on the growth status of the children. It can be concluded from the study that Aligarh children were lagging behind physical development when compared to ICMR and NCHS standards. The lagging is more in weight than in stature and hence, there is a considerable room to improve the school children physical status.

For assessing the nutritional status for each age group by sex, the weight and height measurement were converted into weight for age (underweight), height-for-age (stunting) and weight for height (wasting) for each child into different nutritional grades. The percentage of boys showing normal weight for age after statistical analysis was found to be 18.6 per cent with 81.4 percent underweight children. When grade I, II and III were considered together for boys the prevalence ranged from a minimum of 57.9 percent in 15 years to a maximum of 96 percent for 7 year old. In case of girls of 5 to 15 years, 15.7 percent were found to be in the normal grade with
84.3 per cent underweight. When grade I, II and III undernourished children were clubbed together the prevalence of overall undernourishment children ranged from a minimum 54.8 per cent in 14 and 15 years to 96.7 per cent for 7 year old girls. The overall prevalence of underweight for both boys and girls were 82.9 per cent.

The age wise analysis revealed that for both boys and girls, a higher rate of prevalence of undernourishment was observed for the younger age group up to 12 years of age and from 13 years onwards a comparatively lower prevalence was observed in the children.

On comparison of overall prevalence of under nutrition between boys and girls, again the girls showed a high prevalence of 84.33 per cent where as boys figure stood at 81.4 per cent. Similarly the prevalence of underweight in the study was higher among the girls than the boys. The higher prevalence in girls than boys may be attributed to the fact that the child rearing practices for male children is more careful than female children in our male dominated society. The preferential treatment and feeding of male children over female has been commonly observed.

The findings revealed that out of 1218 boys, 56 per cent fall within normal range of height for age with 36.8 per cent in grade I, 6.7 per cent in grade II of stunting. Only 0.41 per cent was found in grade III category of stunting.

The analysis showed that in case of girls, out of 1364 subjects, 36.2 per cent were found in the normal grade, with 50.1 per cent in nutritional grade I, and 12.8 per cent in grade II and 0.9 per cent in grade III nutritional status. The overall analysis revealed that the total prevalence of stunting was 54.5 per cent with 43.88, 9.95 and 0.6 percent in grade I (mild), grade II (moderate) and grade III (significant) stunted children respectively.

In comparing the growth status of Aligarh children with other growth studies in India the findings were not in total agreement. It was observed that with regard to some studies there was a similarity and for others a high prevalence rate was observed in the present study.
On age wise analysis, the study observed that as in case of underweight a higher prevalence of stunting for both boys and girls was found in young children in the age group of 5, 6 and 9 years with a minimum prevalence in 14 and 15 years.

It has been reported that as long as height-for-age is stable after the minimum age of school enrolment (6 years) then there is little or no catch-up growth and heights for age at 8 or 9 years reflects the effect of early childhood nutrition. In the present study, the children in the age group of 5, 6 and 9 years were found to be suffering from higher rates of stunting, thus reflecting the nutritional deprived condition during the early years of life.

On comparison between girls and boys the overall prevalence of stunting showed that more girls than boys are experiencing different forms of stunting.

With respect to wasting of boys, 85.5 percent were found to be in normal grade with 12.3, 18 and 0.3 per cent in grade I, II and III respectively with an overall prevalence of 14.5 per cent wasting.

The result relating to prevalence of wasting in girls revealed that 87.5 per cent were in normal range with 10.3 per cent in grade I category, 1.46 per cent and 0.73 percent in II and III category with the overall prevalence of 12.5 per cent wasting in girls. The analyses revealed an overall rate of wasting 13.4 per cent. When the prevalence for all the three nutritional grades are considered together, the overall prevalence was found to be highest for 12 year with 34.7 per cent followed by 15 years with 20.2 per cent and a nil prevalence for 8 years.

The higher proportion of malnutrition in children was observed in the study calls for greater vigilance and more immediate solutions. To strengthen relevant intervention programmes for combating the malnutrition among children, it is suggested that focused targeting be emphasized. Nutrition education programmes should be imparted to school children. More importantly nutrition advocacy to policy makers should be intensified.

The other aspects the study examined were child, family and social factors. The findings shows that the percentages of children with normal nutritional status were slightly higher in children having two siblings 22.18 percent in comparison to 8.1
percent in 7th and above born children. The prevalence of undernourishment was 84.2 per cent in children with three or more siblings in comparison to 81.8 per cent in children having less than two siblings. The children belonging to small families showed comparatively lower prevalence of malnutrition. The prevalence of underweight by family size shows an increasing trend with increase in number of family members.

The data analysis relating to parental education indicates that nutritional status progressed with increase in mothers as well as fathers educational level. The study also found three-time higher prevalence of severe grade of malnutrition in children of illiterate mothers. The positive correlation of education and the nutritional status, thus emphasize the fact that education is a catalyst of change and its role in the process of human resource development cannot be ignored. Women’s education is also critical for meeting the region specific, demographic and health goals in growing urban centers like Aligarh city.

The study noticed that the socio economic disparities between the children of educated and uneducated parents were a contributory factor for the differences observed. The study found that low income and large family size go hand in hand. The effect of these two factors has very much influenced the nutritional status of the young children.

Nutritional status of children increased with increase in parental occupational level. Further on comparison of prevalence of malnutrition between paternal and maternal occupation, it was observed that children of occupational mothers suffers lesser degree of malnutrition, about 60.16 percent of children in comparison to 82.67 percent of malnourished children of paternal occupation. With regard to the prevalence of severe degree of malnutrition the analysis revealed that there were no children in severe grade of mothers who were engaged in professional, service and skilled occupations, but with regard to father’s occupational level, only professional and service categories did not show any severe grade malnourished children. It was found that relatively low percentage 56.90 percent children of working mothers were
suffering from malnutrition against 94.56 percent in children of non-working mothers.

An inverse trend was noticed in nutritional status of the children as the income decreased. The prevalence of malnutrition in the lower income group was the highest in comparison to other income groups.

The overall prevalence of malnutrition was found to be somewhat high in the vegetarian children (84.36 percent) in comparison to 81.7 percent in non-vegetarian children. However, no significant relationship was seen between the prevalence rate and religion in this study.

The observations of the study revealed that ordinal position contributes the most to the nutritional status followed by education and occupation of mother, occupation of father, and socio-economic status. As the problem of malnutrition amongst school children should also be addressed at home level, the factors identified in the study are important for the development of relevant interventions at the domestic plane. The higher prevalence of malnutrition with increasing birth order highlights the need for limiting the family size to improve the nutritional status of these children. Measures like maintenance of proper birth spacing between each child, as well as limiting the family size with one or two children should be emphasized on urban educated families too. Measures like improving the educational level of girl child (would be mother), removal of gender discrimination, providing job opportunities to them so as to improve their financial conditions are also the priority issues. Appropriate multifaceted community based programmes are also required for stimulating growth and development of school children.

On comparison of food intake between normal and underweight children it was found that dietary intake of cereal differ significantly. The study revealed that the average consumption of cereal, pulses, meat and other food groups except roots and tubers and fats were substantially below the recommended allowances. Between boys and girls the consumption of milk and meat products were found to be higher for boys as compared to girls. The average calorie intake was found to be deficient for all age
groups except 5-6 year age group children. The result revealed that the average intake were inadequate for the entire nutrients except for calcium, thiamine and riboflavin.

Statistical analysis showed an overall 29.86 per cent prevalence of anemia in Aligarh children with 32.33 percent in girls and 27.09 percent in boys. In contrast to highest prevalence of under weight, stunting and wasting and other nutritional deficiency signs, the prevalence of vitamin-A deficiency was low. The total overall prevalence was found to be 13.86 with 12.64 per cent in boys and 14.95 per cent in girls. The signs of vitamin B complex deficiency like angular stomatitis, cheliosis and glossitis were observed in 15.82 percent children. In girls the prevalence of vitamin B complex was 19.10 per cent. It was observed to be higher than the boys’ figure of 13.13 per cent. Data analysis revealed that 37.02 per cent of children had shown clinical sign of dental carries.

Eighty five children out of 1218 boys (6.97 %) and two forty nine girls (18.25%) out of 1364 were found with the signs of different grade of goitre with total prevalence of 12.93 per cent, signifying the existence of iodine deficiency in Aligarh.

The research revealed that though prevalence was high in the deteriorating condition of nutritional status, with highest prevalence 58.97 percent in grade III of nutritional status, children with normal nutritional status were not spared as 7.72 percent children of normal nutritional status were also found with symptoms of OB grade of goitre, thus calling for an immediate intervention programme to control and prevent the iodine deficiency disorder in children irrespective of their nutritional status.

A slight increase in the rate of prevalence with decreasing income group was observed. The high prevalence of goitre in low socio economic status was due to the intake of non iodized salt, faulty food habits (prolong high intake of goitrogenic food), ignorance about effect of iodine deficiency disorders, and ionization of salt. It has been observed that socio economic status of people is also related with the general awareness regarding iodine deficiency disorder. Improvement in the socio economic status will lead to greater awareness regarding the problem.
When overall goitre prevalence rate was analyzed according to the food habits, it was found that the vegetarians showed higher goitre prevalence 17.53 percent than the non-vegetarians with 9.18 percent of goitre prevalence.

On analysis it was observed that the overall prevalence of goitre was low (9.94%) in children taking iodized branded salt in comparison to children (19.94%) taking non-iodized branded coarse or open salt.

Result revealed that 75.27 percent of the iodized salt had an iodine content of 15 ppm and more whereas all the crystalline salt samples had iodine content of less than 15 ppm. About 35.27 percent of crystalline salt had no iodine content at all.

On comparison between Iodine content of salt and prevalence of goitre, it was observed that almost all the children (194) who were consuming salt with nil content of iodine showed different grades of goitre with 25.25 percent on OB grade, 54.12 percent in grade I and 20.61 percent in grade II category. On analyses for urinary iodine excretion, only 5 girls (1.83%) were found to have UIEL of <2.0 µg/dl (severe iodine deficiency). It was found that 3.66 per cent and 8.05 per cent have UIEL of 2.0-4.9 µg/dl and 5.00-9.9 µg/dl. respectively. The overall median urinary iodine excretion of the girls studied was found to be 11.65 µg/dl.

Out of 244 boys studied it was found that only 1 boy (0.40%) showed urinary excretion level of <2 µg/dl, and 3 (1.22%) and 6 (2.45%) had 2-4.9 µg/dl, and 5-9.9 µg/dl urinary excretion level respectively. The median urinary iodine excretion level of boys studied was found to be 14.60 µg/dl. When the total iodine urinary excretion level for both boys and girls (517 children) was analyzed, it was observed that 6 (1.16%), 13 (2.51%) and 28 (5.41%) of the children had urinary iodine excretion level < 2, 2-4.9, and 5-9.9 µg/dl. In the present study the median urinary iodine excretion of the children studied was 12.64 µg/dl indicating that there was no biochemical deficiency of iodine in the subjects studied.

The total goitre prevalence rate of 12.93 percent found signifies the existence of iodine deficiency in Aligarh city, necessitating corrective intervention on priority basis. These findings indicates that to achieve elimination of iodine deficiency disorder from the city, there is a need for appropriate multifaceted community based
programmes such as monitoring the quality of iodized salt, improving nutrition education about the impact of dietary goitrogen and the importance of iodized salt.

The study revealed that in children the major clinical conditions encountered were anemia, dental carries and vitamin A deficiencies. Infection of skin and eyes were also observed to be more common. The higher prevalence of anemia in younger age group makes a strong case for continuing iron tablet supplementation from preschool to school age group also. The overall higher incidence of dental caries apart from poor hygienic care of teeth in children probably reflects fluoride content of drinking water and hence necessitates further in depth research exploration. The intervention programme of supplementary vitamin and minerals that are mainly focused on preschool children should also be imparted to the school age children. The observations of the present study suggest that the nutritional status of school children in the city is unsatisfactory. Majority of the children are underweight and are suffering from various nutritional deficiencies. The overall health conditions of children are poor and necessitate a routine thorough health checkup for diseases, which result in ill health and poor academic performance. The appalling state of health of school children as revealed in this study emphasizes the need for establishment of proper 'school health clinics in cities and urban centers having significant proportion of school children.