

Assessment of nutritional status of adolescent girls from 15-18 years in private high schools in Raipur, Chhattisgarh

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Background: Adolescent period is a phase of human development comprising the change from childhood to adulthood. Nutritional requirements increase 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 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 high schools in an urban area of Raipur, Chhattisgarh among 480 adolescent girls of 15-18 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 socioeconomic 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, 31.46% had moderate stunting and 4.38% were severely stunted. 2.71% had severe thinness, 27.92% were thin and 7.71% were overweight. The major morbidity among study subjects was, 19.6% had conjunctival pallor(anaemia), 8.75% had dental caries, 6.46% had Vitamin B complex deficiency, 4.8% had angular stomatitis and 0.84% 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, Malnutrition

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Introduction

The term adolescence has been derived from the Latin word "adolescere" which means "to grow up". World Health Organization (WHO) defines adolescents as individuals in the age group 10-19 years [1]. The adolescent period is often subdivided into early (10-13 years), middle (14-16 years) and late (17-19 years) adolescence [2]. There have been around 1.2 billion adolescents in the world, constituting 20% of the global population and 350 million adolescents constituting about 22% of the population in countries of the South-East Asia Region (SEAR)[3]. There have been around 243 million adolescents in India, constituting 21% of the whole population in the country [4].

Adolescence is an important phase of growth and development. Unique changes occurring in an individual during adolescence are accompanied by progressive achievement of biological maturity. [5] This period is supposed to be very crucial since these are the formative years in the life of an individual when major physical, psychological and behavioural changes take place [6]. Adolescence may represent a window of opportunity to prepare nutritionally for healthy adult life [7]. During this period, adolescents gain up to 50% of their adult weight, 20% of their adult height and 50% of their adult skeletal mass. [8]

In India we face a big challenge regarding the nutritional status of adolescents with some studies showing that around half of them are wasted and 40% are stunted.[9] According to UNICEF, malnutrition in the form of anaemia is present in a large proportion of India's adolescents.[10] Chronically malnourished adolescents are more likely to remain undernourished during adulthood and pregnancy and thus are more likely to deliver low birth weight babies, thus creating a vicious cycle.[11]

Physical growth of adolescent girls has been related to their dietary behaviour and if this has been compromised, it may lead to malnutrition.[12] In India, the nutritional needs of adolescent girls, in particular, are often neglected.[13] Nutrition has been the cornerstone of socio-economic development and the problems related to nutrition are not just medical but multifactorial, with their roots in many other sectors of development such as education, demography, agriculture and rural development.[14]

In general, adolescent girls have been the worst sufferers of the ravages of various forms of malnutrition because of their increased nutritional needs and low social power.[15] Socio-cultural factors, the craze for trendy foods; peer influences, mood; body image; food habits of adolescents in the recent past and extreme changes in the lifestyle have affected both their nutrient intake and needs. [16]

Unfortunately assessment of the nutritional status of adolescent girls has been the least explored area of research particularly in India.[17] Since there was a need to conduct an insightful study to evaluate the nutritional status of school-going adolescent girls studying in class IX to XII in Raipur city, we selected school as our study places as the school going girls are easily accessible and also receptive.

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 15-18 years (IX-XII Standard) in Raipur city were studied.

Inclusion criteria:

- High school attending girls
- Age group 15-18 years
- Studying in Std IX-XII

Exclusion criteria:

- Age group <15years and >18 years
- Girls studying in class other than IX-XII 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 taking 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 anemic girls.
- The proportion of adolescent girls with different vitamin deficiency.

Confounding factors:

01. Socio-economic status.
02. Religious belief.
03. Menstrual history.
04. Food habit.

Statistical analysis

- 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.
- Data were expressed as a percentage and mean +/- SD.
- The Chi-square test was used to analyze the significance of the difference between the distribution of data.
- P-value <0.05 was considered statistically significant.

Results

Out of the total of 480 adolescent girls in the study, the majority (81.6%) were Hindu, 15.8% were Muslim, 54.38% girls had mothers who were educated up to Higher Secondary, 16.25% up to Middle School, whereas 9.58% girls had an illiterate mother. 58.13% of girls had fathers who were educated till Higher Secondary and 4.8% had an illiterate father.

The occupational status of fathers' of study subjects showed that 43.13% were doing jobs either informal or in-formal sector, 42.71% were involved in the small scale of self business, and 14.2% were daily wage workers. 81.1% of mothers of the study participants were housewife. 37.5% girls belonged to Upper Lower (Class IV) Class of Modified Kuppuswamy Scale, 34.79% belonged to Lower Middle (Class III) Class and 27.71% belonged to Upper Middle (Class II) Class. The majority of the study subjects were living in the nuclear family i.e. 73.95% whereas 26.05% 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

Stunting	Frequency	Percentage
Severe (<-3SD)	21	4.38
Moderate (<-2SD)	151	31.46
Normal	308	64.17
Total	480	100

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

Particular	Frequency	Percent
Normal (-1 SD to +1 SD)	296	61.67
Overweight > +1SD	37	7.71
Severe Thinness (<-3SD)	13	2.71
Thinness (-3 SD to -1 SD)	134	27.92
Total	480	100

Table.3. Distribution of Morbidity conditions in study subjects

Disease	Frequency	Percentage
Anemia (Conjunctival Pallor)	94	19.60
Dental Carries	42	8.75
Vitamin B Complex deficiency	31	6.04
Angular stomatitis (Lips)	23	4.80
Vitamin A deficiency (Bitot's spot)	4	0.84

Table 4. Multivariate analysis for determinants of stunting in adolescent girls from 15 to 18 years old girls

Variables	Stunting (%)	Odds Ratio	P value	[95% Conf. Interval]	
Age in years					
15 year	38.3	Ref.			
16 year	30	0.563	0.07	0.302	1.049
17 year	45	1.099	0.766	0.590	2.047
18 year	30	0.608	0.134	0.318	1.166
Religion					

Hindu	37	Ref.			
Muslim	28.9	0.616	0.103	0.344	1.103
Christian	41.7	0.907	0.882	0.249	3.299
Mother's education					
Illiterate	50	Ref.			
Primary	27.6	0.388	0.099	0.126	1.194
Middle	37.2	0.952	0.92	0.363	2.496
High school	34.4	0.420	0.115	0.142	1.236
Higher Secondary	36.4	0.497	0.061	0.240	1.032
Graduate	17.6	0.190	0.004	0.061	0.594
Father's education					
Illiterate	3	Ref.			
Primary	44.4	2.308	0.221	0.604	8.821
Middle	40.7	2.646	0.205	0.587	11.930
High school	26.8	0.623	0.513	0.151	2.572
Higher Secondary	35.1	1.556	0.495	0.437	5.543
Graduate	36.4	1.667	0.426	0.473	5.879
Father's occupation					
Daily wages	36.8	Ref.			
Job	32.4	1.184	0.644	0.579	2.417
Self business	39	1.358	0.39	0.676	2.729
Mother's occupation					
Daily wages	32	Ref.			
Job	36.1	1.269	0.637	0.472	3.410
House wives	36	1.424	0.327	0.702	2.891
Self business	60	2.771	0.316	0.378	20.311
Type of family					
Joint	33.6	Ref.			
Nuclear	36.6	0.952	0.857	0.557	1.627
Socio-economic status					
SES-II	26.3	Ref.			
SES-III	38.3	1.646	0.113	0.889	3.050
SES-IV	40.6	2.011	0.023	1.100	3.675
Environmental hygiene					
Good	38.1	Ref.			
Fair	34.3	0.883	0.615	0.544	1.434
Poor	38.8	0.896	0.768	0.431	1.863
Immunization status					
Complete	36	Ref.			
Incomplete	35	1.058	0.847	0.596	1.878
Menstrual history					
Regular	37.1	Ref.			
Irregular	33.3	0.880	0.65	0.507	1.528
No Menarche	18.8	0.378	0.166	0.095	1.499
Teeth					
Caries	33.3	Ref.			
Normal	36.1	1.071	0.852	0.524	2.188
Diet					
Vegetarian	35.7	Ref.			
Non vegetarian	36	0.944	0.779	0.634	1.408
Pattern of diet					

Regular	35.6	Ref.			
Irregular	36.5	1.012	0.957	0.654	1.567

Height for age <-3SD as per NCHS/WHO standard 2007 was used as severe stunting in the present study. The mean height of the total 480 study subjects was 153.82 ± 7.95 cm. The prevalence of stunting was 35.8%. The association of religion with stunting was not statistically significant (p>0.05). The association of mother's education with stunting was statistically significant (p=0.00) with the result showing that 26.1% of severely stunted girls belonging to illiterate mother whereas the association between father's occupation and stunting was not statistically significant.

The association between socioeconomic status and stunting was statistically significant (p=0.001) with families belonging to SES-IV having a maximum of 8.9% severely stunted girls whereas families with SES-III having 3.3% severely stunted girls. Protein deficit in the diet of study subjects was found to be statistically significant in association with stunting (p=0.00) with 16% of girls with severe stunting having >10 gm protein deficit.

Mothers who were graduate had less chance of having their girl children stunted (OR-0.190, P=0.004) as compared to illiterate mothers. Fathers who were educated had less chance of having their girl children stunted as compared to illiterate fathers. Fathers who do the job had more chance of having their girls stunted as compared to daily wagers. Mothers who were housewives had 1.424 times more chance (OR-1.424 p=0.327) of having their girl stunted as compared to daily wagers. Type of family did not have a significant impact on the stunting status of the girl child.

Girl child with SES-III status had more chance of having girl child stunted (OR-2.01, P=0.023) as compared to lower SES status. Environmental hygiene, menstrual history, immunization status and dental caries did not have a significant impact on the stunting status of adolescent girls. Being vegetarian or non-vegetarian did not have a significant impact on the height of adolescent girls. Adolescent girls who were having irregular diet had little more chance of being stunted (OR-1.012, P=0.654).

Table 5. Multivariate analysis for determinants of thinness in adolescent girls from 15 to 18 years old girls

Thinness	Thinness (%)	Odds Ratio	P value	[95% Conf. Interval]	
Age in years					
15 year	26.7	Ref.			
16 year	25	0.913	0.788	0.471	1.769
17 year	30.8	1.266	0.483	0.655	2.450
18 year	40	2.124	0.025	1.100	4.099
Religion					
Hindu	29.3	Ref.			
Muslim	40.8	2.046	0.011	1.179	3.550
Christian	8.3	0.259	0.209	0.031	2.129
Mother's education					
Illiterate	26.1	Ref.			
Primary	31	1.186	0.769	0.380	3.695
Middle	30.8	0.979	0.969	0.337	2.846
High school	25	1.044	0.942	0.324	3.369
Higher Secondary	31.4	1.135	0.757	0.509	2.529
Graduate	35.3	1.497	0.452	0.523	4.282
Father's education					
Illiterate	17.6	Ref.			
Primary	29.6	2.287	0.303	0.474	11.046
Middle	22.2	1.966	0.455	0.334	11.588
High school	33.9	3.431	0.148	0.646	18.228
Higher Secondary	31.2	2.470	0.242	0.543	11.240
Graduate	32.2	2.720	0.193	0.602	12.282
Father's occupation					
Daily wages	30.9	Ref.			
Job	28.5	0.627	0.229	0.293	1.340
Self business	32.7	0.991	0.98	0.477	2.056
Mother's occupation					
Daily wages	28	Ref.			
Job	16.7	0.675	0.504	0.213	2.141
House wives	32.4	1.100	0.799	0.528	2.291
Self business	20	1.096	0.939	0.104	11.540
Type of family					
Joint	29.6	Ref.			
Nuclear	31	1.416	0.207	0.825	2.430
Socio-economic status					
SES-II	36.8	Ref.			
SES-III	27.5	0.477	0.021	0.254	0.896
SES-IV	2.9	0.708	0.272	0.382	1.311
Environmental hygiene					
Good	34.5	Ref.			
Fair	30.3	0.752	0.261	0.458	1.236
Poor	25.4	0.748	0.477	0.336	1.665
Immunization status					
Complete	31.2	Ref.			
Incomplete	27.5	0.763	0.379	0.417	1.395
Menstrual history					

Regular	29.7	Ref.			
Irregular	33.3	1.109	0.718	0.633	1.944
No Menarche	37.5	2.079	0.211	0.660	6.551
Teeth					
Carries	26.2	Ref.			
Normal	31.1	1.387	0.393	0.655	2.939
Diet					
Vegetarian	30.6	Ref.			
Non vegetarian	30.6	1.022	0.919	0.676	1.543
Pattern of diet					
Regular	30	Ref.			
Irregular	32.1	1.107	0.656	0.707	1.736

BMI for age <-3SD of NCHS/WHO standard 2007 was used as severe thinness in the present study. The mean BMI of the total 480 study subjects was 19.75 ± 3.26 kg/m². The overall prevalence of thinness in our study was 30.63%.

As compared to Hindu girl children Muslim had 2.04 times (OR_2.04, P=0.011) significantly more chance of being thin. Parent's education did not have a significant impact on the thinness status of adolescent girls. Mothers who were educated till graduation had 1.497 times more chance (OR-1.497, p=0.452) of having their girl thin as compared to illiterate mother. Fathers who do the job and self business had less chance of having their girls thin as compared to daily wagers. Mothers who were doing the job had less chance (OR-0.675, p=0.504) of having their girl thin as compared to daily wagers. Type of family did not have a significant impact on the thinness status of the girl child. The socioeconomic status of a girl child did not have a significant impact on the thinness status of adolescent girls. Similarly environmental hygiene, menstrual history, immunization status, dental caries and diet did not have a significant impact on the thinness status of adolescent girls.

Discussion

In the present study, out of 480 school going adolescent girls an equal number of sample was taken from each age group. The age-wise maximum proportion of stunted girls against their sample maximum were (45%) from 17 years age group followed by 38.33% from 15 years and lowest 30% from 16 and 18 years age group. Rengma MS et al (2016) in Assam reported similar findings that a maximum of 47% of girls was stunted from 16 years age group followed by 38% from the 17 and 18 years age group and the lowest 33.5% from 15 years age group. [18]

Similarly age-wise maximum proportion of thinness was (40%) in 18 years age group, followed by (30.83%) in 17 years and 26.67% in 15 years age group and the lowest 25% in 16 years age group. A similar study by Chandrashekarappa SM et al (2016) in Mysuru reported opposite findings that maximum (35.3%) girls were thin from 16 years age group and lowest 18.3% from 18 years age group.[19]

Religion wise analysis of nutritional status showed that 29.33% were Hindu girls compared to 40.79% Muslim girls and it was statistically significant. Whereas 36.99% of Hindu girls were stunted as compared to 28.95% of Muslim girls and the association between stunting and religion was statistically not significant.

As compared to Hindu girl children Muslim girl children had a 2.04 times more chance of being thin (OR- 2.04, P=0.011). Rani D et al (2018) in a similar study assessed the Nutritional Status of Teenage Adolescent Girls in the Urban Slum of Varanasi. They reported that 60.4% of Hindu girls were thin as compared to 57.1% of Muslim girls. Though like our study the association was statistically not significant. [20]

In the present study, 90.35% of mothers were educated and 9.65% were not educated. Of educated mothers 34.33% of girl children were stunted as compared to 50% of non-educated mothers. Whereas of educated mothers 31.11% girl children were thin as compared to 26.09% of non-educated mothers. This was statistically significant. In the present study, 96.46% of fathers were educated and 3.54% were not educated.

Fathers who were educated had 31.10% thin girls as compared to 17.65% of non-educated fathers. Whereas of educated fathers 35.85% girl children were stunted as compared to 35.29% of non-educated fathers. Fathers who were graduate had 1.497 times more chance (OR-1.479, p=0.452) of having their girl thin as compared to illiterate fathers.

A similar pattern in findings was observed in a study by Kunwar R and Pillai CB (2011) who did a study in primary schools of a large cantonment in New Delhi and reported that of illiterate fathers 36.51% of adolescent girls were undernourished and of educated father 30% were undernourished. Whereas of illiterate mothers 34.47% of adolescent girls were undernourished and of educated mother 29.7% were undernourished.[21]

In the present study, daily wagers fathers had a high prevalence of (30.88%) thinness as compared to those on jobs (28.50%) and those doing self business had the highest prevalence of thinness (32.68%) in their adolescent girls. Whereas daily wagers mothers had less prevalence of thinness (28%) as compared to housewife mothers (32.39%). Mothers who were doing jobs (16.67%) and self business (20%) had less prevalence of thinness as compared to daily wages and housewives. The Association between mother's occupation and nutritional status of their children was statistically significant. Fathers who do the job had less chance of having their girls thin (OR-0.627, P=0.229) as compared to daily wagers. Mothers who do the job had half chance (OR-0.675, p=0.504) of having their girl thin as compared to daily wages. Konwar P et al (2019) in the tea estates of Nazira subdivision of Sivasagar district, Assam reported that adolescent girls whose parents were unemployed had 60% stunting and thinness compared to those whose parents were employed had 50.38% of stunting and 50% thinness. [22]

In the present study, SES-II has more prevalence (36.84%) of thinness in girls as compared to SES-III (27.54%) and SES-IV (28.89%). Whereas SES-IV has maximum stunting (40.56%) as compared to SES-III (38.23%) and SES-II (26.31%). The Association between SES status and nutritional status of their children was statistically significant. Konwar P et al (2019) in the tea estates of Nazira subdivision of Sivasagar district, Assam found that adolescent girls belonging to the Upper middle class had 56.25% prevalence of stunting and 65.62% of thinness whereas the lower middle and lower class had 49.78% of stunting and 48.06% of thinness. [22]

In the present study, adolescent girls from the nuclear family had slightly more thinness 31% as compared to joint families 29.6%. Whereas 34.51% of girls were thin in families where environmental hygiene was good, 30.33% in families where environmental hygiene was fair and 25.37% in families where environmental hygiene was poor. There was no statistically significant association between environmental hygiene and the nutritional status of adolescent girls. A similar study by Chandrashekarappa SM et al (2016) in JSS Medical College, Mysuru reported that 64% of adolescent girls from the nuclear family had thinness as compared to 36.5% of joint families and it was statistically not significant. [19]

The immunization status of study subjects shows that, 31.25% of thin adolescent girls had their immunization status complete as compared to 27.5% of thin adolescent girls who had their immunization status incomplete. It was statistically not significant. The menstrual history of study subjects shows that 37.11% of adolescent girls were thin who had a regular menstrual history as compared to 33.33% of those who had irregular menstrual history. This association was statistically significant. Goyal R et al (2012) studied the Nutritional Status and Menarche in Adolescents of Punjab. They also had similar findings that 71.17% of adolescent girls were thin who had an irregular menstrual history as compared to 59.92% of those who had regular menstrual history. [23]

In the present study, 70.63% of adolescent had protein deficit and 70% had calorie deficit. 16% severely thin girls had >10 gm of protein deficit and 5% severely thin girls had 5-10 gm of protein deficit whereas 66% of thin girls had >10 gm of protein deficit. It has a statistically significant association. Similarly 36% severely thin girls and 60% of thin girls had >400 calorie deficit, whereas 37.7% of normal girls had a 200-400 calorie deficit. This also had a statistically significant association between calorie deficit and thinness in study subjects.

Konwar P et al (2019) in Assam assessed the Nutritional status of adolescent girls belonging to the tea garden. They reported that calorie and protein deficits were found to be 76.60% and 65%, respectively. [22]

In the present study 28.33% of the adolescent girls had irregular diet. Of those who had irregular diet 5.14% were severely thin girls and 27.21% were thin. It was a statistically not significant association b/w thinness and dietary intake. Whereas 53.57% of adolescent girls in the present study were vegetarian and 38% of them were severely thin and 55.22% of thin girls were vegetarian. There was no significant association b/w thinness and type of diet. Kotecha, P. V. et al (2013) in Baroda studied the dietary pattern of school-going adolescent girls in urban areas. They reported that nearly 80% of adolescents were consuming regular food and nearly 60% of adolescents had their breakfast daily. [24] Shukla NK et al (2017) in Barabanki, Uttar Pradesh reported that about one-fourth of the girls stated that they never took breakfast before coming to school. Daily intake of breakfast was found in 16.9% of the study subjects while 43.0% of the girls stated about frequent missing of meals. [25]

In the present study the mean weight (kg) of adolescent girls was 46.40 ± 6.16 , mean height (cm) was 153.82 ± 7.95 and mean BMI (Kg/M²) was 19.75 ± 3.26 . Maximum thinness 40% (BMI <18.5) was in 18 year age group followed by 37.5% in 15 years, 38.8% in 16 year age group and 33.3% in 17 years age group. Choudhary K et al (2014) did a cross-sectional study in Govt. Sr. Sec. Girls' School in Bikaner, Rajasthan to assess the nutritional status of adolescent girls at a government senior secondary girls' school. Mean height & Mean weight were 136.8 cm & 28.64 kg respectively whereas the mean BMI was 15.244. [26] As per WHO criteria for Height for Age (H/A), which measured the level of stunting in girls, 31.46% were in the moderate stunting category of malnutrition, and 4.38% of girls were severely stunted. As per WHO criteria for Body Mass Index (BMI), 2.71% of girls were in severe thinness, 27.92% were in Thinness and 7.71% were overweight. Banerjee, S et al (2011) did the under-nutrition study among adolescents: a survey in five secondary schools in rural Goa. They found that 25.7% were thin and 7.7 were severely thin. [27] Baliga SS et al (2014) in a village in Peeranwadi district in Belgaum, Karnataka assessed the nutritional status of adolescents girls aged 15 to 19 years, 40.84% were stunted and 39.43% were thin. [28]

The major morbidity among study participants was 19.60% had conjunctival pallor (anemia), 8.75% had dental carries, 6.46% had Vitamin B complex deficiency, 6.04% pale nail, 34.80% had angular stomatitis in lips and 0.84% had Vitamin A deficiency (Bitot's spot). Dambhare DG et al (2010) in High Schools of peri-urban areas in Wardha reported Morbidity among School going Adolescent girls. 38.89% had anaemia and 35.34% had dental caries. 13.79% had a refractory error, 7.76% had worm infestation. 6.9% had skin problems, 2.59% had tonsillitis and 2.59% had wax in the ear. [29] Susmitha KM et al (2012) in six social residential hostels of schedule cast girls in Nellore, Andhra Pradesh reported major morbid conditions among girls were Dental caries 28.04%, Skin disorders 26.4%. [30] Bhattacharya A et al (2015) did a study in three randomly selected co-educational schools of Burdwan District, West Bengal reported that 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. [31]

Conclusion

The present study was conducted among high school girls from private schools in Raipur city of Chhattisgarh state to evaluate their nutritional status and morbidity pattern. More than one-third of the (35.84%) late adolescent school girls were stunted, 30.63% were having some form of thinness and 19.60% had clinical anaemia.

The nutritional status of adolescent girls contributes to the nutritional status of the community. As a preventive strategy, there is a need to apply health and nutritional education program for inculcating healthy lifestyles. 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. All teachers and parents should be given health and nutritional education sessions by the health experts to enforce healthy eating habits among adolescent girl. Parents 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.

What does this study add to existing knowledge?

Effective implementation of this program should reach adolescents in their environment, such as in schools, families and communities. Skill-based nutrition education for the family and effective infection control and routine health assessment of school-going girls should be done.

Author's contribution

Dr. Sharja Phuljhele: Concept, study design

Dr. Prankur Pandey: Manuscript writing

Dr. Prerana Singh: Manuscript writing, Statistical analysis

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