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Assessment of nutritional status and prevalence of iron-deficiency anaemia among school going adolescent girls at rural areas of Purba Medinipur district: A cross sectional study based KAP model

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Abstract
Anaemia, a serious and challenging nutrition cum health problem of Indian adolescent girls, the major reasons are poor knowledge, practices and socio-economic conditions. The study covered the prevalence of under-nutrition and anaemia in adolescent girls, their nutrition-related knowledge, attitude, and practices (KAP) and to find out the relation among socio-economic status, body mass index (BMI) and 'KAP' with anaemia. School going rural adolescent girls (n=200) of Purba Medinipur district, West Bengal were selected randomly. The study revealed that 53.5% were from lower middle class and 43.5% were in under-nutrition status. Among the participants, 53.8%, 33.8% and 1.2% suffering from mild, moderate and severe anaemia respectively. In the domains of nutrition and anaemia, 74% have inadequate knowledge, 88% have poor attitude level, and 89% follow unhealthy practices. A significant association noted among the socioeconomic status, BMI, KAP levels with nutritional anaemia and such factors have positive impact on it.

Keywords: Socio-economic status, adolescent girls, anaemia, BMI, KAP

Introduction

Adolescence, the time between childhood and adulthood, is an important stage in human life. As adolescence is a time of tremendous physical, psychological, and cognitive development, it is a uniquely special stage in life. In India, adolescents constituents 22.8% of the population [1]. It is a unique stage of human development and an important time for laying the foundations of good health. About one-tenth of the population is adolescents and the nation's growth and wellbeing greatly dependent on the nutritional status of these adolescents.

Malnutrition affects the adolescents the most, since during these periods, their requirement for nutrients is more. This requirement further increases during pregnancy [2]. Attention to nutritional status is important during the adolescent stage, especially for girls, as they are undergoing the complex process of growth and development. During adolescence, the need for all nutrients increases. The increased demands for energy and nutrients that happens in adolescence due to remarkable growth and development during this period [3]. The nutritional requirements may be double at the peak of growth spurt compared to the rest period of adolescence. In the another study found an increased predominance of under-nutrition among rural teenage girls [4]. Healthy adolescent girls to be healthy mothers of a nation that will help to generate a sound and protective future generations. Malnutrition is posting a great threat to adolescents, especially in developing countries like India. Under-nutrition in this age group may be due to variety of factors, including the continuation of childhood malnutrition, household food insecurity, a lack of awareness, inadequate knowledge or incorrect dietary practices, and food fads. Furthermore, the prevalence of under-nutrition linked anaemia is quite high (>60%) in this age category [5]. Worldwide, the highest prevalence of such anaemia among women, including adolescents, is observed in India. The prevalence of anaemia among adolescent girls is 56% in India [6]. The widespread incidence of anemia in adolescent girls in India is gaining increasing recognition. Anemia among adolescent girls (Hb <12 g/dl) is concerningly high according to the reports of NFHS-5,2019 which revealed over 59.1%, with a distribution of mild, moderate and severe anemia are 26.4%, 30.1% and 2.6% respectively [7]. A survey by Indian Council of Medical Research (ICMR, 2000) in different parts of India revealed that 87 per cent of pregnant women suffer from anaemia and about 10 per cent have severe anaemia (Hb<80 g/l) [8]. In another study exposed that the average prevalence of anaemia was 83 per cent (Hb<70 g/l) among pregnant women in 16 districts [9].

Nutritional anemia is a significant public health issue in India. It has devastating impacts on health, physical and mental productivity which affects quality of life, particularly among the vulnerable. Urgent action to combat anaemia is needed from all concerned as remarkable levels of morbidity are noted of the anaemic persons and it is associated with national socio-economic loss. The purpose of the investigation is to find out the time based occurrence of under-nutrition and anaemia of adolescent school girls and to assess nutrition-related knowledge, attitude, and practices (KAP), the association between socio-financial state, body mass index (BMI), KAP level and prevalence of nutritional anaemia in adolescent school girls at rural communities in the district of Purba Medinipur.

Material and Methods:

Study design and sample: The cross-sectional study design was selected, and a total 200 adolescent girls (aged 12-17 yrs) were randomly selected from different villages under rural areas of Purba Medinipur district.

Inclusion criteria: School going adolescent girls (12-17 yrs) from rural community of Purba Medinipur were included in this study.

Exclusion criteria: Married adolescent girls and severely ill girls were excluded from study.

Questionnaire development and haemoglobin estimation: The questionnaire was separated into 3 sections: Socio-demographic, anthropometric and nutritional KAP status. Haemoglobin was estimated by random sampling out of the selected adolescents.

1. **Socio-Demographic information:** In this section, information were collected from the subjects about age, education, religion, family type, family income as per modified B.G Prasad scale-2020 [10], mother education and age at menarche.
2. **Anthropometric assessment:** The anthropometric parameters like height, weight, BMI were covered. Height was measured by anthropometer [11]. Weight was measured by weighing machine [12].
3. **KAP questionnaire preparation:** Questionnaires on KAP were prepared covering 3 major domains: Nutritional Anaemia, Nutrition & Health, Sanitation & Hygiene [13]. All questions of knowledge level were objective types with multiple options where 1 and 0 mark were allotted for correct and wrong answer respectively. Total score under knowledge domain was 0 to 70. Participants were classified in three groups according to obtained score where inadequate knowledge group having the score less than 35 (<50%), moderately adequate knowledge group having the score 35-52.5 (50% to 75%) and strong knowledge from 53.0-70 (76% up to 100%). Attitude questions were prepared by using 5 point Likert scale where the score 1 for strongly oppose, score 2 for oppose, score 3 for neutral, score 4for acceptance and score 5 for strongly acceptance. The cumulative score having the span of 0-100. Attitude questions were categories as poor with the score less than 50% (<50), good from 50% to 75% (50-75) and very good is scored from 76% upto 100% (76-100). In practice level of questionnaire, there were of 2 options: yes/no (scored: 1/0). Total score were ranged from 0 to 30. Practice levels were categories as unhealthy practice with the score less than 50% (<15), normal practice from 50% to 75% (15-22.5) and health friendly practice is scored more than 76-100% (22.8-30).

Haemoglobin estimation: Blood sample was collected by professional technicians and haemoglobin was estimated in a authorized laboratory. The reading was compared with WHO (2011) standards for classification of anaemic samples [14]. Total 80 adolescent girls were selected randomly for haemoglobin estimation.

Statistical analysis: Data were evaluated by SPSS20 and expressed as Mean and its standard deviation for numerical variables and count. Percentage was computed for categorical variables. For non-parametric variables, chi-square ($\chi 2$) test was done. The statistical evaluation was considered significant at p <0.05.

Ethical statement: Institutional Human Ethics Committee (IHEC) of Vidyasagar University has provided the ethical clearance certificate (ref. no.- VU/IHEC-5/1-24 dated 06.09.2024). All the participants were informed regarding the purpose of the study. Written consent form was obtained from each of the participant for willing to participate in this study.

Results and Discussion

Socio-demographic details

The socio-demographic features of the study subjects are shown in Table 1. Adolescence has three developmental stages *viz*., early (10-14 years), middle (15-17 years) and late (17-21 years) based on physical, psychological and social changes. Following this classification, the subjects in the age range of 12 - 17 years i.e., early and middle-adolescence stage were selected for the present study as this is the appropriate time to develop positive attitude among young girls towards better health as well as nutrition. The socio-demographic data of the participants revealed that among the 200 selected adolescent girls, majority (68.5%) belong to early adolescent period and 31.5% were from middle adolescence period. Students in 7^{th} standard constituted the highest proportion i.e., 39% followed by 8th, 9^{th}, 10th and 11^{th} standard with percentage of 21%, 13%, 16% and 11% respectively. Among the adolescent girls, 80.5% were Hindu, 18% were Muslim and 1.5% belonged to other religions. Out of the total population, 71.5% adolescent girls were from nuclear family and 28.5% were from joint family. From economic dimensions, according to modified B.G prasad scale-2020, 53.5% were from the lower middle class, 39% were from the middle class and 7.5% were from the upper middle class of socio-economic status [11]. Among the adolescent girls, 94% girls were non-vegetarian and 6% were vegetarian. Maximum mother’s educational qualification was higher secondary and secondary education i.e 37% and 24% respectively, 13% mother educational qualification was graduate, 10% mother education was postgraduate and above. Menarcheal age was 11-12 years of 57% subjects, 25%, 16% and 2% girls menarcheal age were 13-15 years, 9-10 years and 16-17 years respectively.

Anthropometric assessment

Adolescence, the junction between childhood and adulthood distinguished by accelerated somatic and reproductive growth. Monitoring growth during this period, is a significant health and morbidity indicator in the community. The anthropometry is simple and reliable technique for public health [15]. Height and weight were measured utilizing standard protocols followed by computation of BMI. Height and weight of the adolescent girls were also compared with the Indian Academy of Paediatrics standards (IAP-2015). The table 2 presented a comparison between the mean weight, height and BMI of the respondents with IAP standard (2015). The mean bodyweight of the participants in the age range of 12-17 years was found to be lower and the mean height was found to be less for all the ages of adolescent girls when compared with IAP standard. The mean BMI was found to be less for the ages of 12,15,16 and 17 years adolescent girls but mean BMI was little higher in 13 and 14 years girls when compared with IAP (2015) standard.

The BMI analysis in this study revealed that 43.5% of adolescent girls are undernourished, a concerning indication of potential nutritional deficiencies or inadequate dietary intake. While 51.5% of the girls fall within the normal BMI range, suggesting adequate nutrition for just over half, the presence of 4% overweight and 1% obese girls highlights emerging concerns about weight management, likely due to imbalanced diets or lifestyle changes. The combined burden of under-nutrition and over-nutrition emphasizes the need for targeted nutritional interventions to address both the extremes (Figure 1). This result is consistent with the publication of other conducted survey in Uttar Pradesh and the result showed that the proportion of underweight, overweight, and obese pupils were 47.0%, 5.9%, and 2.7%, respectively, the survey was done among 2400 adolescent school girls (10-19 years) in Barabanki district of Uttar Pradesh [16].

Anaemic status

The grades of anaemia were categorized according to WHO, as severe, moderate and mild anaemia [17]. The current study reveals a high time based nutritional anemia among adolescent girls, with a mean haemoglobin level of 10.59 g/dl. Most girls (53.8%) had mild anaemia, while 33.8% had moderate anaemia, and 1.2% had severe anaemia. Another study reported that among the anaemic adolescent females in Orissa, 45.2% had mild anaemia, 46.9% had moderate and 4.4% had severe anaemia [5]. A comparable study conducted by Rajaratnam et.al. to assess the prevalence of severe, moderate and mild anaemia among adolescent girls in Tamil Nadu revealed 2%, 6.3% and 36.5% respectively [18]. Another one study was conducted on women in coastal Kochi, Kerala, the majority (72.6%) of the individuals in the entire population were anaemic. Among them, most of them (51.6%) were mildly anaemic and some (21%) were moderately anaemic [19]. The proportion of mild anaemia in this study is higher compared to earlier findings, suggesting widespread but less severe iron deficiency. These results underscore the need for early intervention programs to prevent the progression of anaemia among adolescents (Figure 2). The cause of lower prevalence of moderate and severe anaemia in adolescent school going girls may be due to impact of mid-day-meal programme in school where protein is also provided about half of daily requirement, an important regulation of anaemia prevention.

Knowledge, attitude and practice level

The findings suggested that, the high prevalence of inadequate knowledge (74%), poor attitudes (88%), and unhealthy practices (89%) among adolescent girls concerning anaemia may stem from several factors(Figure-3). Limited access to health education, particularly in schools and communities contributes to the insufficient knowledge. In the previous study showed that, about 75% of adolescent girls had moderate knowledge, 24% had lower knowledge, and only 1% had sufficient knowledge on micronutrient deficit anaemia and 75% of adolescent girls were having desirable practice while only 25% had undesirable practice on iron deficiency anaemia [20]. Another study showed that, majority of participants (60%) had an adequate knowledge regarding anaemia. A positive attitude was demonstrated, along with adequate awareness of anaemia. A total of 55.5% of participants expressed having good health habits [21]. Cultural beliefs and misconceptions about nutrition and health may also play a role in shaping negative attitudes [22]. Additionally, socio-economic factors, including limited access to nutritious food and healthcare services, could explain the widespread unhealthy practices. Addressing these gaps requires targeted health education programs, community-based interventions to shift attitudes, and improved access to resources for promoting healthy practices. This comprehensive approach could help to mitigate anaemia and improve overall adolescent health.

Table 3 demonstrates that among the adolescent girls who were anaemic, 78.75% had lack knowledge, 12.5% had slightly adequate knowledge and 8.75% had sufficient knowledge. The result revealed the prevalence of anaemia is more among the girls with inadequate knowledge and there is a significant association between knowledge levels about nutrition and the prevalence of anaemia among adolescents. According to the study conducted in Indonesia, maternal knowledge of anaemia was associated with child anaemia in urban and rural areas [23]. The current study also revealed a relationship between lower knowledge level and high prevalence level of anaemia significantly among adolescent girls. It is crucial to implement targeted health education programs for adolescent girls, focusing on enhancing their nutritional literacy and awareness of anaemia prevention, as this can empower them to make informed dietary choices and ultimately reduce anaemia rates in this vulnerable population, now called as social vaccination programme.

Table 4 revealed that maximum (89%) anaemic adolescent girls had poor attitude towards nutrition and heath, 9% had good attitude and only 2% anaemic girls had very good attitude and there is a substantial relationship between attitude levels and anaemia prevalence among participants, as statistically calculated by a level of significance at $p<0.05$. However, it is noteworthy that a higher prevalence of anaemia is observed among those with poor attitudes towards nutrition and health. This implies that while attitude alone may not directly influence anaemia prevalence, negative attitudes could contribute to poor dietary practices, thereby indirectly impacting nutritional health. Another study conducted in Malaysian adolescent girls on nutrition education, attitude and haemoglobin status, there was a extremely significant (1% level) positive connection between respondent's attitude scores and hemoglobin levels. The study suggests that better attitudes have positive impact on higher haemoglobin levels among adolescents [24]. The current study also agrees with the previous findings. This indicates the importance of fostering positive attitudes towards nutrition and health, as enhancing participants' perspectives could potentially mitigate anaemia prevalence even if the statistical significance is not firmly established. Therefore, addressing attitude-related barriers through targeted interventions may be beneficial in improving overall health outcomes among this population.

The data presented in Table 5 demonstrated among the anaemic adolescent girls 91% girls have unhealthy practices about anaemia, 7.5% have normal practice and 1.2% have healthy practices. There is a significant association between practice level and the prevalence of anaemia among participants at $p<0.05$, that nullify the null hypothesis. This finding suggests that improper practice level is positively correlated with a higher prevalence of anaemia. In a previous study conducted among adolescent girls in coastal Kochi, Kerala, a strong positive connection was established between subject's practice scores and hemoglobin levels. Practices including consumption of food earlier in the day, intake of vitamin C rich fruits, regularly eating fruits, and frequent drinking of tea/coffee, etc. lead to better hemoglobin levels of individuals [19]. The present study revealed the same findings.

The data presented in Table 6 demonstrated that maximum (51%) anaemic adolescent girls were from lower middle class family, 35% were from middle class family and 14% anaemic girls were from upper middle class family and there is a significant association between socio-economic status and the prevalence of anaemia among participants at $p<0.05$, resulting in the rejection of the null hypothesis. The above result indicates that lower socio-economic status is positively correlated with a higher prevalence of anaemia. A further investigation carried out among adolescent girls from rural regions of Tamil Nadu revealed that the prevalence of anaemia was high (70.59%) among the girls who belonged to lower class socio-economic status, followed by lower middle class (50.49%) and middle class (34.48%). This was found to be statistically significant [25]. These findings were concordant with other similar studies conducted among anaemic girls belonging to Uttar Pradesh [26], Nagpur [27], Chandigarh [28], and Delhi [29] showing high prevalence rate of anaemia among lower socioeconomic groups. The present study showed the same findings. The close relationship between anaemia and socioeconomic status emphasizes the need for formulating and implementing measures to address and eradicate socioeconomic disparities. Individuals from economically disadvantaged backgrounds may experience limited access to nutritious food, healthcare, and education, contributing to inadequate dietary practices and poor health outcomes. This highlights the critical need for public health interventions and policies that address socio-economic disparities, aiming to improve nutrition and health literacy within vulnerable populations, ultimately reducing the prevalence of anaemia and enhancing overall well-being.

In the present study, Table 7 indicated the prevalence of anaemia was more among the underweight (41%) and normal weight (53%) adolescent girls and prevalence of anaemia was less among the overweight group (5%) and obese (1%) adolescent girls which was statistically significant ($p<0.05$). The study revealed that there was a significant association between Body Mass Index (BMI) and the prevalence of anemia. Lower BMI values are correlated with a higher prevalence of anemia among the participants. The overall incidence of anemia against to BMI in that observation was consistent with numerous other literatures indicated that individuals with high BMI had a lower prevalence of anemia, while participants were having low BMI, more likely to be anemic. Low BMI is associated with a higher prevalence of anemia [1,30,31,32]. In current observation, adolescent females with underweight have a greater frequency of anemia that could be attributable to deficit state of food and poor dietary routines in rural areas. Individuals with lower BMI often face nutritional deficiencies that compromise their overall health, leading to a reduced capacity for erythropoiesis and consequently, anemia. This relationship emphasizes the importance of addressing nutritional status as a crucial factor in the prevention and management of anaemia. Interventions designed to enhancing dietary intake and improving a healthy weight are essential to enhance the nutritional status of individuals, thereby reducing the risk of anemia and improving health outcomes in the affected population.

Table 1: Socio-demographic characteristics of the subjects covered in the study, n=200

Category		Number (n)	Percentage (%)
Age	Early Adolescence(12-14yrs)	137	68.5
	Middle Adolescence(15-17yrs)	63	31.5
Education	Class -vii	78	39
	Class-viii	42	21
	Class-ix	26	13
	Class-x	32	16
	Class-xi	22	11
Religion	Hindu	161	80.5
	Muslim	36	18
	Others	3	1.5
Family type	Nuclear	143	71.5
	Joint	57	28.5
Family income (modified B.G Prasad scale-2020) Per capita income (PCI) (INR/month)	I-(Upper class) >7533	0	0.0
	II-(Upper middle class) 3766-7532	15	7.5
	III-(Middle class) 2260-3765	78	39
	IV-(Lower middle class) 1130-2259	107	53.5
	v-(Lower class) <1129	0	0.0
Mother's education	Illiterate	12	6
	Primary	20	10
	Secondary	48	24
	Higher secondary	74	37
	Graduate	26	13
	Postgraduate & above	20	10
Dietary pattern	Vegetarian	12	6
	Non-vegetarian	188	94
Age at Menarche	9-10yr	32	16
	11-12 years	114	57
	13-15 years	50	25
	16-17 years	4	2

Table 2: Comparison of mean height, body weight and BMI of age specific adolescent girls with IAP standard (2015), n=200

Age (Year)	Height (cm) Mean±SD	IAP standard (2015)	P value	Weight (kg) Mean±SD	IAP standard (2015)	P value	BMI (kg/m²) Mean±SD	IAP standard (2015)	P value
12year	147.2±6.77	148.4	0.291	37.01±4.82	39.8	0.001*	17.01±1.97	18	0.003*
13year	149.8±6.74	152.2	0.031*	42.62±6.22	43.6	0.328	19.07±2.50	18.8	0.494*
14year	151.2±5.89	154.7	0.000*	46.57±8.06	46.4	0.873	20.43±3.49	19.4	0.027*
15year	151.3±4.47	156.1	0.000*	44.25±6.85	48.4	0.007*	19.32±2.84	19.9	0.335
16year	155.2±5.51	156.9	0.254	47.7±6.56	49.7	0.261	19.89±2.56	20.3	0.554
17year	156.4±6.92	157.4	0.501	48.28±4.32	50.9	0.001*	19.89±1.98	20.6	0.096

Values presented as mean±SD. Statistical interpretation was done using one-sample t-test. '*' indicated significant difference at $p<0.05$

Table 3: Association between knowledge level and anaemia prevalence, n=80

Anaemic status	Knowledge level			Chi-square test of independent variable (λ^2)
	Inadequate n=63	Moderately adequate n=10	Adequate n=7	
Severe anaemia	1(1.6%)	0(0.0%)	0(0.0%)	37.18(p=0.000)*
Moderate anaemia	26(41.3%)	1(10%)	0(0.0%)	
Mild anaemia	35(55.6%)	6(60%)	2(28.6%)	
Normal	1(1.6%)	3(30%)	1(71.4%)	

Percentage value given in parenthesis. Statistical interpretation was done using chi-square (λ^2) test. *significant at the level of $p<0.05$

Table 4: Association between attitude level and anaemia prevalence, n=80

Anaemic status	Attitude level			Chi-square test of independent variable (λ^2)
	Poor n=71	Good n=7	Very good n=2	
Severe anaemia	1(1.4%)	0(0.0%)	0(0.0%)	34.09(p=0.000)*
Moderate anaemia	26(36.6%)	1(14.3%)	0(0.0%)	
Mild anaemia	41(57.7%)	2(28.6%)	0(0.0%)	
Normal	3(4.2%)	4(57.1%)	2(100%)	

Percentage value given in parenthesis. Statistical interpretation was done using chi-square (λ^2) test. *significant at the level of $p<0.05$

Table 5: Association between practice level and anaemia prevalence, n=80

Anaemic status	Practice level			Chi-square test of independent variable (λ^2)
	Unhealthy Practice n=73	Normal practice n=6	Healthy Practice n=1	
Severe anaemia	1(1.4%)	0(0.0%)	0(0.0%)	42.97(p=0.000)*
Moderate anaemia	27(37%)	0(0.0%)	0(0.0%)	
Mild anaemia	42(57.5%)	1(16.7%)	0(0.0%)	
Normal	3(4.1%)	5(83.3%)	1(100%)	

Percentage value given in parenthesis. Statistical interpretation was done using chi-square (λ^2) test. *significant at the level of $p<0.05$

Table 6: Association between socio-economic status and anaemia prevalence, n=80

Anaemic status	Socio-economic status			Chi-square test of independent variable (λ^2)
	Lower middle class n=41	Middle class n=28	Upper middle class n=11	
Severe anaemia	1(2.4%)	0(0.0%)	0(0.0%)	41.75(p=0.000)*
Moderate anaemia	20(48.8%)	7(25%)	0(0.0%)	
Mild anaemia	20(48.8%)	19(67.9%)	4(36.4%)	
Normal	0(0.0%)	2(7.1%)	7(63.6%)	

Percentage value given in parenthesis. Statistical interpretation was done using chi-square (λ^2) test. *significant at the level of $p<0.05$

Table 7: Association between Body Mass Index (BMI) and anaemia, n=80

Anaemic status	BMI status				Chi-square test of independent variable (λ^2)
	Underweight n=33	Normal n=42	Overweight n=4	Obese n=1	
Severe anaemia	1(3%)	0(0.0%)	0(0.0%)	0(0.0%)	20.53(p=0.015)*
Moderate anaemia	19(57.6%)	8(19%)	0(0.0%)	0(0.0%)	
Mild anaemia	12(36.4%)	26(61.9%)	4(100%)	1(100%)	
Normal	1(3%)	8(19%)	0 (0.0%)	0(0.0%)	

Percentage value given in parenthesis. Statistical interpretation was done using chi-square (λ^2) test. *significant at the level of $p<0.05$

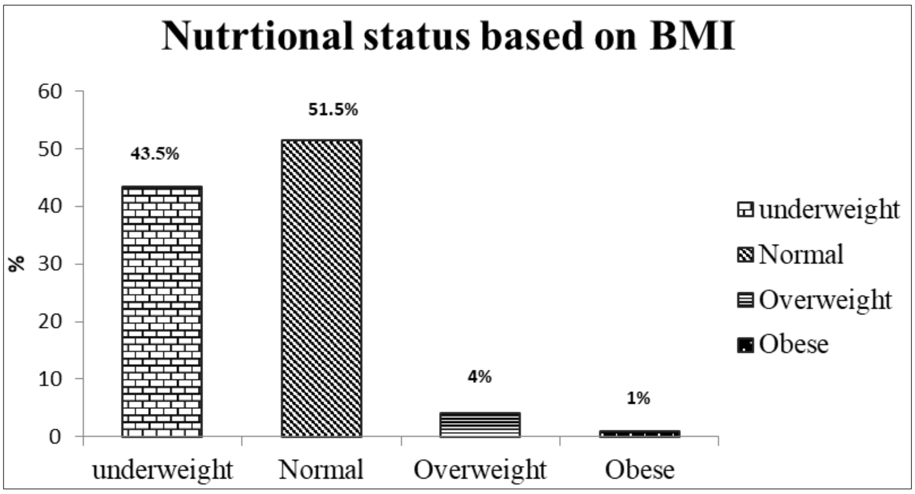

Fig 1: Distribution of participant's nutritional status based on BMI, n=200

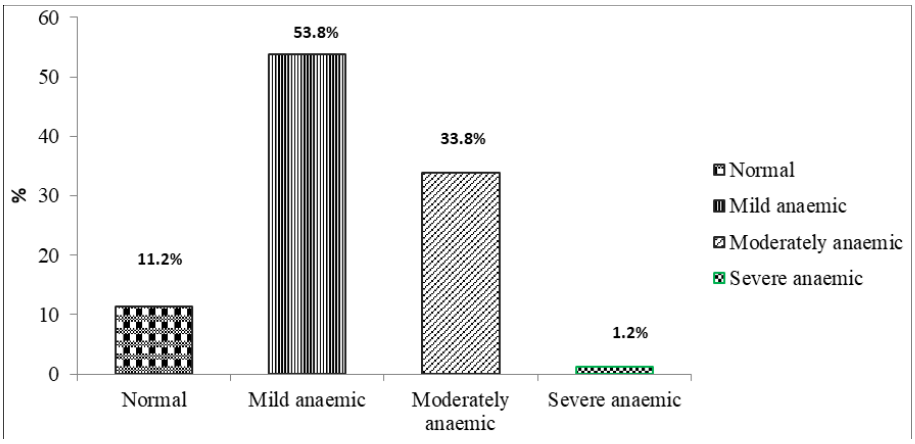

Fig 2: Prevalence of anaemia of the subjects and types, n=80

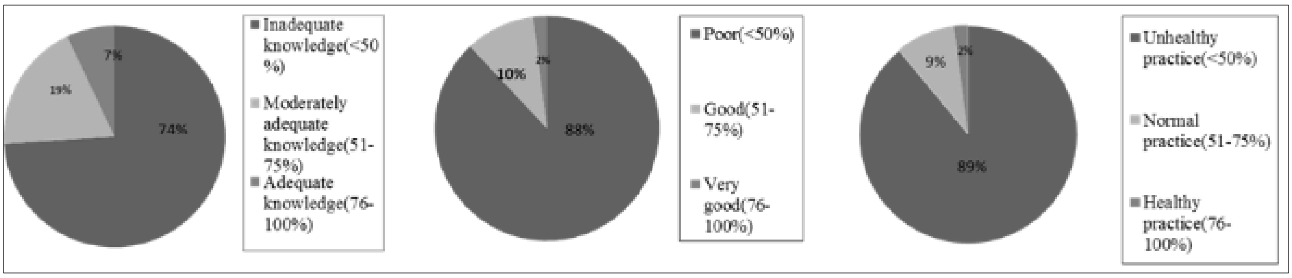

Fig 3: Distribution of Knowledge, Attitude and Practice level among adolescent girls, n=200

Conclusion

In the present study, almost one in two adolescent girls belonged from lower middle class family as per B.G Prasad scale, they were under-nourished and near about fifty percent had mild anaemia and their KAP levels were very poor. The socio-economic status (SES), BMI and KAP levels among adolescent school going girls showed a association with the prevalence of anaemia significantly. Lack of basic information on health, food and nutrition in rural adolescent girls, it is may be due to lack of proper health guides who provides information about good nutrition from govt. and non-govt. guided available strategies for wellness and health. In addition, efforts should be given to improve their nutritional status and KAP level through proper nutrition education by formal and informal ways.

Ethical consent statement

Institutional Human Ethics Committee (IHEC) of Vidyasagar University has provided the ethical clearance certificate (ref. no.- VU/IHEC-5/1-24 dated 06.09.2024). All the participants were informed regarding the purpose of the study. Written consent form was obtained from each of the participant for willing to participate in this study.

Author's contribution

All authors read and approved the final form of the manuscript.

Conflict of Interest

No conflict of interest from our side.

Data Availability statement

The corresponding author may be communicated for concerned data availability.

References

1. Dasgupta A, Butt A, Saha TK, Basu G, Chattopadhyay A, Mukherjee A, *et al*. Assessment of malnutrition among adolescents: Can BMI be replaced by MUAC? Indian J Med. 2010 Apr;35(2):276-9.
2. Choudhary S, Mishra CP, Shukla KP. Dietary pattern and nutrition-related knowledge of rural adolescent girls. Indian J Prev Soc Med. 2010 Jun;41(3):207-15.
3. Story M, Stang J. Nutrition needs of adolescents. In: Stang J, Story M, editors. Guidelines for Adolescent Nutrition Services. Minneapolis: University of Minnesota; 2005. p. 21-34.
4. Shivaramakrishna HR, Deepa AV, Sarithareddy M. Nutritional status of adolescent girls in rural area of Kolar District - a cross-sectional study. Al Ameen J Med Sci. 2011 Aug;4(3):243-6.
5. Bulliyy G, Mallick G, Sethy GS, Kar SK. Hemoglobin status in non-school going adolescent girls in three districts of Orissa, India. Int J Adolesc Med Health. 2007 Oct;19:395-406.
6. Aguayo VM, Paintal K, Singh G. The adolescent girls' anaemia control programme: A decade of programming experience to break the inter-generational cycle of malnutrition in India. Public Health Nutr. 2013 Sep;16(9):1667-76.
7. International Institute of Population Sciences (IIPS) and ICF. National Family Health Survey (NFHS-5), India, 2019-21: Volume II. Mumbai: IIPS; 2021 [cited 2025 Jun 4]. Available from: https://dhsprogram.com/pubs/pdf/FR375/FR375.pdf
8. Medappa N. Iron absorption and its implications on strategies to control iron deficiency anaemia. Indian Counc Med Res Bull. 2000;30:1-7.
9. Toteja GS, Singh P, Dhillon BS, Saxena BN, Ahmed FU, Singh RP, *et al*. Prevalence of anaemia among pregnant women and adolescent girls in 16 districts of India. Food Nutr Bull. 2006 Dec;27(4):311-5.
10. Majhi MM, Bhatnagar N. Updated B.G Prasad's classification for the year 2021: consideration for new base year 2016. J Family Med Prim Care. 2021 Nov;10(11):4318-9.
11. Agrawal KN, Saxena A, Bansal AK, Agarwal DK. Physical growth assessment in adolescents. Indian Pediatr. 2001 Nov;38:1217-35.
12. Choudhary S, Mishra CP, Shukla KP. Correlates of nutritional status of adolescent girls in the rural area of Varanasi. Internet J Nutr Wellness. 2008 Dec;7(2):1-10.
13. Moore JB, Pawloski L, Rodriguez C, Lumbi L, Ailinger R. The effect of a nutrition education program on the nutritional knowledge, hemoglobin levels, and nutritional status of Nicaraguan adolescent girls. Public Health Nurs. 2009 Mar;26(2):144-52.
14. Das DK, Biswas R. Nutritional status of adolescent girls in a rural area of North 24 Parganas district, West Bengal. Indian J Public Health. 2005 Jan;49(1):18-21.
15. Norris SA, Frongillo EA, Black MM, Dong Y, Fall C, Lampl M, *et al*. Nutrition in adolescent growth and development. Lancet. 2022 Jan;399:172-84.
16. Ahmad S, Shukla NK, Singh JV, Shukla R, Shukla M. Double burden of malnutrition among school-going adolescent girls in North India: A cross-sectional study. J Family Med Prim Care. 2018 Nov;7(6):1417-24.
17. Cappellini MD, Motta I. Anemia in clinical practice—definition and classification: does hemoglobin change with aging? Semin Hematol. 2015 Oct;52(4):261-9.
18. Rajaratnam J, Abel R, Asokan JS, Jonathan P. Prevalence of anemia among adolescent girls of rural Tamil Nadu. Indian J Pediatr. 2000 Sep;37(5):532-6.
19. Jose S, Antony SC, Isaac BR. Impact of knowledge, attitude and practice on anemia status among women in coastal Kochi, Kerala. Int J Multidiscip Curr Res. 2016 Apr;4:295-8.
20. Renuga R, Sivaranjani S, Jeevitha S, Kumar SA. A descriptive study to assess the knowledge, practice and attitude on iron deficiency anemia among adolescent girls at selected private school, Kanchipuram Dt, Tamil Nadu, India. Indian J Public Health Res Dev. 2020 Mar;11(3):1-5.
21. Huong C, Chua JL, Ng RY, Panse DK, Misra S, Sumera A. Knowledge, attitude and practices (KAP) towards anaemia among female university students in Malaysia: A cross-sectional survey. Malays J Nutr. 2022;28(2):203-15.
22. Nelson SW, Guerra PL. Educator beliefs and cultural knowledge: Implications for school improvement efforts. Educ Adm Q. 2014 Feb;50(1):67-95.
23. Souganidis ES, Sun K, Kraemer K, Raj JH, Sari M, Semba RD, *et al*. Relationship of maternal knowledge of anemia with maternal and child anemia and health related behaviors targeted at anemia among families in Indonesia. Matern Child Health J. 2012 Dec;16(9):1913-25.
24. Yusoff H, Wan Daud WN, Ahmad Z. Nutrition education and knowledge, attitude and hemoglobin status of Malaysian adolescents. Southeast Asian J Trop Med Public Health. 2012 Jan;43(1):192-7.
25. Sasidharannair A, Kumari C, Sinha P, Singaravelu SL, Jaikumar S. Prevalence of anemia among adolescent girls in a rural area of Tamil Nadu, India. J Family Med Prim Care. 2019 Apr;8:1414-7.
26. Chaudhary SM, Dhage VR. Study of anaemia among adolescent females in the urban areas of Nagpur. Indian J Community Med. 2008 Oct;33:245-8.
27. Rawat CMS, Garg SK, Singh JV, Bhatnagar M. Socio-demographic correlates of anaemia among adolescent girls in rural areas of the district Meerut (UP). Indian J Community Med. 2001 Oct;26:173-5.
28. Basu S, Hazarika R, Parmar V. Prevalence of anaemia among the school going adolescents of Chandigarh. Indian Pediatr. 2005 Jun;42:593-8.
29. Kapoor G, Aneja S. Nutritional disorders in adolescent girls. Indian Pediatr. 1992 Aug;29:969-73.
30. Sumarmi S, Puspitasari N, Handajani R, Wirjatmadi B. Underweight as a risk factor for iron depletion and iron-deficient erythropoiesis among young women in rural Areas of East Java, Indonesia. Malays J Nutr. 2016 Sep;22(2):219-32.
31. Ramachandra S, Kasthuri A. Anaemia in the elderly who resided in a South Indian rural community. Indian J Prev Diagn. 2008 Sep;5(10):4-12.
32. Kalyanshetti SB, Kallur R. Association of anemia with BMI in medical students: a cross-sectional study. Indian J Basic Appl Med Res. 2016 Jul;1(6):371-7.