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Nutritional Disparities among Adolescent Girls Belonging to the Tribal Localities of Gujarat

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ABSTRACT

Background: Adolescence is marked by the onset of the second growth spurt, a phase of rapid growth and development that places high demands on nutritional intake. Poor nutritional status among adolescent girls is a major public health issue in India, with the situation being even more critical in tribal areas. This study was conducted in the tribal region of the western state of Gujarat, aiming to identify the factors contributing to the poor nutritional status of adolescent girls. **Methods:** Simple random sampling technique was used to enroll subjects. Adolescent aged between 16-18 years (N=120) were enrolled for the study. Anthropometric measurements (Height, Weight and Mid Upper Arm Circumference), dietary history (24 hr recall, Minimum dietary diversity-Women) and blood haemoglobin was measured. **Results:** The mean BMI-for-Age (BAZ) score was -1.09±1.07, with approximately 22 (18.3%) of the subjects being classified as thin. The mean height for age (HAZ) score was -1.22 ± 0.85, and about 18 (15%) of the subjects were found to be stunted. Approximately 80 (66.66%) of the subjects were moderately anaemic, 18 (15%) were mildly anaemic and 7 (5.8%) were severely anaemic. The median nutrient intake among the adolescents was found to be significantly low compared to the Recommended Dietary Allowance (RDA) at ($p<0.001$). The Minimum Dietary Diversity (MDD-W) score of the adolescent girls was 4.25 ± 0.57. **Conclusion**: Nutritional status of the adolescent girls was in compromised conditions. Some of the underlying reasons were; Preference and consumption of fat rich foods, skipping of breakfast, poor IFA and Deworming rate and poor personal hygiene etc.

Keywords: Tribal, adolescents, Anaemia, Nutrient intake, BMI-for-Age (BAZ), Height-for-Age (HAZ), Haemoglobin, MDD-W, Mid Upper Arm Circumference (MUAC).

Introduction

Adolescence is the phase of life between childhood and adulthood, from ages 10 to 19.[1] Adolescence is the period of fastest growth in an individual's life, second only to the first year of life. Proper nutrition during this time is essential to address any deficiencies from childhood and should provide the necessary nutrients to support physical and cognitive development, ensure sufficient energy reserves for illness and pregnancy, and help prevent the onset of nutrition-related diseases in adulthood. In many developing countries, nutrition programs have primarily focused on children and women, often overlooking adolescents.[2] Unfortunately, adolescent nutrition is one of the major public health challenges in India. Expenses related to anaemia are estimated to account for almost 6% of the annual GDP of India. Gujarat is one of progressive state in India however adolescent nutrition is also poor in this state. Prevalence of severe and moderate thinness of the tribal districts of the state was 25.8-39%; with population of 14.6%.[3] Due to precarious nutritional status of this population with other combined factors led to this study to understand intensity of malnutrition and anaemia in the study area. This pilot study was part of a larger research project that is investigating the role of fortified rice intervention in conjunction with the regular meal patterns of the population.

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Methods

This was cross-sectional pilot study where 120 adolescent girls were surveyed. Simple random sampling technique was used for enrolling 16-18 years adolescents. This study was carried out between January 2022 to December 2022. Household survey was carried out in the 10 sampled villages of the tribal localities of Vadodara and Aspirational district of Narmada. Five villages from each of the two tribal talukas/ blocks were randomly selected for the study. Twelve adolescent girls were randomly selected from each village for the study. An in-depth survey schedule was used to elicit the information. Adolescent aged between 16-18 years was enrolled for the study. Kuppuswammy socioeconomic scale, 2021was used to assess socioeconomic status; lower (<5), Upper lower (5-10), lower middle (11-15), upper middle (16-25) and, upper (26-29)**.**[4]

Data on Height-for-Age Z-score (HAZ), BMI-for-Age-Z score, Mid-Upper Arm Circumference (MUAC), haemoglobin level, 24-hour dietary recall, and the Minimum Dietary Diversity score for women (MDD-W) were collected. MDD-W questionnaire was used to record the food groups consumed by the subjects during the last 24 hr period. WHO 2007 Growth reference was used for calculating the Height-for-Age Z-score (HAZ) and BMI-for-Age-Z score (BMI-Z),[5] MUAC of the subjects was recorded in the relaxed position up to the nearest 0.1 cm on the left arm using the MUAC tape. Haemoglobin of the subjects was analysed using cyanmethemoglobin method with 20 microlitre of whole capillary blood using dry filter paper technique. The dried blood spots were kept in 5 ml drabkin reagent until the complete dissolution. The absorbance of the sample and the standard were measured at 540 nm on spectrophotometer (systronics spectrophotometer 117). Data entry, coding, tabulation etc was performed on Microsoft excel. Dietary data was analysed using DietCal software.[6] WHO Anthro-plus software was used for calculating the BAZ and HAZ scores.[7] The statistical analysis was carried out on Jamovi software.[8] Data on socioeconomic status, type of housing is presented in frequency and percentages N (%). BAZ and HAZ data are presented in Mean (SD). Prevalence of stunting and thinness, anaemia is presented in N (%).MDD-W data is presented in Mean ± SD. Normality of the data was analyzed using Shapiro Wilk test ($p<0.05$) therefore based on the non-normal distribution of the nutrient intake and haemoglobin levels of the subjects, Wilcoxon singed rank test was used to compare the actual nutrient intake among the adolescent girls with the recommended dietary allowances, 2020. Dietary data is presented in terms of median (IQR).

Results

Demographic information: Adolescents belonging to Bhil, Rabari, Vasava, Tadvi and Baria tribal communities were assessed. Based on the socioeconomic status of the subjects, approximately 101 (84.16%) belonged to upper lower class followed by 12 (10%) lower middle class and 7 (5.83%) to the lower class. Approximately 59 (49.16%) had Semi Pakka house (cemented walls and roof made up of tin), 58 (48.33%) Pakka house (concrete building) and 3 (2.5%) had Kacha house (made up of mud and wood).

Anthropometric indices: Mean age of the adolescent girls was (N=120) 16.54 ± 8.07 years. Mean HAZ of the subjects was -1.22 (0.85). Approximately 18 (15%) subjects were stunted (HAZ ≤2 SD) and 3 (2.5%) severely stunted (HAZ ≤3 SD). Mean BAZ score was -1.09 (1.07), approximately 22 (18.3%) were thin (BAZ ≤2 SD), 3 (2.5%) were severely thin (BAZ ≤3 SD), 6 (5%) had BAZ ±1SD and1 (0.83%) had BAZ ± 2 SD. Mean MUAC of the subjects was 22.92 ± 2.95 cm. Median haemoglobin of the subjects was 10.1 (1.90) g/dl. Approximately 80 (66.66%) subjects were moderately anaemic, 18 (15%) mildly anaemic and 7 (5.8%) severely anaemic respectively. Out of 120 subjects, 5 (4.16%) were found to have sickle cell anaemia. Mean haemoglobin level of the sickle cell anaemic subjects was 8.8 ± 0.83 g/dl.

Nutrient Intake

Based on the distribution of the data, a Wilcoxon signed-rank test was performed to compare the difference between the RDA and the actual nutrient intake of adolescent girls. Approximately 103 (85.83%) of the adolescents were found to be meeting 50-75% of their energy requirement. According to the ICMR (2020), approximately 100-130g/day of

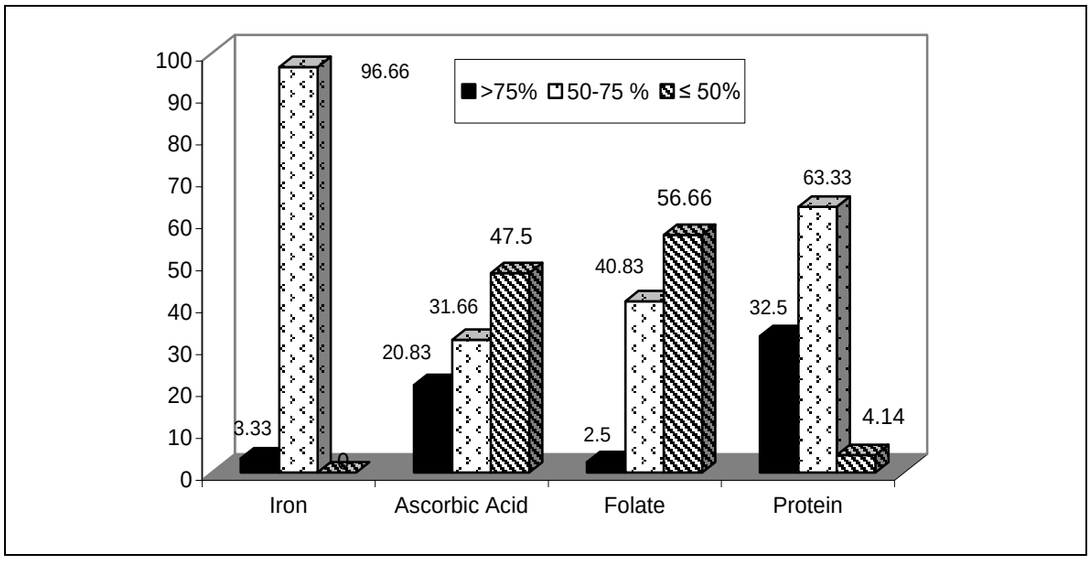
carbohydrates should be consumed in a day.[9] In this study, carbohydrate intake of all the subjects was higher than the RDA. Except for carbohydrates and fat, the intake of all the other nutrients of the subjects was below the RDA level. Approximately 76 (63.33%) of the subjects consumed 50-75% of the recommended protein level, while 39 (32.5%) of the subjects consumed more than 75% of the RDA. The protein intake of the subjects was found to be lower than the RDA level (Table-1). Skipping breakfast was commonly observed among the subjects. The majority of the subjects were found to either skip breakfast or have tea/coffee along with locally available Khari biscuits, Gathiya, and Papdi for breakfast.

Table-1: Average Nutrient Intake among Adolescents girls. [NA: Reference EAR/RDA values are not available]

Nutrients	Median	RDA	% RDA	W	p	EAR	%EAR	W	p
Energy (Kcal)	1609	NA	-	-	-	2400	67.04	-815	<0.001
Carbohydrate (gm)	223.08	100-130	223.08	118	<0.001	NA	-	-	-
Protein (gm)	31.16	46	67.73	-11.7	<0.001	35	89.02	-3.66	<0.001
Total Fat (gm)	64.69	40	161.72	25.0	<0.001	NA	-	-	-
Total Folates B9 (µg)	132.27	270	48.98	-110	<0.001	223	59.31	-69.0	<0.001
Total Ascorbic Acid (mg)	37.04	70	52.91	-26.2	<0.001	57	64.98	-21.2	<0.001
Iron (mg)	9.43	32	29.46	-22.4	<0.001	18	52.38	-8.36	<0.001

Average fat consumption of the subjects was found to be more than 60 g per day. Some of the reasons were; availability of packaged foods, personal preference for oily foods and use of more oil in cooking food. The intake of hematinic nutrients was lower than the recommended level. Approximately 116 (96.66%) of the subjects were found to be consuming ≤50% of the RDA level of iron. Among the non-vegetarian subjects, the consumption of non-vegetarian foods was monthly in nature. Approximately 68 (56.66%) of the subjects were consuming ≤50% of the RDA of folate, while 49 (40.83%) of the subjects were meeting 50-75% of the RDA. The intake of vitamin C was also found to be lower than the RDA level. Only 49 (40.83%) of the subjects were meeting 50-75% of the RDA level of vitamin C [Figure-1].

Figure- 1: Percentage of adolescents consuming haematic nutrients compared to the RDA

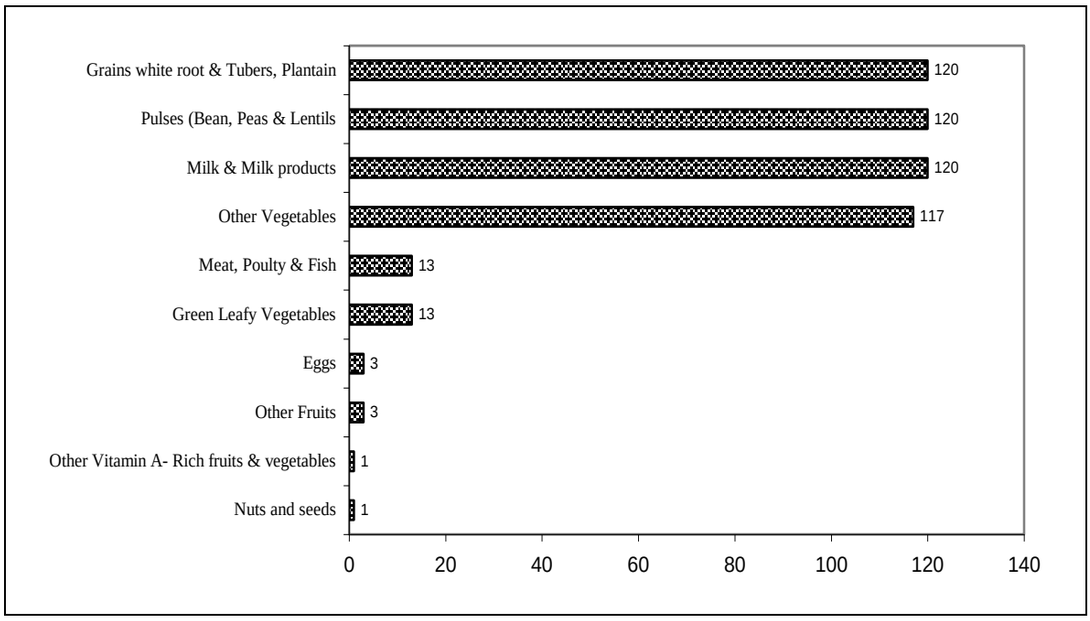


Approximately 52 (43.33%) of adolescent girls were vegetarian, while 68 (56.66%) were non-vegetarian. The minimum dietary diversity score of the adolescent girls was 4.25± 0.57. [Figure 2] The majority of the subjects consumed cereals, pulses, milk and milk products during the previous 24 hours. Among cereals/millets, *Wheat*, *Rice*, *Bajra*, *Jowar*, and *Maize* was commonly consumed. Among pulses, pigeon peas, green gram, black gram, chickpeas, and cowpea beans

were commonly consumed. The majority of the subjects consumed milk or milk products, typically in the form of tea or coffee. Consumption of milk products such as curd and buttermilk occurred either weekly or fortnightly.

Approximately 117 (97.5%) subjects consumed other vegetables. Commonly consumed other vegetables included cabbage, cauliflower, drumstick, and cluster beans etc. Consumption of micronutrient-rich foods such as fruits, green leafy vegetables, meat, and meat products was low. Some of the commonly consumed green leafy vegetables included Spinach, Suva ni bhaji (dill leaves), Saragva (Drumstick/Moringa leaves), and Barf ni bhaji, while some of the commonly consumed root vegetables and tubers were brinjal, potato, and onion. The majority of the subjects stated that fruit consumption was very irregular and mostly seasonal in nature. Consumption of nuts and oil seeds was also low. Groundnuts were locally available and consumed by the majority of the subjects. Among eggs and meat, only poultry (hen) meat was consumed by the subjects. The consumption pattern of meat and meat products was either fortnightly or monthly.

Figure- 2: Percentage of adolescents consumed different food groups during the last 24 hr period



Discussion

In India, majority of the schemes give more emphasis on children below six years, pregnant and lactating women. Adolescent period is still a neglected group.[10] Based on the insights derived from reviews of existing literature, it is evident that there is a significantly elevated occurrence of anaemia among adolescents throughout India. In the tribal areas, situation of under-nutrition and anaemia is very alarming. Studies conducted among tribal adolescent girls revealed that under-nutrition and anaemia are the biggest drivers of malnutrition. Prevalence of anaemia among adolescent girls from 16 districts of India was 90% while 7.1% had severe anaemia.[11] Among Kukna tribal adolescents, prevalence of anaemia was 45.9%.[12] Approximately 87% adolescent girls were found to be anaemic in Maharashtra, 80% in Karnataka,77.3% in Andhra Pradesh, and 76.3% in Chhattisgarh. [13, 14, 15, 16]

In the present study, overall prevalence of anaemia among the adolescent girls was 87.5%.Nutrient intake of the subjects was also found to be less compared to the recommended level. In Sabarkantha district, approximately, 97% adolescent girls were found to be anaemic. [17]

Malnutrition is the prolonged outcome of the physiological response. Various stages of development depend upon optimal bioavailability of nutrient pool present in individuals. Growth spurt occurs in adolescence with the

absorption and utilization of these nutrients. Addressing the micronutrient malnutrition is of genuine concern during the growth spurt period. In India, respite the entire nutrition program in place; we can observe varied responses of malnutrition in most of the states. Malnutrition has been recognized as a major factor hindering India's global economic potential.[18]

Preventing the malnutrition among adolescent girls, Purna scheme (Prevention of under-nutrition and reduction of nutritional anaemia) is operational in the state. Under which 4 packets (1Kg) of Purna Shakti, a supplement made up of nine micronutrients is given to the adolescent girls of 14-18 years of age.[19] Unfortunately, Purna scheme is also facing implementation challenges at the field level. This situation clearly reveals that people are not optimally utilizing the nutritional services provided by the Govt. Despite the consumption of pearl millets and non-vegetarian food products, the majority of adolescent girls were anaemic. Some of the underlying reasons were reduced nutrient and micronutrient intake due to skipping breakfast, low preference for milk and milk-based products, consumption of monotonous dietary staples, high infestation, low compliance of IFA, deworming, fortified staples and poor hygienic practices.

Poor nutrient intake has been highlighted by various studies conducted in the different tribal localities in India. According to National Nutritional Monitoring Bureau, median intake of energy among the adolescent girls 13-15 years old was 1307 Kcal while among 16-17 years was 1525 Kcal.[20] In the present study, intake of nutrients was also found to be low. Median intake of haematinic nutrients was found to be particularly low. Minimum dietary diversity of the subjects was also found to be <5 which indicates a poor dietary diversity score.[21]

Studies revealed that knowledge of tribal adolescents regarding the food and nutrition is less and an urgent attention has to be given in order to improve the nutritional status of the adolescents.[22] Food consumption pattern is a determining factor of the nutritional status of a population. Studies revealed that meal skipping is a common practice among adolescent girls. In Maharashtra, approximately, 28% of the adolescent girls had no history of breakfast.[23]

In the study area it was observed that majority of the subjects were not consuming the PURNA Shakti packets rather feeding the packets to domestic milch animals. In a nutshell it can be stated that causes of malnutrition and anaemia are varied from place to place. In the study area prevalence of sickle cell anaemia was also prevalent therefore nutrition counselling should be based on the requirement of the subjects.

Limitation: This study was a pilot study where N=120 subjects were assessed therefore for generalization we require large scale studies to understand the dietary pattern among adolescent girls. Except haemoglobin, assessment of other blood parameters was not conducted in the study.

Conclusion

There is a necessity to raise awareness about the significance of consuming diverse food groups among adolescents. It is important to raise awareness about the importance of breakfast. It is imperative to transform societal attitudes concerning the education and marriage of girl child. Bridging the knowledge gap is achievable only through the provision of adequate education. Addressing malnutrition and anaemia, being a multifaceted concern, requires collaboration and program implementation across all the relevant departments. There is an urgent need to use the wide spread social and behaviour change communication campaigns to aware people about the importance of utilizing nutrition-based services provided by the Govt. Only amalgamation of correct knowledge, attitude and practices can bring the fruitful changes. Exclusive care of this section will cater the health needs of over one fifth of the population of the country.

Disclosures

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