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NUTRITIONAL STATUS AND DIETARY PRACTICE OF THE SCHOOL-GOING TOTO TRIBAL CHILDREN IN ALIPURDUAR DISTRICT, WEST BENGAL

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ABSTRACT

Malnutrition is a crucial public health problem among school children. Sufficient nutrition is very critical for optimum growth and development of children. The objective of the study is to determine the nutritional status and dietary habits of Toto tribal school-going children. A cross-sectional study was carried out at Totopara Village of Alipurduar district, West Bengal. from October 2020 to March 2021. Fifty children were selected by simple random sampling technique for the study. To gather data, a pre-tested questionnaire and anthropometrical measurements were used. The database was made through MS Excel and analysis of data was done by SPSS version 20.0. Logistic regression analysis was applied to identify the factors related to malnutrition. The statistical significance was expressed at p-value <0.05 with a 95% confidence interval. None of 6-12 years children were identified as underweight. A moderate case of stunting was noticed among 4% of individuals (Conicity index: 0%-10.4%) and had no severe stunting. Furthermore, only 2% of 6-12-year-old children were overweight. Waist-to-hip ratio (WHR) was significantly ($p<0.01$) positively correlated with weight, Body-mass index (BMI), percentage body fat index (PBF), and waist-to-height ratio (WHtR). The arm circumference to height ratio (AHtR) was significantly ($p<0.01$) positively correlated with weight, height, WHR, Conicity index (CI), and WHtR. They consumed fewer nutrients according to RDA except protein and riboflavin. The study has come to the conclusion that the Toto children are suffering from the double burden of malnutrition. To confront this problem an intervention should be taken by policyholders. Encouraging them to proper dietary habits with the help of nutritional education would be an interventional method.

KEYWORDS: Tribal, School-going children, Malnutrition, Toto.

INTRODUCTION

The school-going phase of life is very crucial because it is the prime time of life for the body to store nutrients. These stores assist children to grow faster. Good nutrition helps to build strong immunity, better health, a disease-free life, and a productive Society.[1] School-going children are the major contributors to future manpower and will help improve the socio-economic conditions of developing countries like India. Therefore, the mental and physical well-being of these children is of utmost concern which can be achieved through adequate nutrition.[2] Children who had not received sufficient amounts of essential macro and micronutrients including carbohydrates, proteins, fats, vitamins, and minerals not able to be in a place to achieve their optimum potential in their education.[3] It is generally observed that the quality and quantity of children's food changes over time from childhood to adolescence. A healthy diet is not their priority during childhood and poor eating habits can lead to various health problems.[4] Diet patterns relate to which foods are eaten in combination, and diet quality indicators consider the nutritional value of different foods relative to guidelines. There is increasing interest in nutritional epidemiology to measure diet quality by dietary patterns rather than a single food item or nutrient.[5] Globally malnutrition is the prime culprit which affects massive numbers of children, especially in developing countries.[6] A population of 47lakh tribal children in our country is the victim of nutrition deprivation which affects their existence, growth, development, learning, performance in an educational institution, and performance as adults.[7] After independence, different policies and programs have been taken by the government for the growth and development of tribal communities by emphasizing their health, livelihoods, and education. Instead of over six decades of many treatments, still, tribals remain the most malnourished part of our society.[8]

MATERIALS AND METHODS

Study population: A total of 50 school-going children were included in this study. Children were selected by a simple random sampling process.

Study area: This cross-sectional study was carried out at Totopara Village of Alipurduar district, W.B. from October 2020 to March 2021.

Data collection: To collect socio-economic, and dietary data (24-hour diet recall) the mothers of the children were interviewed using a pre-tested questionnaire. Anthropometric data were recorded using a standard protocol.

Parameters assessed

Measurement of Anthropometric parameters

The body weight and height were recorded using the standard method of the FANTA project. Measurement of height was taken using an Anthropometric rod.[9] The mid-upper arm circumference (MUAC), Head circumference, and chest circumference were taken using non-stretchable measuring tapes.

Measurement of dietary intake

Food Variety Score (FVS) was determined by summing the different numbers of food items consumed by children throughout the 24-hour food recall period. The DDS (Dietary Diversity Score) calculation was calculated by summing the number of pre-defined food groups taken by the children during the past 24 hours.[10] The Dietary Serving Score (DSS) calculation was based on six major food groups (grains/roots, vegetables, fruits, legumes, meat/fish, and milk). This system was considered a scoring system and a maximum score of twenty (20) was assigned to these unique food groups. The unique food groups of dairy fruits and vegetables were awarded a maximum of four (4) points per recommended serving of two and the cereal/root groups were awarded four (4) points per recommended serving. Two (2) points per serving were recommended for the legumes and meat/fish/egg groups.[11] The Mean Adequacy Ratio (MAR) was calculated after averaging NAR (Nutrient Adequacy Ratio).[12] Recommended dietary servings were assessed by referring to the Recommended Dietary Allowance (RDA) for Indians.[13,14]

Measurement of socio-economic parameters

Determination of socio-economic status was done by B.G.Prasad scale (DJ, 2020).[15] The respondent was made to fill up the information regarding mothers'age and level of education family occupation, family income, type of family and food habits.

Statistical analysis: Execution of data entry and analysis was performed using MS Excel and SPSS version 20.0, respectively. Anthropometric parameters were evaluated using the 2006 WHO Anthro 3.2.1 Software. The student's t-test was performed to determine if there remains any significant difference in the mean considering significance at $p<0.05$.

Ethical consideration: Ethical clearance was obtained from the Human Ethical Committee (HEC) of Vidyasagar University, Midnapore, West Bengal, India. Also, the consent form of the participating child from their guardian and permission from Totopara-Ballalguri Gram Panchayat was obtained.

Exclusion and Inclusion Criteria: Children having an illness, physical deformities, birth defects, congenital anomalies, etc., and those who disagreed to participate were excluded. Healthy children between the age of 6-12 years were included.

RESULTS

Socio-economic status

The studied subjects had their place to a remotely located distinct tribal community. Most of the mothers (40%) belonged to the age group of 20-29 years of age. Nearly three-fourths (70%) of them were illiterate farmers. They were from economically very poor families and lived in kachha or semi-pucca houses. A percentage of 82 comes from the nuclear type of family. (Table-1)

Table 1: Socio-economic status of Mothers.

Variables	Characters (n=50)	No	(%)
Respondent	Male	6	12
	Female	44	88
Age groups of the mother (in Years)	<19	0	0
	20-29	20	40
	30-35	19	38
	>35	11	22
Mothers Education	Illiterate	35	70
	Primary	2	4
	Secondary	8	16
	Higher Secondary	4	8
	College & above	1	2
Per capita monthly income in Rs.	7533 and above	0	0
	3766-7532	1	2

	2260-3765	1	2
	1130-2259	8	16
	1129 and Below	40	80
Occupation	Farmer	37	74
	Labour	8	16
	Housewife	3	6
	Self-employed	2	4
Family size	Up to 5	41	82
	>5	9	18
House Type	Kachha	12	24
	Semi pucca	21	42
	Pucca	1	2
	Wooden	6	12

Nutritional status of school boys and girls (6-12 years): A total of fifty children (n=50) having age 6-12 years were selected for the anthropometric measurements and divided into 2 groups: 6-9 years and 10-12 years. The BMI was greater for boys than girls in both age groups. The student's t-test was performed to determine if there remains any significant difference in the mean between two genders and two age groups. The Mean ± SD of the anthropometric parameters had no significant gender difference except Waist to Height ratio (WHtR) ($t=9.37$, $p<0.01$), Conicity index (CI) ($t=7.53$, $p<0.01$), and arm-to-height ratio (AHtR) ($t=9.5$, $p<0.01$) (Table-2).

The prevalence of malnutrition (a reference to the WHO Child Growth Standard) among 6–12-year age groups in terms of underweight (Figure -1), and stunting (Figure-2) was higher for girls than boys.

Table 2: Anthropometric measurement of the Toto Boys and Girls (6-12 years) in West Bengal.

Parameters	6-9 years. (n=34)			10-12 years. (n=16)			Total (n=50)		
	Boys Mean± SD	Girls Mean± SD	T and (sig)	Boys Mean± SD	girls Mean± SD	T and sig	Boys Mean± SD	Girls Mean± SD	T and (sig.)
Weight (kg)	22.71 ± 4.7	22.19± 2.68	0.36 (.72)	28.8 ±5.1	28.0 ±5.2	.30 (0.76)	24.25 ±5.46	24.6 ±4.8	.023 (0.819)
Height (cm)	122.3 ±7.0	122.2 ±8.8	.04 (.97)	136.1 ±8.2	136.3 ±9.0	.04 (.96)	125.7 ±9.43	128.0 ±11.25	0.75 (0.45)
MUAC (cm)	18.59 ±1.9	18.6 ±1.4	.09 (.92)	19.4 ±1.5	19.5 ±1.3	0.10 (.92)	18.8 ±1.83	19 ±1.39	0.41 (0.67)
Triceps skin fold (mm)	10.38 ±1.7	10.38 ±1.50	.006 (.99)	10.85 ±2.47	9.88 ±1.45	0.98 (0.34)	10.5 ±1.89	10.18 ±1.46	0.64 (0.520)
BMI (kg/m^2)	15.04 ±1.45	14.88 ±1.45	0.26 (.79)	15.45 ±1.3	15.0 ±1.4	0.64 (0.53)	15.15 ±1.73	14.9 ±1.41	0.45 (0.64)
W/H	0.911 ± .030	.924 ±.022	1.3 (0.19)	0.92 ±0.17	0.92 ±.012	0.40 (0.69)	0.91 ±0.028	0.93 ±0.018	1.3 (0.199)
Conicity index	1.24 ±0.13	1.38 ±.158	2.7 (.011)	1.6 ±.063	1.64 ±.094	0.78 (0.446)	1.48 ±0.185	1.33 ±0.196	2.74 (0.008)
WHtR	0.43 ±.024	0.47 ±.028	3.3 (.003)	0.50 ±.033	0.50 ±.020	0.06 (0.951)	0.44 ±0.051	0.48 ±0.029	3.06 (0.004)
AHtR	0.47 ±.037	0.51 ±.031	3.3 (.003)	0.54 ±0.34	0.54 ±.018	0.19 (0.85)	0.49 ±0.048	0.52 ±0.031	3.08 (0.003)
PBF (%)	3.46 ±2.34	3.43 ±1.66	.04 (.96)	4.71 ±1.67	4.20 ±1.76	0.58 (0.56)	3.77 ±2.23	3.75 ±1.70	0.048 (0.96)
Body adiposity index (BAI)	24.7 ±3.5	28.5 ±3.1	3.2 (0.003)	28.8± 4.02	29.06± 2.8	0.10 (0.92)	25.77± 4.00	28.73± 2.95	2.9 (0.006)

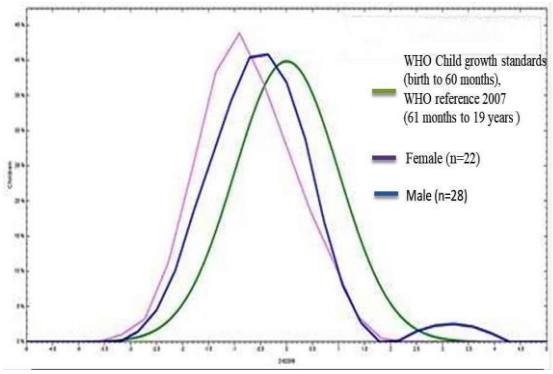

Figure 1: Weight for age of school Toto children in West Bengal Bengal.

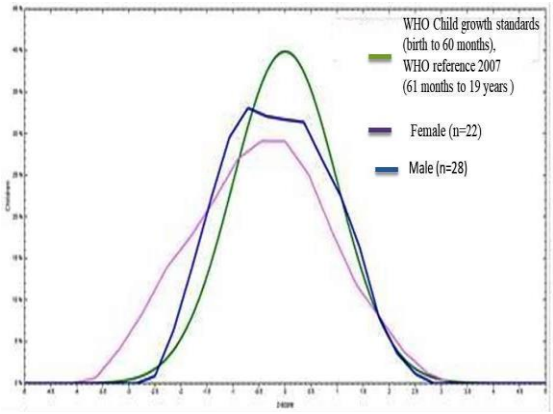

Figure 2: Height for age of 6-12 years Toto children in West Bengal.

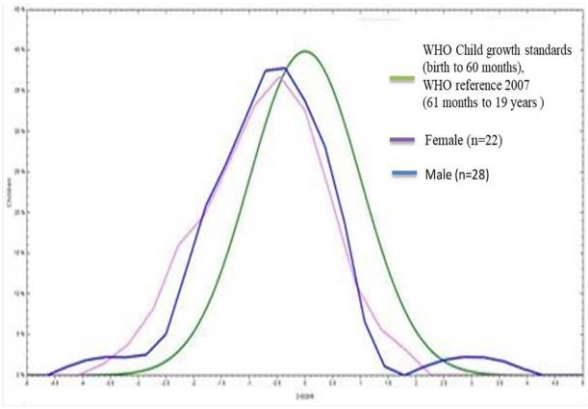

Figure 3: BMI for age of 6-12 years Toto children in West Bengal.

No child of 6-12 years children was identified as underweight. Moderate stunting was observed among 4% of individuals (Conicity index: 0%-10.4%) and had no severe stunting. In Table 3 the BMI for age analysis showed 6% had moderate chronic energy deficiency (CED) and 2% had severe CED. Furthermore, only 2% of 6-12-year-old children were overweight.

Table 3: BMI for the age of 6-12 years Toto children in West Bengal.

Age group	Severe % < -3SD (95% CI)	Moderate % < -2SD (95% CI)	% > +1SD (95% CI)	Moderate % > +2SD (95% CI)	Severe % > +3SD (95% CI)
Total (50)	2 (0- 6.9)	6 (0-13.6)	4 (0- 10.4)	2 (0-6.9)	0 (0- 1)
6-9 years (n=34)	2.9 (0- 10.1)	5.9 (0-15.3)	5.9 (0-15.3)	2.9 (0- 10.1)	0 (0- 1.5)
10-12 years (n=16)	0 (0- 3.1)	6.3 (0- 21.2)	0 (0-3.1)	0 (0- 3.1)	0 (0- 3.1)

Boys (n=28)	3.6 (0-16.3)	3.6 (0-16.3)	3.6 (0-16.3)	3.6 (0-16.3)	0 (0-2.4)
Girls (n=22)	0 (0-2.3)	9.1 (0-23.4)	4.5 (0-15.5)	0 (0-2.3)	0 (0-2.3)

Table- 4 shows the mid-upper arm circumference (MUAC) was significantly ($p<0.01$) correlated with weight, height, BMI, WHR, and PBF. Furthermore, WHR was significantly ($p<0.01$) positively correlated with weight, BMI, PBF, and WHtR. The AHtR was significantly ($p<0.01$) positively correlated with weight, height, WHR, CI, and WHtR.

Table 4: Pearson correlation of different anthropometric parameters of Toto children in West Bengal.

Parameters	Weight	Height	BMI	WHR	CI	WHtR	AHtR	PBF	MUAC	BAI
Weight	1	.851** (.000)	.617** (.000)	.414** (.003)	.508** (.000)	.357* (.011)	.289* (.042)	.732** (.000)	.771** (.000)	-.086 (.552)
Height	.851** (.000)	1	.120 (.407)	.088 (.542)	.742** .000)	.326* (.021)	.347* (.013)	.282* (.048)	.527** (.000)	-.101 (.487)
BMI	.617** (.000)	.120 (.407)	1	.704** (.000)	-.113 (.436)	.235 (.100)	.067 (.644)	.980** (.000)	.689** (.000)	.027 (.855)
WHR	.414** (.003)	.088 (.542)	.704** (.000)	1	.198 (.168)	.566** (.000)	.352* (.012)	.729** (.000)	.506** (.000)	.347* (.013)
CI	.508** (.000)	.742** (.000)	-.113 (.436)	.198 (.168)	1	.789** (.000)	.839** (.000)	.076 (.600)	.210 (.143)	.539** (.000)
WHtR	.357* (.011)	.326* (.021)	.235 (.100)	.566** (.000)	.789** (.000)	1	.971** (.000)	.369** (.008)	.223 (.119)	.88** (.000)
AHtR	.289* (.042)	.347* (.013)	.067 (.644)	.352* (.012)	.839** (.000)	.971** (.000)	1	.211 (.141)	.111 (.441)	.897** (.000)
PBF	.732** (.000)	.282* (.048)	.980** (.000)	.729** (.000)	.076 (.600)	.369** (.008)	.211 (.141)	1	.739** (.000)	.103 (.478)
MUAC	.771** (.000)	.527** (.000)	.689** (.000)	.506** (.000)	.210 (.143)	.223 (.119)	.111 (.441)	.739** (.000)	1	-.119 (.409)
BAI	-.086 (.552)	-.101 (.487)	.027 (.855)	.347* (.013)	.539** (.000)	.88** (.000)	.897** (.000)	.103 (.478)	-.119 (.409)	1

Consumption of nutrients by 6-12 years Toto children: The gender-wise mean nutrient intake per day by Toto children having 6-9 yr and 10-12 yr age groups had no significant difference as shown in Table 5.

Table 5: Mean nutrient intake per day by 6-12-year-old Toto children in West Bengal.

Nutrients	6-9 years			10-12 years		
	Boys Mean ±SD	Girls Mean ±SD	T and (sig.)	Boys Mean ±SD	Girls Mean ±SD	T and (sig.)
Energy (kcal)	1512.36±149.8	1583.38 ±212.7	1.14 (0.26)	1747.8±146.1	1465.5±91.1	0.14 (0.87)
Protein (gm)	48.2 ±5.68	50.5 ±6.40	1.10 (0.27)	47.0 ±4.07	46.9 ±2.13	0.054 (0.95)
Fat (gm)	22.18 ±2.73	22.18 ±2.7	1.58 (0.12)	21.8 ±21.35	21.8 ±1.25	0.60 (0.55)
Calcium (mg)	237.18 ±36.2	263.38 ±67.8	1.48 (0.15)	230.4 ±24.0	250.2 ±45.7	1.02 (0.31)
Phos (mg)	565.2 ±57.78	594.5 ±89.1	1.16 (0.25)	556.2 ±60.7	561.4 ±44.1	0.17 (0.84)
Iron(mg)	5.18 ±0.66	5.13 ±0.78	0.22 (0.82)	5.28 ±0.82	5.04 ±0.822	0.55 (0.58)
Vitamin A(µg)	439.18 ±84.6	421.03 ±109.1	0.53 (0.59)	474.6±110.4	451.4 ±78.4	0.48 (0.62)
Thiamine (mg)	0.86 ±0.08	0.88 ±0.12	0.81 (0.42)	0.84 ±098	0.83 ±0.07	0.26 (0.78)
Riboflavin(mg)	2.7 ±0.09	2.1 ±0.96	1.70 (0.09)	3.23 ±129	2.79 ± 1.53	0.61 (0.54)
Niacin (mg)	9.9 ± 0.92	10.19 ±1.49	0.71 (0.48)	9.78 ±1.20	9.58 ±0.96	0.37 (0.52)
Vitamin C(mg)	3.96± 1.12	3.4 ±1.49	1.25 (0.22)	4.63 ±1.55	4.15 ±1.41	0.64 (0.52)

Table 6 shows the gender-wise mean and significance of FVS, DDS, DSS, and MAR of 6-9 years and 10-12 years Toto children. The quality of diet was very poor for school-going Toto children.

Table 6: Mean ±SD Different dietary indicators and their significance value for 6-12 years of Toto children in West Bengal.

Dietary diversity indicator	6-9 years			10-12 years		
	Boys (n=21) Mean ±SD	Girls (n=13) Mean ±SD	T and (sig.)	Boys (n=7) Mean ±SD	Girls (n=9) Mean ±SD	T and (sig.)
FVS	3.52±1.43	3.15±0.98	0.81 (0.421)	4.28±0.48	4 ± 0.707	0.90 (0.37)
DDS	3.14±1.27	2.84±0.8	0.74 (0.459)	3.28±0.49	3.11±0.78	0.03 (0.977)
DSS	7.28±2.34	7.01±1.48	0.37 (0.713)	7.94±1.01	7.96±1.9	0.03 (0.97)
MAR	0.88±0.11	0.89±0.07	0.134 (0.895)	0.83±0.11	0.97±0.16	1.83 (0.08)

Figure 4 and Figure 5 show the line graph for DDS and MAR for 6-9 and 10-12-year-old children.

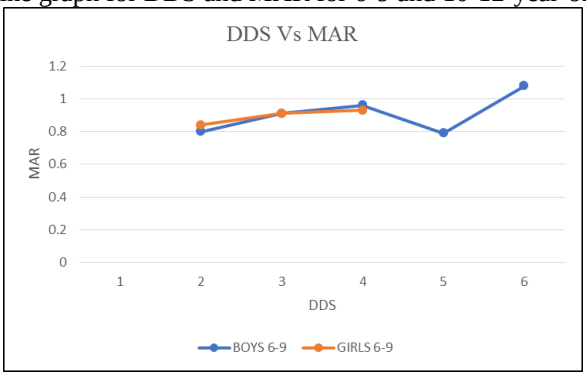

Figure 4: DDS vs MAR of 6-9 years Toto children in West Bengal.

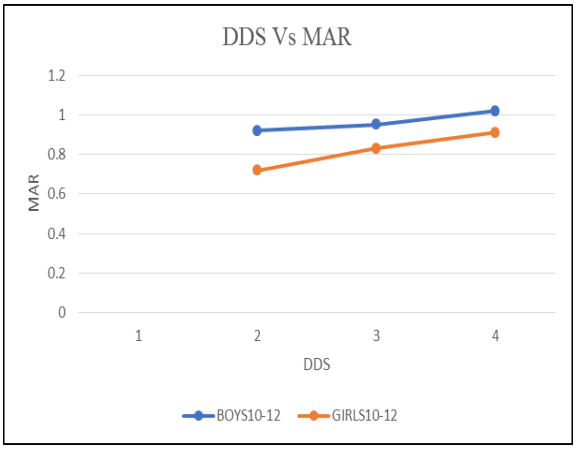

Figure 5: DDS vs MAR of 10-12 years Toto children in West Bengal.

Food variety score (FVS) had a significant positive correlation with DSS and DSS for both 6-9 years children and between FVS Vs. DSS of 10-12 years children (Table 7).

Table 7: Correlation of different dietary diversity indicators of 6-12-year-old Toto children in West Bengal.

	6-9 years				10-12 years			
	FVS	DDS	DSS	MAR	FVS	DDS	DSS	MAR
FVS	1	.927** (.000)	.469** (.005)	0.571** (0.00)	1	.322 (.223)	.795** (.000)	.095 (0.726)
DDS	.927** (.000)	1	.578** (.000)	.518** (.000)	.925** (.000)	1	.727** (.001)	0.208 (0.439)
DSS	.469** (.002)	.578** (.000)	1	.432* (.011)	.795** (.000)	.036 .895	1	0.133 (0.623)
MAR	0.571** (0.00)	.518** (.000)	.432* (.011)	1	.095 (0.726)	0.208 (0.439)	0.133 (0.623)	1

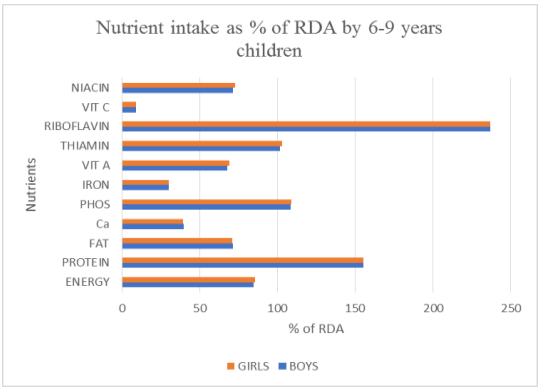

Figure 6: Nutrient intake as % of RDA by children (6-9 years).

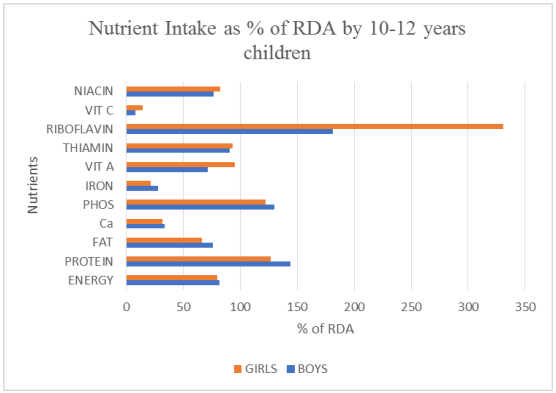

Figure 7: Nutrient intake as % of RDA by 10-12 years children.

Figure 6 and Figure 7 show the gender-wise nutrient intake as a percentage of the RDA. From the figures, it is obvious that they consumed fewer nutrients according to RDA except for protein and riboflavin.

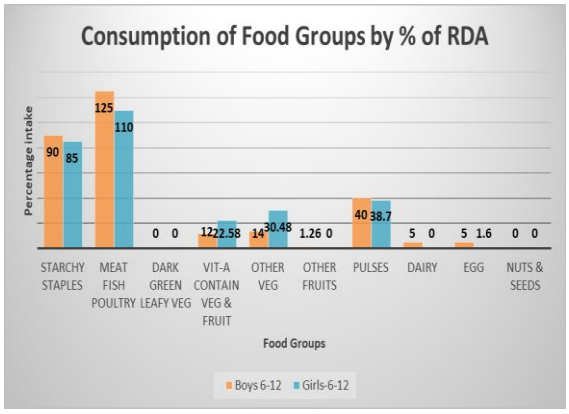

Figure 8: Gender-wise nutrient intake by school-going children (as a percentage of the RDA).

Fig-8 shows the gender-wise food intake from different food groups as a percentage of the RDA. From the figure-8 it is obvious that they consumed inadequate amounts of food from different food groups according to RDA except cereals and meat.

DISCUSSION

This study describes the nutritional status, dietary habits, and different nutrients consumed by Toto School-going children. None of 6-12 years children were identified as underweight. Moderate stunting was observed among 4% of individuals and had no severe stunting. The BMI for age analysis showed that 6% had moderate CED and 2% had severe CED. Furthermore, only 2% of 6-12-year-old children were overweight. A study of 100 school-going children of 7-9 years in Lucknow, Uttar Pradesh in 2014 was assessed by Saxena and Mishra.[16] They found that 25% of subjects were mildly stunted, 22% of subjects were moderately stunted 15% of subjects were severely stunted 30% were mild, 24% were moderately and 3% of students were severely wasted (Saxena and Mishra, 2014). A descriptive cross-sectional study was done by Cynthia[17] on primary school children having age group 6 to 10 years in Kurnool of Andhra Pradesh. The study reported that 63% were undernourished.[17] In this study prevalence of malnutrition among 6–12-year age groups

in terms of underweight, and stunting was higher for girls than boys. In a similar study, Saheb and Prasad, (2009) found that the boys were slightly taller than girls.[18]

In our study, it was found that Toto school-going children were suffering from the double burden of malnutrition. This study has a similarity with a study conducted by Patel et al amongst 5-13 years of school children in Ahmedabad and they observed that 29.44% of children were underweight and 0.78% of children were obese.[19]

This study also reveals that the quality and variety of diet was very poor for the studied children. A similar study done by Debbarma et al[20] in Tripura also found that the diet of the children was lack in milk, fat, oil, meat, etc.

CONCLUSION

The Toto children are in the double burden of malnutrition. Their diet is improper in terms of quality and quantity. Their diet was lack in food variety. They were used to take cereals and meat but not pulses, milk, or vegetables which led to micronutrient deficiency in these children. So, to safeguard this problem an intervention should be taken by the policyholders of our country as the Toto people are considered as one of the world's lowest indigenous ethnic groups. Awareness to develop proper dietary habits with the help of nutritional education would be an interventional method.

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