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## **NUTRITION PROFILE OF CHILDREN RECEIVING MID-DAY-MEAL IN RURAL SCHOOLS OF RAJASTHAN**

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### **ABSTRACT**

The present study was conducted to assess the nutritional profile among 129 subjects (10-13 years) of VI, VII AND VIII class of rural government schools of Rajasthan. Tools and techniques used included pre-tested interview cum questionnaire schedules to elicit information on socio-demographic profile, household characteristics, mid-day- meal acceptability, and dietary pattern. Dietary assessment was done using 2 days 24 hour-recall and food frequency questionnaire. Anthropometric measurements were done in terms of height and weight. Mid day meal contribution to total energy and protein intake per meal was also calculated. Salient findings indicate that the prevalence of underweight among boys and girls was 66% and 55% respectively according to WHO 2007 standards. The prevalence of stunting was 51% among boys and 40% among girls. Estimates of dietary adequacy based on dietary guidelines and requirements (RDA) showed wide gaps in the adequacy for all food group and nutrients. Mean nutrient adequacy was low for energy (62-72%), protein (64-86%), iron (42%-58%), vitamin A (25%), vitamin B6 (2%-2.5%). Also, mean percent adequacy of cereals (40%-50%), pulses (40%), green leafy vegetables (30.5%), fruits (39%) was low among the subjects. Low intake of nutrient reflects the poor nutritional status of the subjects. MDM consumption was irregular. Meals on different days meet only 39 - 51% of the calories and 43- 46% of the protein according to standard MDM norms. It contributed to 30% of total energy intake and 25% of protein intake by the subjects. The existing MDM programme should further be strengthened to improve the compliance to gain maximum benefits for young children.

**Keywords:** *Mid- Day Meal, Nutritional Profile, School Going Rural Children*

### **INTRODUCTION**

Children play an important role in the development of the country. Child health as an area of policy option has been given much attention by health economists, public health experts, planner's etc. Children are vital to the nation's present and her future. They have begun to be recognized not only for who they are today but also for their future roles in creating families and powering the work force of the society. Poor child health and nutrition impose significant and long-term economic and human development costs - especially on the poorest countries and communities. Improving child health and nutrition is not only a moral imperative but also a rational long-term investment (Dey *et al.*, 2011). Under five years old children are targeted for priority care under various maternal and child health programmes, but school age children (5-15 years) are not given due attention. No coherent, coordinated and effective health service is available in the country for this group of school going children (Chandra, 2010).

The main nutritional problems faced by the school-age child include stunting, underweight, anaemia, iodine deficiency disorders and vitamin A deficiency. In countries experiencing the 'nutrition transition', overweight and obesity are emerging as problems in the school-age child. Other health problems being faced by school-age children are malaria, helminth infections, diarrhoeal diseases, respiratory infections. Much of the disease burden derives from the poor environmental conditions in which children live under exposure to biological, chemical and physical hazards in the environment and a lack of resources essential for human health.

**Research Article**

Eighty percent of primary-school age children (6-10 years) attend schools (87% in urban areas and 78% in rural areas). School attendance drops to 69 percent for children age 11-14 years and is only 38 percent for children age 15-17 years. Gender disparity in education is quite prominent in the school age population, with only 57 percent of girls age 6-17 years attending school, compared with 77 percent of boys in the same age group. In every age group, the disparity is higher in rural areas than in urban areas. Among children age 6-10 years, the gender disparity in school attendance is only 4 percentage points in urban areas and 17 percentage points in rural areas. At ages 11-14 years and 15-17 years, there is a sizeable gender disparity in favor of boys in both urban and rural areas (NFHS-3, 2005-06).

One of the largest studies of anthropometric status of rural school children in 5 low income countries (Ghana, Tanzania, Indonesia, Vietnam and India) found the overall prevalence of stunting and underweight to be high in all five countries, ranging from 48% to 56% for stunting and from 34% to 62% for underweight. Second, in all countries there was a trend for z-scores for height-for-age and weight-for-age to decrease with age, thus, as children got older they became progressively shorter relative to the reference population. Third, the boys in most countries tended to be more stunted than girls and in all countries, boys were more underweight than girls (Partnership for Child Development, 1998).

A study was conducted in rural areas of west Bengal to ascertain the growth and nutritional status of adolescent school girls (5<sup>th</sup> – 8<sup>th</sup> class) in the rural area. The results revealed that the weights and heights of these girls were below those of standard value. Only 28.2% subjects were in the normal category and the percentage of subjects suffering from Grade I (25.7%), Grade II (30.4%), Grade III (13.7%) and Grade IV (1.9%) malnutrition was quite prevalent in this study. With respect to height for age index, 65.2% of the subjects were in the normal category, 32.6% had mild retardation and about 2.2% had poor status. This study shows widely spread prevalence of malnutrition among rural adolescent girls (Maiti *et al.*, 2003). ICMR multicentre study indicated 90% anaemia in adolescent girls (Toteja *et al.*, 2006).

In 1995, government started mid day meal program to foster nutritional support to primary education children. The main objective of this particular programme is to encourage poor children, belonging to disadvantaged sections, to attend school more regularly and help them concentrate on classroom activities as well as to improve their nutritional status. In 2007, government extended MDM programmed from VI to VIII class. They try to provide 1/3<sup>rd</sup> of RDA according to their age (MDM Guidelines, 2010).

**Table 1: Cyclic Menu Provided in Rajasthan**

Day	Menu	Day	Menu
Monday	Khicdi+Chapati+Soya-Aloo Veg	Thursday	Dal+Chapati+Banana
Tuesday	Dal+Chapati+Rice	Friday	Veg+Chapati+Rice
Wednesday	Khadi+Chapati+Rice	Saturday	Veg+Chapati+Kheer

This particular age group of 10- 13 years is of more concern for future of India. They are more prone to macro as well as micronutrient deficiency as discussed above. Limited information is available on the nutritional status of the rural school children (age group 10-13 years). Hence, the present study was undertaken with the following objectives.

**Objectives**

➤ *General Objective:*

- To assess the nutritional profile of rural school children of class VI, VII and VIII receiving mid-day-meal.

➤ *Specific Objectives:*

- To assess nutritional status of the rural children.
- To assess their dietary intake.
- To assess the acceptability of MDM by students.

## **Research Article**

### **MATERIALS AND METHODS**

#### ***Methodology and Techniques***

The present study was conducted on rural school going children (class VI TO VIII) in 2 villages of Jaipur district of Rajasthan. A total of 3 government schools one school at Charanwala village and two schools in Beelwa village were included in the present study. The data was collected in the year July 2011 to December 2011.

#### ***Inclusion Criteria:***

- a) Willingness to participate
- b) Age group 10-13 years

#### ***Exclusion Criteria:***

- a) Students suffering from any medical complication.
- b) Those taking Iron Folic Acid (IFA) Supplements.

For the present study, interview cum questionnaire schedules were developed, pretested and used for the collection of required information from study volunteers. The first performa was to elicit socio-demographic profile, background information and morbidity pattern and second performa were used to collect information regarding the acceptability of Mid- Day- Meal. Microtoise and Tanita digital weighing scales were used for anthropometric measurements. Dietary pattern was studied by using 24 hour-recall and food frequency questionnaire. 24-hour recall was collected for 2 days. All the data was consolidated on excel sheet.

Rechecking of the consolidated result was done to ensure accuracy. Mean, median, standard deviations range was obtained for quantitative data, like age, heights, weights, food group intake and nutrient intake. SPSS 16.0 package was used. Dietary analysis was performed by using Nutritrust Software. The dietary intake of the subjects was evaluated against Recommended Dietary allowances (RDA) as well as calorie percentage contribution of MDM was analysed. BMI for age and height for age were calculated and compared with World Health Organisation (WHO) (2007) reference for 5-19 years using Anthroplus software developed by WHO (2007).

### **RESULTS AND DISCUSSION**

The sample of the study comprised of rural government school children studying in class VI, VII and VIII. They belonged to two 2 villages of the Jaipur district namely Charanwala and Beelwa. Out of 129 subjects covered only 12 were from Charanwala village and remaining 117 were from Beelwa village. The age wise distribution of subjects shows that all the subjects were in the age range of 10-13 years, with maximum frequency (57) in the age group of 13 years. Only 9 subjects were 10 years old. Out of 129 students, 53 (41%) were boys and 76(59%) were girls. Girls were more than boys as one of the school at Beelwa village was girl's school. In the present study, all the subjects were Hindus. Majority of the subjects (51.9%) belonged to underprivileged categories and 48.1% of the subjects were from general category.

It was observed that 56.7% of the fathers and 22.5 % of the mothers were engaged with the skilled job (fixed job). Out of 129 subjects, 80.6% stayed in pucca houses. In majority (64.3%) of the homes, firewood was used as a fuel for cooking. Almost all the household (93.8%) had access to electricity supply. In 61.2 % of the households, tap water was used as the source of drinking water.

Around 48.1% of the subjects reported morbidity in past one month and fever (63%) was the most common cause of morbidity followed by cold (16%) Diarrhoea (6%) and skin disease (5%). About 6% of the subjects reported suffering from serious infectious disease such as chicken gunia, measles, etc. Only 4% reported that they had suffered from a combination of diseases such as fever, cold, diarrhoea simultaneously.

Almost 50.7% of the morbid subjects take allopathic medicine from private hospitals. History of the passage of worms was reported by only 7.8% of the subjects. Anthropometric assessment was done in terms of height and weight and data was collected from 125 subjects. Mean median, standard deviation, and range of height and weight of boys and girls are given in table 2.

**Research Article**

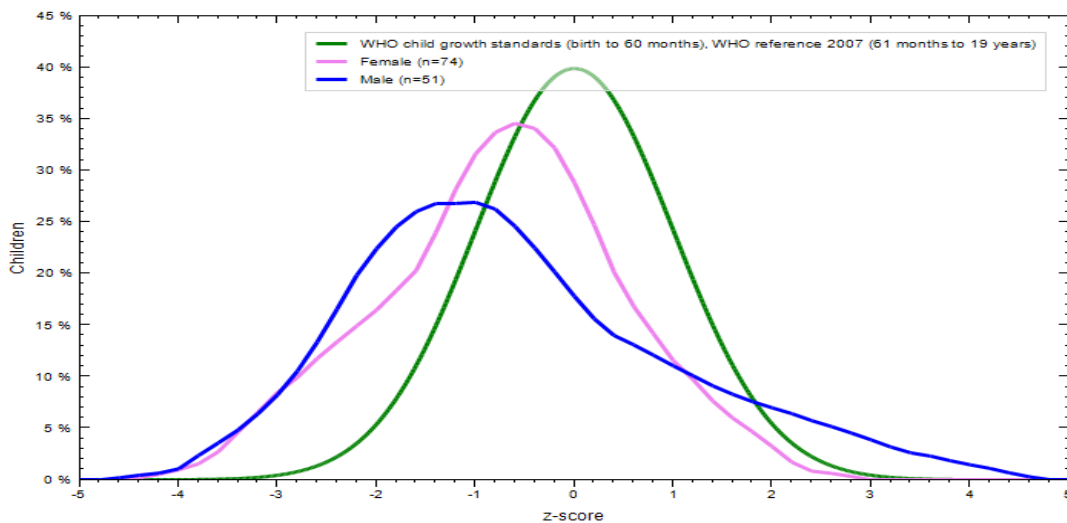
**Table 2: Household Characteristic of the Subjects**

Household Characteristics	N = 129	%
<b>Type of House</b>		
Kutchra	6	4.7
Semi pucca	19	14.7
Pucca	104	80.6
<b>Total Number of Room in the House</b>		
1	13	10.1
2-3	49	38.0
4-5	44	34.1
>5	23	17.8
<b>Sharing Room with Domestic Animals</b>		
No	90	69.8
Yes	8	6.2
Not applicable	31	24.0

**Table 3: Height and Weight of Subjects**

	Height (cm)		Weight(Kg)	
	Boys (51)	Girls (74)	Boys (51)	Girls (74)
Mean	147.3	148.2	35.4	35.7
S.D.	10.1	7.8	7.9	6.4
Median	147.4	149.5	33	35.5
Range	133.1-169.2	128-165.8	23.5-56	22.5-50.5

The height for age z scores were calculated for the subjects. The distribution of height for age of the subjects in comparison to WHO Reference (2007) is presented in Figure 1. It can be observed from the figure below that distribution is peaked and that majority of the subjects lie below the median indicating that their height for age was less than WHO (2007) reference. Stunting was more in boys than girls. Almost 50% of boys had height for age below Z score of -1 SD. Mild stunting was observed among 35.1% subjects, moderate stunting among 13.7% and severe stunting among 2% of the subjects. Similarly, among girls 25.7% were mildly stunted, 12.2 % were moderately stunted and 2.7% were severely stunted, thus, putting total stunting among girls close to 40%.



**Figure 1: Height for Age in Comparison to WHO (2007)**

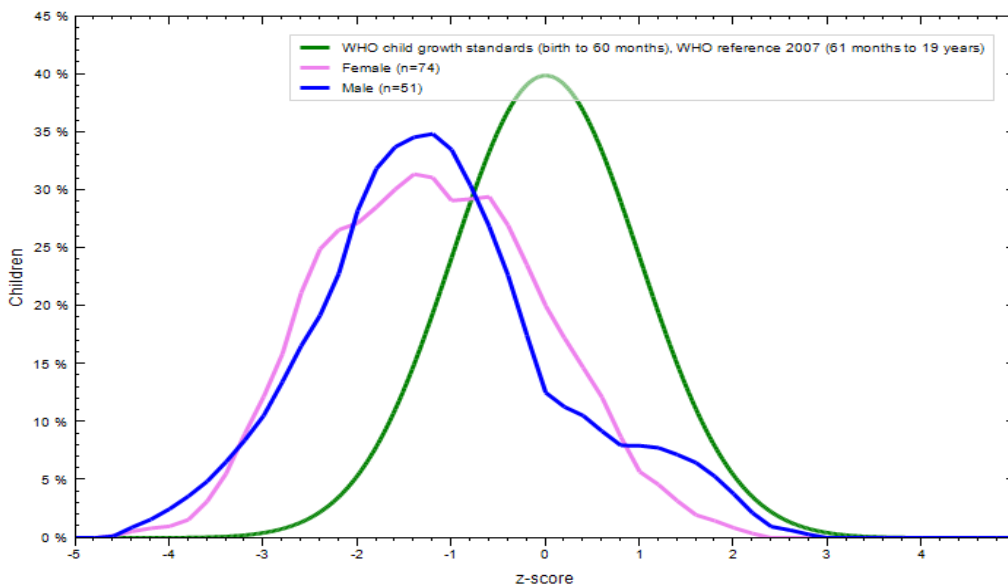
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**Table 4: Height for Age of the Subjects Using Z Scores (n=125)**

Z Scores	Boys (51)		Girls (74)	
	N	%	N	%
< -3S.D.	1	2.0	2	2.7
< -2SD to -3 SD	7	13.7	9	12.2
< -1 S.D. to -2 SD	18	35.3	19	25.7
> -1 SD to Median	10	19.6	25	33.8
Median to + 1 SD	6	11.8	13	17.6
> + 1 SD to + 2 SD	6	11.8	6	8.1
> + 2 SD to + 3 SD	2	3.9	0	0
> + 3 SD	1	2.0	0	0

It can be concluded that in the present study boys were more stunted than girls. This is similar to the results of the study conducted by Partnership for child development (1998) in rural areas of 5 developing countries including India.

The body mass index for age was calculated for the subjects and prevalence of under nutrition and over nutrition was assessed by using WHO (2007) reference. The distribution was plotted in the graph based on the BMI for age of the subjects and is given in figure 2.



**Figure 2: BMI for Age in Comparison to WHO (2007)**

The distribution is peaked and shifted towards the left side indicating that majority of the boys and girls were in the category of underweight. The distribution accordance of their z scores can be seen in table 5. It can be observed from the table below that around 68% of the boys and 56% of the girls are in various categories of underweight while around 7.8% of the boys and 2.7% of the girls were overweight. Although, the majority of the subjects were undernourished and underweight, severe under nutrition was observed among 5.9% boys and 1.4% girls respectively. Mild under nutrition was most prevalent among boys (29.7% in girls and 45.1% in boys) while moderate under nutrition was more prevalent among girls (15.7% in boys and 24.3% in girls).

**Research Article**

**Table 5: BMI for Age of the Subjects Using Z Scores (n=125)**

Z Scores	Boys (51)		Girls (74)	
	N	%	N	%
<-3S.D.	3	5.9	1	1.4
< -2SD to -3 SD	8	15.7	2	24.3
< -1 S.D. to -2 SD	23	45.1	18	29.7
> -1 SD to Median	11	21.6	22	29.7
Median to + 1 SD	2	3.9	22	12.2
> + 1 SD to + 2 SD	4	7.8	9	2.7
> + 2 SD to + 3 SD	0	0	0	0
> + 3 SD	0	0	0	0

Hence, it can be observed that there is a high prevalence of stunting as well as underweight among rural school children. Similar results have been showed by Bohite and Iyer (2011) in their study among rural school children, wherein 67% of the children were underweight as per WHO (2007) reference. Out of 129 subjects, only 41.1% of the subjects take MDM regularly but MDM was liked by 80% of the subjects. Majority of the subjects (52.3%) favourite meal was rice and dal. Rice was one of the favourite items of the subjects which make them accept and like MDM.

**Table 6: Favourite Meal of the Subjects**

Meal	N (112)	%
Dal+ Chapati + Rice	17	13.3
Veg+ Chapati	5	3.9
Rice+Dal	67	52.3
Veg+Rice	14	10.9
Kheer	2	1.6
Combination of any of the above	6	4.7

The energy and protein content of the MDM was also calculated. Most of the dishes provide between 43-46% of the protein and 39- 51% of the calories of the recommended amount.

**Table 7: Calories and Protein Content of MDM**

Mid Day Meal	Average Calorie From MDM (kcal.)	% of MDM Recommended	Average Protein From MDM (gm)	% of MDM Recommended
Khicdi+Chapati+Soya-Aloo Veg	432	61.7	15.05	75.2
Dal+Chapati+Rice	279	39.8	9.34	46.7
Khaddi+Chapati+Rice	324	46.2	8.89	44.45
Dal+Chapati+Banana	320	45.7	9.45	47.25
Veg+Chapati+Rice	275	39.2	8.65	43.25
Veg+Chapati+Kheer	360	51.4	12.7	63.5

Data on dietary habits revealed that 85% of the subjects were vegetarians, 10% were ova-vegetarian and only 5 % of the subjects were non-vegetarian. Majority of the subjects (81.4%) reported that they eat adequately.

It was observed that majority of the subjects consume lunch / MDM (92.2%) and dinner (97.7%) almost every day, followed by breakfast which was consumed by 53% of the subject daily. Majority of the subjects consumed at least 3 meals every day. It was found that 58% of the subject skipped the meal. Almost 24% of the subjects skip meal four times a week and the most common reason was the loss of

**Research Article**

appetite. The other reasons for skipping, meals were they disliked the meal, anger, peer pressure, fasting, and sickness.

The frequency of eating out was less that is only 7.8% of the subjects was eating outside. Around 88% reported that they used iodized salt at home. 50% of the subjects used buffalo milk, followed by cow milk used by (30.6%).

Almost 73.3% of the subject used mustard oil for cooking and pure ghee was used by most of the subjects. Data on food consumption showed that the mean percent adequacy of cereals, pulses, other vegetables were low. Mean percent adequacy of milk and milk products, roots and tubers and fats and oils was moderate. Green leafy vegetables and fruits intake were minimal among the subjects.

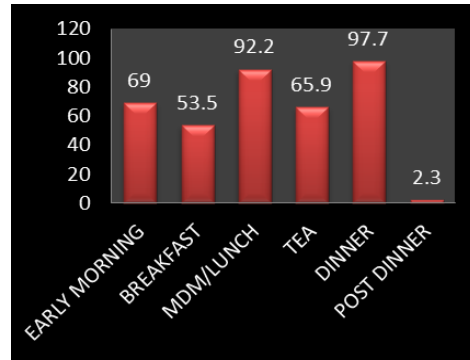
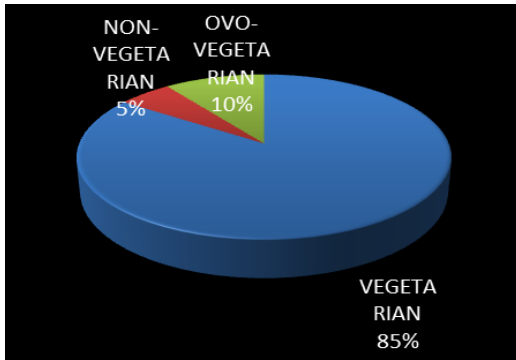
**Table 8: Average Food Group Intakes by Subjects**

<b>Food Groups</b>	<b>RDI(gm)</b>	<b>Mean± S.D.</b>	<b>% Adequacy of RDI</b>
<b>Cereals</b>			
10-12 boys	300	140±55	46.6
10-12 girls	240	120±53	50
13-15 boys	420	200±52	47.6
13-15 girls	330	135±54	40.9
<b>Pulses and legumes</b>			
10-12 boys	60	25±12	41.6
10-12 girls	60	24.3±12	40.5
13-15 boys	75	30± 11	40
13-15 girls	60	25± 10	41.6
Milk and milk products	500	315±176	63
<b>Root and tubers</b>			
10-12 boys	100	95±28	95
10-12 girls	100	85.6±25	85.6
13-15 boys	150	123.4± 24.6	82.2
13-15 girls	100	94.8± 25.7	94.8
Leafy vegetables	100	30.5±25	30.5
Other vegetables	200	99.45± 29.8	49.72
Fruits	100	39.1± 23.8	39.1
<b>Sugar</b>			
10-12 boys	30	35±9.5	116.6
10-12 girls	30	35.5±10.4	118.3
13-15 boys	20	30.5±10.4	152.5
13-15 girls	25	25.5±11.5	102
<b>*Fat and Oils</b>			
10-12 boys	35	25.85+ 15.4	73.85
10-12 girls	35	20.74+10.2	59.25
13-15 boys	45	35.4+10.8	78.6
13-15 girls	40	20.6+9.5	51.5

\*Fats and oils is the visible portion here.

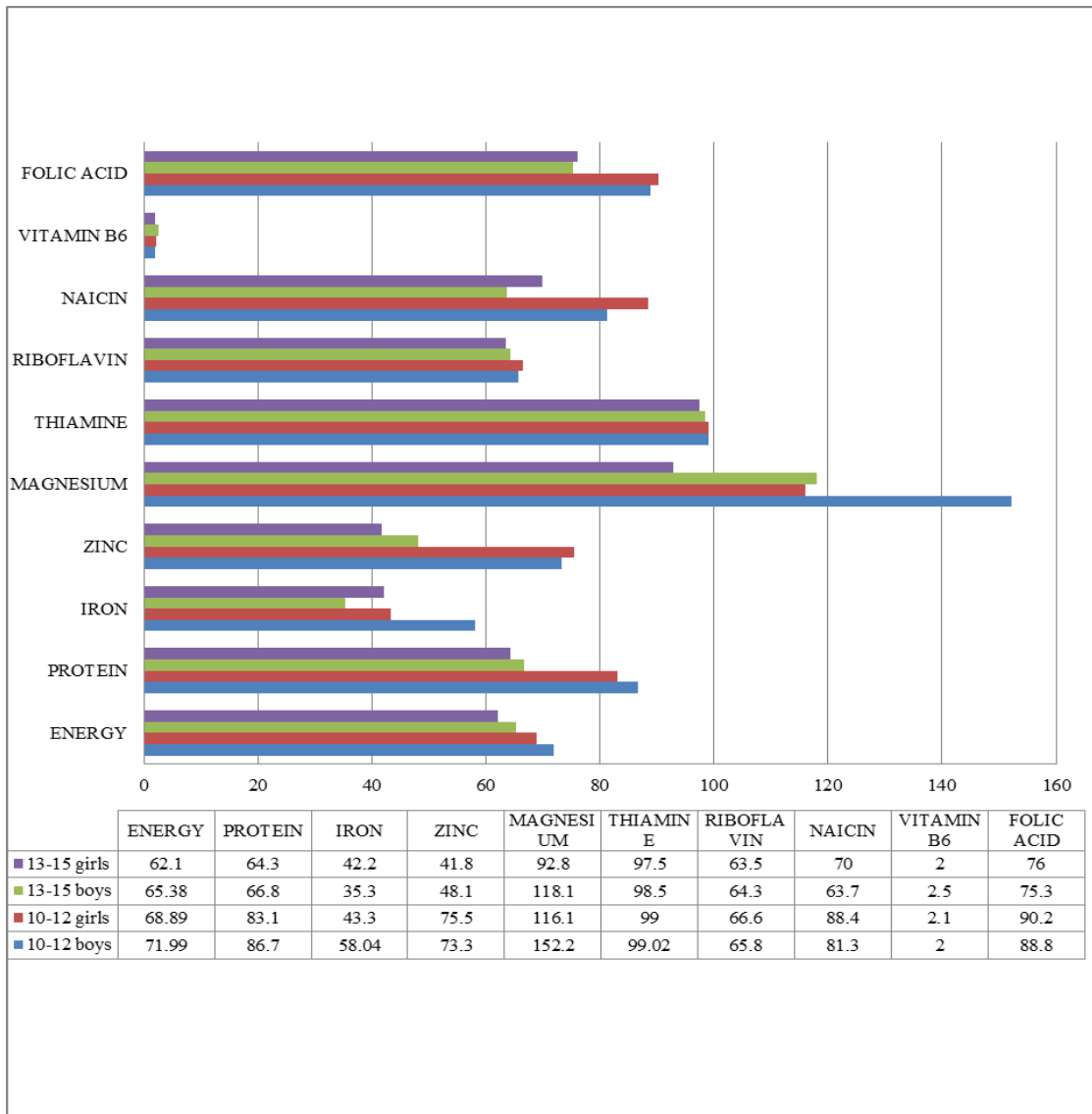
Mean nutrient adequacy was low for the energy (62%-72%), protein (64%-86%). The nutrient adequacy for iron (42%-58%), vitamin A (25%) was very poor. Low intakes of energy and protein are reflected in the poor nutritional status of the subjects.

**Research Article**



**Figure 3: Dietary Habits of the Subjects (N=129)**

**Figure 4: Meal Taken by the Subjects Daily**



**Figure 5: Mean Percentage Adequacy of Different Nutrients for Subjects Compared to RDA**

Data on MDM contribution to total average energy and protein intake was 30% and 25%, respectively. Meals on different days meet only 39 - 51% of the calories and 43 - 46% of the protein of standard MDM



**Research Article**

norms. Khicdi + Chapati + soya aloo provides the maximum calories and protein per meal i.e. 432kcal and 15.05 gm, respectively.

**Table 9: MDM Contribution to Daily Average Energy and Protein Intake**

Mid Day Meal	Average Calorie From MDM	Average Protein From MDM	% Contributed		To		% Contributed		to	
			10-12 Yrs Boys	10-12 Yrs Girls	13 Yrs Boys	13 Yrs Girls	10-12 Yrs Boy	10-12 Yrs Girls	13 Yrs Boys	13 Yrs Girls
Khicdi+Chapati+Soya-Aloo Veg	432	15.05	27.4	31.2	24.0	29.8	43.4	44.7	41.3	45.1
Dal+Chapati+ Rice	279	9.34	17.7	20.1	15.5	19.2	26.8	27.7	25.7	28.0
Khadi+Chapati+ Rice	324	8.89	20.5	23.4	18.0	22.3	25.6	26.4	24.4	26.6
Dal+Chapati+ Banana	320	9.45	20.3	23.1	17.7	22.1	27.3	28.1	26.0	28.3
Veg+Chapati+ Rice	275	8.65	17.4	19.8	15.2	19.0	25	25.7	23.8	25.9
Veg+Chapati+ Kheer	360	12.7	22.8	26.0	20.0	24.8	36.7	37.7	34.9	38.1

The reason behind low contribution of MDM in improving the nutritional status of children can be due to the fact that school meal becomes a substitute rather than the supplement for the home meal in poor households. The consequences of the child under nutrition for morbidity and mortality are enormous – and there is, in addition, an appreciable impact of under nutrition on productivity so that a failure to invest in combating nutrition reduces potential economic growth. In India, 30 per cent of the school age children has moderate to severe malnutrition. Major nutrition problems reported to be are PEM, vitamin A deficiency and iron deficiency anaemia. Dietary inadequacies have been considered as predominant etiological factors in the causation of all deficiency diseases. Growth and nutritional status of school going children are profoundly influenced by the diet consumed by them. In the present study, the dietary intake of the subjects was very low and inadequate. Cereals and pulses which are the major source of energy and protein their intake was low and inadequate which might be one of the reasons of the prevalence of under nutrition among the subjects. Intake of green leafy vegetables and fruits was also very low which could increase the risk of micronutrient deficiencies. A study conducted on 1-12 years old children to assess their dietary status from 12 villages of Agra found that intake of the entire nutrient was less than 73% and beta-carotene intake was minimal. It was not even meeting the 1/5<sup>th</sup> of the RDA (Sankhla *et al.*, 2004). In the result of the present study vitamin A intake was also very low i.e. 25% of the RDA.

In the present study, the prevalence of underweight was 66% among boys and 55% among girls which is quite high. Severe under nutrition was observed among 5.9% boys and 1.4%, girls respectively. Mild under nutrition was most prevalent among boys (29.7% in girls and 45.1% in boys) while moderate under nutrition was more prevalent among girls (15.7% in boys and 24.3% in girls). Similar findings were observed in a study by Chandra *et al.*, (2006) conducted among 4 -14 years old children and they spotted 44% of children were underweight. They also concluded that nutritionally inadequate intake is one of the major factors of malnutrition. A study in rural schools of Gujarat determine the magnitude of micronutrient malnutrition shows that the malnutrition was highly prevalent with 70% of children being underweight, 55% children suffered stunting (Joshi and Nair, 2011). Therefore, the school children, in their existing nutritional conditions are in great need of health promotion, health appraisal, and health restoration. To overcome the health problems and initiate any programmes for improvement in their

### **Research Article**

health status it becomes necessary to have exact information about the prevalence of deficiency diseases among school children so that appropriate preventive steps are taken.

### **Conclusion**

MDM was implemented in the school for so many years to improve the attendance rate and nutritional status of the students. But it can be observed that under nutrition is very high among rural children. The amount of meal intake is also not specified, hence, the norms of MDM according to which 700 kcal and 20gm protein should be consumed by each child could not be met by the students. The nutrient requirements are too high for the student to eat at a time. In order to provide 700 kcal and 20gm protein to the subjects which are almost 1/3 of the RDA, it is suggested to divide the meal into 2 parts. One snack can be introduced along with the meal which can improve the intake. Teachers and parents participation is also required to improve the nutritional intake of the students. Students can be provided with nutritional lessons and activity which help them to increase their nutritional intake and improve their nutritional status.

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