Assessment of nutritional status of school-going girls from 11-14 years in private middle schools in Raipur, Chhattisgarh

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Background: The adolescent period is a phase of human development comprising the change from childhood to adulthood. Nutritional requirements increased to a great extent during this period as compared to the previous years of growth. Adolescence may represent a window of opportunity to prepare nutritionally for a healthy adult life. The present study was intended to assess the nutritional status of school-going adolescent girls. **Materials and Methods:** This one-year community-based, cross-sectional study was conducted in private middle schools in the urban area of Raipur, Chhattisgarh among 480 adolescent girls of 11-14 years. All the selected adolescent girls were personally interviewed with the help of a pre-designed and pre-tested questionnaire regarding age, type of family, dietary habits and socio-economic status. A three-day recall method was used to assess nutrient intake. The nutrient intake was calculated using tables of nutritive value of Indian foods. **Results:** As per WHO nutritional measurement criteria, children were classified as per their anthropometric criteria as 44.58% had moderate stunting and 2.5% were severely stunted. 0.42% had severe thinness, 38.75% were thin and 2.29% were overweight. The major morbidity among study subjects were, 12.5% had conjunctival pallor(anaemia), 8.96% had dental caries, 5.83% had Vitamin B complex deficiency, 1.04% had angular stomatitis and 0.63% had Vitamin A deficiency. **Conclusion:** The present study recommends that efforts should be made to reduce the prevalence of malnutrition among adolescent girls. For this regular health check-ups should be done at schools with the help of school authorities and hospitals.

Keywords: Adolescent Girls, Dietary Habits, Nutritional Requirement

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Introduction

A high prevalence of thinness (low BMI for age) is reported as one of the major nutritional health problems among adolescents in India along with a significant proportion of the population being affected by overweight and obesity.[5] The coexistence of both under as well as overnutrition occurring simultaneously within a population is referred to as a double burden of malnutrition.[6] Nowadays, the double burden of malnutrition is an emerging public health problem resulting as a consequence of nutritional transition.[7] On one side, undernourished adolescents are likely to face short stature with diminished immunity, while on the other side, overweight and obese adolescents are at higher risk for developing non-communicable diseases.[8] Malnutrition further leads to a devastating impact not only on the physical and mental health of female adolescents but also acts as a risk for future generations in the cycle of the continuum of care.[9] Menarche is a complex of growing up. From both medical and social perspectives, it is often considered the central event of female puberty, as it suggests the possibility of fertility. The age of onset of the menstrual cycle varies from 9-18 years, with the average age in the United States being about 12 years and 8 months, whereas in India, it is slightly lower and has been reported to be around 12 years [10] [11] [12]. The psychosocial and emotional problems associated with menarche are of considerable magnitude and they may exert a significant influence on the nutritional status.

More or less, all the national health programs have an adolescent domain in itself and primary-care physicians including the medical officers working at primary and secondary level government health facilities are the nodal officers for their catchment areas and act as a backbone for efficiently running these programs such as Rashtriya Kishor Swasthya Karayakram, Rashtriya Bal Swasthya Karayakram, Reproductive Maternal Newborn Child and Adolescent Health (RMNCH+A), Adolescent Reproductive and Sexual Health, and other school-based screening programs. The adolescent population especially the females are quite vulnerable to accessibility and utilization of available health-care sources.[13] When viewed grossly, both underweight as well as overweight are associated with the number of communicable

And non-communicable co-morbidities. Of the patients visiting nowadays to out-patient departments a major proportion of adolescents present with direct and indirect health problems associated with malnutrition.

A rapid increase in height and related skeletal growth and onset of menarche increases energy and nutrient demand thus leading to a deficiency of micronutrients like iron, calcium iodine etc. Unfortunately, the assessment of the nutritional status of adolescent girls has been the least explored area of research, particularly in rural India. Despite the problem of the double burden of malnutrition being so widely distributed among adolescent females, only a few studies are present in this context and minimal reliable data are available. Because of this impending public health problem, the present study was conducted to determine the nutritional status of girls of age group 11 to 14 years studying in a private middle school in Raipur city.

Material and Methods

Study design: Community-based cross-sectional study.

Study duration: January 2019 to December 2019

Study setting: This study was conducted in selected private schools in the urban area of Raipur city.

Study population: A total of 480 adolescent girls attending high school and higher secondary school ranging from 11-14 years (VI-VIII Standard) in Raipur city were studied.

Inclusion criteria:

- Middle school-attending girls

- Age group 11-14 years

- Studying in Std VI-VIII

Exclusion criteria:

- Age group < 11 years and >14 years

- Girls studying in classes other than VI-VIII Std

- Girls with any genetic disease, metabolic problem or chronic disease.

- Girls with any history suggestive of any haemoglobinopathy or any dysmorphic features suggestive of genetic disease.

- Girls not giving consent

Methodology/ Data Collection

Girls were enrolled after obtaining proper consent from them and their school principal. Socio-demographic information was collected by using pre-tested and pre-designed structured proforma by interview technique. Nutritional status was assessed using anthropometry, clinical examination and general physical examination.

Major variables:
- Weight
- Height
- BMI- body mass index

Outcome variables:
- The proportion of adolescent girls classified as malnourished-both undernourished and overweight/obese
- The proportion of girls with moderate or severe stunting
- The proportion of clinically anaemic girls.
- The proportion of adolescent girls with different vitamin deficiencies.

Confounding factors:

1. Socio-economic status.

2. Religious belief.

3. Menstrual history.

4. Food habit.

Statistical analysis

1. All relevant data were entered into pre-designed proforma and analyzed (with the help of a statistician) using Microsoft SPSS software for Windows Version 20.0 and Microsoft Excel 2010.

2. Data were expressed as a percentage and mean +/- SD.

3. The chi-square test was used to analyze the significance of the difference between the distribution of data.

4. A P-value <0.05 was considered as statistically significant.

Results

Out of a total of 480 adolescent girls in the study, the majority (91.25%) were

Hindu, 8.54% were Muslim, 63.75% of girls had mothers who were educated up to Higher Secondary, 16.46% up to Middle School, whereas 4.79% girls had an illiterate mother. 46.04% of girls had fathers who were educated till Higher Secondary and 3.54% had illiterate fathers.

The occupational status of the fathers' of study subjects showed that 43.96% were doing jobs either in the formal or informal sector, 42.92% were involved in the small scale of self business, and 13.13% were daily wage workers. 83.96% mothers of the study participants were housewives. 35.42% of girls belonged to the Upper Lower (Class IV) Class of Modified Kuppuswamy Scale, 35.63% belonged to the Lower Middle (Class III) Class and 28.96% belonged to the Upper Middle (Class II) Class.

The majority of the study subjects were living in a nuclear family i.e. 74.38% whereas 25.63% were living in a joint family. 62.5% of the study subjects had fair environmental hygiene at home, 23.54% had good environmental hygiene and 13.96% had poor hygiene.

Table 1: Nutritional status as per WHO criteria for Height for Age

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Particular	Frequency	Percentage
Severe stunting	12	2.50
Moderate	214	44.58
Normal	254	52.92
Total	480	100

Table 2: Nutritional status as per WHO criteria-BMI (Thinness)

Particular	Frequency	Percent
Normal (-1 SD to +1 SD)	281	58.54
Overweight > +1SD	11	2.29
Severe Thinness (<-3SD)	2	0.42
Thinness (-3 SD to -1 SD)	186	38.75
Total	480	100

Table 3: Distribution of Morbidity conditions in study subjects

Disease	Frequency	Percentage
Anaemia (Conjunctival Pallor)	60	12.50
Dental Caries	43	8.96
Vitamin B Complex deficiency	28	5.83
Refractory error	20	4.17
Vitamin A deficiency (Bitot's spot)	3	0.63

Table 4: Determinants of thinness in study participants

BMI	Odds Ratio	Std. Err.	P>z	[95% Conf. Interval]	
Age in years					
12 years	0.973	0.281	0.924	0.552	1.715
13 years	0.675	0.198	0.179	0.380	1.198
14 years	0.735	0.307	0.462	0.324	1.668
Religion					
Muslim	0.434	0.150	0.016	0.221	0.854
Mother education					
Primary school	1.011	0.664	0.987	0.279	3.663
Middle school	0.879	0.524	0.829	0.273	2.830
High School	1.340	0.906	0.666	0.356	5.044
Higher Secondary	1.743	0.996	0.331	0.569	5.341
Graduate	3.603	3.617	0.202	0.504	25.774
Father education					
Primary school	0.839	0.607	0.808	0.203	3.462
Middle school	0.614	0.478	0.531	0.134	2.821
High School	0.696	0.497	0.612	0.171	2.825
Higher Secondary	0.458	0.316	0.257	0.118	1.768
Graduate	0.643	0.428	0.507	0.175	2.370
Father occupation					
Job	1.378	0.532	0.407	0.646	2.938
Self business	1.027	0.385	0.943	0.492	2.142
Mother Occupation					
Job	0.619	0.324	0.359	0.222	1.726
Self business	0.656	0.688	0.688	0.084	5.124
Housewife	0.943	0.382	0.886	0.426	2.088
Type of family					
Nuclear	1.462	0.384	0.148	0.874	2.446
Socio-economic status					
Lower middle class-III	0.872	0.262	0.650	0.484	1.573
Upper lower-IV	1.477	0.432	0.183	0.832	2.621
Immunization					
Incomplete	0.517	0.120	0.004	.328	.815
Menstrual history					
Regular	0.690	0.305	0.401	0.290	1.641
Teeth					
Caries	0.622	0.207	0.154	0.324	1.194
_cons	1.666	1.255	0.498	0.381	7.294

Table.4. shows that as compared to 11 year girl child; 12 year, 13 year and 14 year old has less chance of being thin (as the odds ratio for 12, 13 and 14 years is less than 1). As compared to Hindu girl children, Muslim girl children had significantly less chance (OR- 0.434, P=0.016) of being thin. In Parent's education, the father's education has an impact on their girl child's BMI. Illiterate fathers have more chance of having their child thin as compared to educated ones as the odds ratio for all of them is less than 1. Mothers who are graduates have 3.60 times more chance (OR-3.603, p=0.202)) of their girl child being thin as compared to illiterate. Analysis shows that as the mother's education increases chance of their girl child being

Thin increases. The father's occupation also has a significant impact on their girl child's nutritional status. Fathers who are on the job have 1.37 times more chance (OR-1.378, p=0.0.359) and those who had self-business have (OR-1.027, p=0.688) of having their girl child thin as compared to daily wages. Mothers who are on daily wages have more chance of having their girl thin as compared to those who are doing the job, self business and housewives. A girl child who is living in a nuclear family has 1.46 times more chance of being thin. A girl child with upper lower socio-economic status has a 1.47 times more chance of having a girl child thin (OR-1.47, p=0.183) as compared to the lower middle class.

Table 5: Determinants of stunting in study participants

Stunting	Odds Ratio	Std. Err.	P>z	[95% Conf.Interval]	
Age in years					
12 years	0.377	0.113	0.001	0.210	0.676
13 years	0.300	0.093	0.000	0.163	0.549
14 years	0.168	0.076	0.000	0.070	0.406
Religion					
Muslim	1.135	0.399	0.718	0.570	2.261
Mother education					
Primary school	0.664	0.459	0.554	0.171	2.574
Middle school	1.306	0.788	0.657	0.401	4.258
High School	0.860	0.598	0.829	0.220	3.361
Higher Secondary	1.971	1.154	0.246	0.626	6.207
Graduate	0.471	0.432	0.412	0.078	2.844
Father education					
Primary school	0.368	0.263	0.161	0.091	1.491
Middle school	0.418	0.324	0.261	0.092	1.912
High School	0.813	0.572	0.769	0.205	3.230
Higher Secondary	0.677	0.465	0.570	0.176	2.600
Graduate	0.686	0.453	0.568	0.188	2.504
Father occupation					
Job	0.633	0.246	0.239	0.295	1.355
Self business	0.449	0.172	0.037	0.212	0.952
Mother Occupation					
Job	1.764	0.955	0.294	0.611	5.096
Housewife	2.219	0.929	0.057	0.977	5.041
Type of family					
Nuclear	1.330	0.355	0.285	0.789	2.243
Socio-economic status					
Lower middle class-III	1.513	0.466	0.179	0.827	2.767
Upper lower-IV	0.956	0.277	0.877	0.541	1.689
Immunization					
Incomplete	1.747	0.415	0.019	1.096	2.782
Menstrual history					
Regular	1.691	0.769	0.248	0.693	4.125
Teeth					
Caries	1.017	0.346	0.960	0.523	1.981
_cons	1.684	1.259	0.486	0.389	7.290

Table.5. shows that as compared to an 11-year girl child; 12 year old had a 0.377 times more chance of being stunted (OR-0.377, p=0.001) and 13 years had a 0.300 times chance (OR-0.300,p=0.000) of being stunted. As compared to Hindu girl children, Muslim girl children had 1.135 times more chance (OR- 1.135, P=0.718).

In parent's education, the father's education did not seem to have any significant impact on having their child stunted as compared to illiterate. Mothers who were educated till higher secondary had 1.971 times more chance of having their girl child stunted as compared to illiterate. Fathers who do job or business as their occupation did not have a significant impact on having their girl child stunted as compared to daily wagers. Mothers who were housewives had 2.219 times more chance (OR-2.219, p=0.057) of having their girl stunted as compared to daily wagers. Girl children with lower middle-class socio-economic status had 1.513 times more chance of having a girl child stunted (OR-1.513, p=0.179) as compared to the upper middle class.

Discussion

A similar study by Singh K S et al (2014) in Uttar Pradesh reported that illiterate mothers 50% of girls whose BMI was <18.5 and who were educated 19% of girls whose BMI was <18.5. Whereas illiterate fathers had all the girls whose BMI was <18.5 and who were educated had 28.72% of girls whose BMI was <18.5. [18]

In the present study, the lower class has more prevalence (52%) of stunting in girls as compared to the lower middle class (40%). Whereas the lower class has 34% thinness as compared to the upper middle class 42%. A girl child with upper lower socio-economic status has 1.47 times more chance of having a girl child thin (OR-1.47, p=0.183) as compared to the lower middle class.

Nair A, et al (2017) in a study in Maharashtra reported that girls from the upper socio-economic class had less proportion of stunting as compared to lower socio-economic class. SES-I had 33.3% of girls stunted, SES-II had 40.91%, SES-III had 42.22%, SES-IV had 47.17% and SES-V had 51.84%. Whereas thinness was high in SES-I has 33.3%, SES-III had 26.67%, SES-IV had 13.58% and SES-V had 22.45%.[19]

In the present study in the nuclear family, 37% of girls were thin and 45% were thin in joint family. 44% of girls were thin in families where environmental hygiene was poor and 36% in families where environmental hygiene was fair.

Rani D et al (2018) did an Assessment of the Nutritional Status of Teenage Adolescent Girls in the Urban slums of Varanasi and reported that 53.9% of adolescent girls were undernourished in joint families as compared to 62% in nuclear families. [16]

The mean weight in middle school girls was 40.27±8.37 kg, and height was 150.87±8.50 cm. As per WHO criteria for Height for Age (H/A), 44.58% were in the moderate stunting category of malnutrition, and 2.5 % of girls were severely stunted. As per WHO criteria for Body Mass Index (BMI), 0.42% of girls were in the category of severe thinness, 38.75% were in Thinness and 2.29% were overweight.

Anand K et al (1999) did a similar study in rural north India. The prevalence of stunting in 12 to 14 years age group girls was 51% and the prevalence of thinness was 32%. The prevalence of anaemia was 8.7% in girls 12-14 years of age group.[20] Patil S N, et al (2009) did a similar study in rural Maharashtra. As per proposed WHO criteria, 69.3% of adolescent girls were underweight (BMI < 18.5). [21] Wasnik V et al (2010) did a Study in Andhra Pradesh, according to WHO reference standards 56.4 % of girls were under-nourished (BMI <18.5 kg/m2).[22] Maiti S, et al (2011) did a similar study in West Bengal. The overall prevalence of stunting and thinness among early adolescents was 32.5% and 20.2% respectively.[23]

The major morbidity among study participants was, 12.50% had conjunctival pallor (anemia), 8.96% had dental caries, 5.83% had Vitamin B complex deficiency, 5% had a pale nail, 3.96% had angular stomatitis (lips) and 0.63% had Vitamin A deficiency.

Dambhare DG, et al (2010) reported that 38.89% of school-going girls had anaemia. 35.34% adolescents had dental caries. 13.79% were suffering from refractive error. 7.76% had worm infestation. 6.9% had skin problems. 2.59% had tonsillitis and 2.59% had wax in the ear.[24] Bhattacharya A. et al (2015) noted that in early adolescents about 55.18% had pallor, 40.33% had

Dental caries, 33.49% were suffering from refractive errors, 23.11% had a history of worm infestation, 38.90% had skin problems, and 68.61% adolescents had ENT problems.[25] Hari Krishna B.N, et al (2017) reported that 34.2% had anemia, 10.5% had worm infestation, 13.3% had dental caries and 2.6% had vitamin D deficiency.[26]

Conclusion

The present study was conducted among middle school girls from private schools in Raipur city of Chhattisgarh state to evaluate their nutritional status and morbidity pattern. More than half of the (47.08%) middle school girls were stunted as they were suffering from chronic malnutrition, 39.17% had some form of thinness and 12.50% had clinical anemia.

The present study recommends that efforts should be made to reduce the prevalence of malnutrition among school children. For this regular health check-ups should be done at schools with the help of school authorities and hospitals. All teachers and parents should be given health and nutritional education sessions by health experts to enforce healthy eating habits among children. Parents are to be informed about the health status of the children by class teachers during parent-teacher meetings and appropriate measures should be taken to improve the lunch pack. None the less even government policy should be made also at private schools to start a Nutrition Supplementation Programme.

Author's contribution:

Dr. Prerana Singh: Concept, study design, manuscript writing and statistical analysis.

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