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A Study on Factors Influencing Nutritional Status of Children in Uttar Pradesh

Sarita Rohatgi[1], Meenu Aggarwal [2]
1 Indira Gandhi National Open University, 2 Shyama Prasad Mukherji College for Women,
meenuag63@gmail.com

Abstract
This study was conducted to assess the factors influencing nutritional status of children (7-9 years) belonging to low and middle socio-economic strata of Mawana, Uttar Pradesh. Analysis of their diet revealed a predominantly cereal pulse based diet and low consumption of milk, green leafy vegetables, fruits and animal foods. Mean daily intake of energy, iron and vitamin A was below recommended dietary allowances. Nutritional status in terms of BMI for age Z-score revealed 56% subjects showed thinness (z score -2SD to -3SD) and 2% showed severe thinness (z score <-3SD) while 41% subjects were normal belonging to BMI for age z score +1SD to -2SD. BMI for age z score was significantly affected by energy intake, total NAR, total income of family and mothers' education. Twelve percent subjects also had clinical signs of PEM. Sixty one percent subjects had one or more clinical signs of Iron Deficiency Anemia (IDA). Anemic status of subjects was significantly influenced by iron intake, energy intake and total NAR. None of the subjects had any clear clinical signs of Vitamin A deficiency.
Key words: nutritional status, children (7-9 years), BMI for age Z score, Iron Deficiency Anemia

1. INTRODUCTION

India is one of few countries in world where poor nutritional status among young children is detrimental to their health outcome. According to WHO and NFHS-3; one in three children in India suffers from stunting and one in two children from underweight (ACC/SCN, 2004). Data from NFHS-3 indicates that six states account for majority of underweight children in the country. These include Uttar Pradesh, Bihar, Jharkand, Chhatisgarh, Gujarat and Madhya Pradesh. Children belonging to socially backward groups like scheduled castes are highly susceptible to under nutrition (Uppal et al, 2005).

2. METHODOLOGY

A total of 100 children (7-9 years) belonging to low or lower middle socio economic group were selected. Locale of the study was a private school catering to low and middle class families of Mawana, Uttar Pradesh. Subjects were students of class 2nd, 3rd and 4th. In these classes there were three sections each, one section from each class was selected for the study.

Data was collected with the help of an interview schedule. Parents were interviewed to get data about their socio demographic profile. Subjects and their parents were interviewed with the help of a questionnaire to get data about dietary pattern by 'Food Frequency Questionnaire'. Dietary assessment was also done by '24 hours recall'. From this data daily of energy and other nutrients was calculated. Nutrient Adequacy ratio (NAR) for nutrients was calculated. If NAR was less than 66% it was given a score of 1, value between 66% and less than 100% were given a score of 2, while score of 3 was given for values of 100% or above. From this Total Dietary NAR was also calculated and were categorized.

Height of subjects was measured to nearest millimeter using height scale. Subjects were weighed on a weighing scale and weight was taken to the nearest 0.5 Kg. From these values BMI for age Z-scores were calculated and compared with WHO norms (2007). Influence of various factors on BMI for Z-scores was studied with help of regression analysis. Clinical examination for presence of Protein Energy Malnutrition (PEM), Iron Deficiency Anemia (IDA) and vitamin A Deficiency (VAD) was done. Subjects were classified as Normal or Deficient on the basis of these signs. Factors influencing IDA were also studied using regression analysis. Significance was studied at level of $p<0.01$.

3. RESULTS AND DISCUSSION

The study was conducted on 100 school children in the age group of 7-9 years. The aim of study was to find out the nutritional status of these children in terms of their anthropometric measurements and clinical signs of iron deficiency anemia and vitamin A deficiency. Data was also collected to study various factors that may influence nutritional status of these children.

Socio Demographic Profile of the subjects: The subjects were students of a private school in Mawana, Uttar Pradesh. Mawana is a small town near Meerut, where not only Hindus (general category) but also a large population of Muslims and schedule castes live. This area has many private primary schools where fees is very nominal as they cater to children belonging to lower and middle socio economic groups.

In this study, there were fifty six boys and forty four girls. In terms of religion, 64% were Hindus. Among Hindus, 39% belonged to general category castes while 25% belonged to schedule castes. Number of Muslim subjects was 36%. Total monthly family income was compiled. In 8% families it was less than Rs 5,000 while a large number (69%) reported it to be between Rs 5,000 to Rs10000. In 23% families it was more than Rs 10,000. Total family income ranged from Rs 2,500 to Rs 18,000.

Literacy levels of parents was not very high. Thirteen percent mothers were illiterate, while 57% reported to have studied up to middle classes. Fourteen percent had studied up to class 12^{th} while 16% were graduates. Education level of fathers was slightly better as none of them was illiterate, however 58% fathers had studied up to middle class only and remaining had studied higher. It was clear that two child family norm was not being followed, as 43% subjects had more than one sibling.

Dietary intake of subjects: Data collected about dietary intake of subjects by 'Food Frequency technique' revealed their diet to be predominantly cereal and pulse based. Wheat and rice were the main cereals consumed while de-husked pulses were also consumed. Consumption of milk was low, while other animal foods like meat, eggs were consumed infrequently even in non-vegetarian families. Rich sources of iron like green leafy vegetables, sprouted pulses, millets etc. were also not consumed in good amounts.

Data on Dietary intake of subjects was also collected by '24 hours' dietary recall'. From this data their energy, protein, iron and vitamin A intake was also calculated. Mean daily intake of energy, protein, iron, vitamin A and calcium was 1221 Kcal, 31.4 g, 7.7 mg, 309 retinols and 420 mg respectively. Mean intake of all nutrients except proteins was lower than RDA (ICMR 2010). There were no significant differences in mean intake values of these nutrients by boys and girls. It meant that there was no gender discrimination in terms of giving food. Nutrient adequacy ratio (NAR) values were calculated for these four nutrients. From these total dietary NAR was also calculated. It was poor in 52% subjects and only fair in remaining 48% subjects.

BMI for age Z Scores: The height of subjects was measured to nearest of 0.1 cm and weight was taken to the nearest of 0.5 Kg. From the data on height and weight of subjects BMI for age Z-scores were computed and compared to the gender and age specific norms of WHO, 2006.

Table 1: Distribution of subjects according to BMI for age Z- scores

BMI for age Z-scores*	Grade	n (%)
+1SD to +2SD	Overweight	1
+1SD to -2SD	Normal	41
-2SD to -3SD	Thinness	56
-3SD	Severe Thinness	2

*Reference; BMI for age (5-19 years) for Boys/Girls Z-scores, WHO (2007)

Only one subject was overweight, forty one were normal (belonging to z score of +1SD to -2SD), while a very large number, 56% showed thinness belonging to z score -2SD to -3 SD while 2% showed severe thinness as per WHO classification (2006) of BMI for age Z scores. Thus, overall 58% subjects had poor BMI for age z scores (Table 1). It was decided to study various factors which could have been responsible for such poor z scores.

For BMI for age z scores the influencing factors tested by regression analysis were total NAR (poor, fair and good), Total monthly income (less than Rs.5 000, Rs 5,000-10,000 and Rs 10,000-20,000), Energy

intake, Number of siblings (0-1/2 or more), Gender (male/female), religion (Hindu/ Muslim) and mother' education (illiterate, up to middle, up to senior secondary, graduate or above).

Table 2: Association of BMI-Z scores with different variables

Variable	Standard Error	Effect Parameter	Significance Level
Number of Siblings	.083	-.447	.001*
Total NAR	.057	.478	.001*
Total Income	.000	.431	.001*
Energy Intake	.000	.631	.001*
Gender	.143	.061	.549
Religion	.148	.038	.709

*Significant as tested by regression analysis, $p<0.01$

The factors which influenced BMI for age z scores were number of siblings, total NAR, total monthly income, energy intake of subject and mothers' education (Table 2). Child with two or more siblings was at a disadvantage as this factor significantly influenced his or her BMI for age z- score. It was clear that in families from poor socio economic strata, restricting number of children can be a step in right direction.

It was found that total NAR as well as energy intake of subjects was significant in affecting the BMI for age z-scores. Thus it was clear that a diet poor in calories as well as protein and micronutrients was responsible for poor BMI for age z-scores.

Significant association of income group with BMI for age z-sores clearly indicated that poverty was an important culprit responsible for lower growth of subjects than their potential. Significant association of mothers' education with BMI for age z-scores of subjects indicates that a mother who is more educated even in low or middle income group is more likely to provide a nutritious diet, a better and safe environment for child to grow. Similar results have been found in a study in West Bengal where mothers' education level was found to be significantly associated with nutritional status of child. (Mukherji et al, 2008).

Many studies have shown gender discrimination as in a study by Neelu et al (2010), girls were more malnourished than boys. Another study done by Bharti and Sunande (2005) also gave similar results. Some studies have shown boys to be more malnourished than girls (Sil et al, 2011; Bose et al, 2008). However in the present study, it was found that gender of the child was not significantly with his BMI for age z-score. It points to the fact that there was no gender discrimination in the study sample. Similar findings have been reported by Panda et al (2010), where nutritional status of boys and girls was same. In present study, religion of child did not affect his BMI for age z-score significantly.

Data on clinical symptoms of Protein Energy Malnutrition: Data on clinical symptoms of PEM revealed that two percent children had muscle wasting, in 12% subjects' depigmentation of hair was observed and 11% of the subjects had thin sparse hair. Overall 12% subjects had one or more symptoms of PEM.

Iron Deficiency Anemia: Globally iron deficiency anemia ranks as number one nutritional deficiency. India has the highest prevalence of anemia and largest number of anemic persons in the world (Kakkar et al). In this study, pale conjunctiva an indicator of iron deficiency anemia was observed in 61% of the subjects, 14% had pallor of eyelids, 40% had pallor of nail beds and only 7% had pallor of palms. Overall 61% subjects had one or more symptoms of iron deficiency anemia (IDA). Srihari et al (2007) also reported high prevalence of anemia in a multi centric study among children. This is very alarming as iron deficiency leads to impaired cognitive performance and decreased growth (WHO, 2001).

It was decided to analyze factors responsible for prevalence of anemia by regression analysis. For IDA the influencing factors tested by regression analysis were iron intake, gender, energy intake, religion (Hindu/ Muslim) and total NAR.

Table 3: Association of IDA with different variables

Variable	Standard Error	Effect Parameter	Significance Level
Iron Intake	.026	.535	.001*
Gender	.098	.131	.196
Energy Intake	.000	.622	.001*
Religion	.103	-.044	.661
Total NAR Score	.041	.397	.001*

*significant association as tested by regression analysis ($p<0.01$)

It was clear by regression analysis that factors which influenced anemic status of subjects were iron intake, energy intake and total NAR (Table 3).

Significant association of dietary intake of iron with IDA indicates to role of predominantly cereal based diets in causing anemia among subjects of this study. Energy intake was also found to be a significant factor. As main source of iron in the diet were cereals and pulses which contributed to energy also, therefore a child who had sufficient intake of energy was less likely to show clinical signs of anemia. Also chances of getting iron rich foods were higher in families where children were getting at least sufficient amount of calories. Anemia was also found to be influenced by total NAR as Vitamin A and protein improve absorption of iron. NAR score also included iron intake.

Gender was an insignificant factor for IDA. It could be because at that age menstrual cycle has not yet started in girls. Also analysis of dietary intake of iron among boys and girls revealed insignificant differences. Religion (Hindu/ Muslim) was also an insignificant factor affecting anemia in this study. It indicates to non-significant differences in dietary patterns among subjects from different religions.

Vitamin A Deficiency: None of the subjects had any clear signs of VAD. However in view of low vitamin A intake it is likely that many of them had subclinical VAD. No tests were done in this study to detect sub clinical VAD.

4. CONCLUSIONS

The study revealed that children were not reaching their potential in terms of weight and height as revealed by low BMI for age Z scores. Significant factors were dietary intake, family income, caste (being schedule caste), number of siblings and mothers education.

Clinical signs of PEM and IDA were present in 12% and 61% subjects respectively. Clinical signs of VAD were not present. High prevalence of anemia appeared to be due to poor diet of subjects. The significant factors were iron intake, energy intake and total NAR.

5. LIMITATIONS

The study was conducted in a private primary school and hence may not represent all children (7-9 years) from low-middle socio economic groups of Uttar Pradesh.

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