Original Article

Prevalence of Anemia among Adolescent Girls in Rural Area of a District of Maharashtra

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Abstract

Introduction: Nutritional anemia is one of India's major public health problems. Adolescence is a vulnerable period in the human life cycle for the development of nutritional anemia. Anemia in adolescent girls contributes to maternal and foetal mortality and morbidity in future.

Aim and Objectives: To estimate the prevalence of anemia among adolescent girls and to study the sociodemographic factors associated with anemia.

Method: It was a community based cross sectional study in 10 villages of a district. 420 adolescent girls were interviewed using a predesigned, pretested questionnaire, and their anemic status was assessed by hemoglobin estimation. Results were analyzed by using percentage, proportion and Chi-square test, with the help of Microsoft Excel 2007 and SPSS version 20.0 statistical software.

Result: Mean age of the study sample was 14.01 ± 2.57 years. The majority (64.8%) of the girls were hindu by religion and belonged to a nuclear family (53.6%). 45.2 % were educated up to high school level. Most of the girls belonged to socioeconomic class IV (46.0%). The prevalence of anemia in this study was found to be 65.7%. The prevalence of mild and moderate anemia among study participants was 32.6 and 29.8%, respectively. A statistically significant association was found between the prevalence of anemia with age group, educational status of both father and mother, and status of attainment of menarche ($p<0.05$).

Conclusion and Recommendation: The prevalence of anemia among adolescent girls was very high; therefore, attempts must be made to sensitize adolescents and their parents through health and nutrition education, information, education, and communication (IEC), and appropriate behavioral change communication (BCC) activities.

Keywords: Adolescent, Female, Prevalence, Nuclear Family, Cross-Sectional Studies, Menarche Anemia, Hemoglobins, Parents Surveys and Questionnaires, Religion Schools, Software, Fathers.

Introduction

According to the World Health Organization, adolescence is defined as a life span between 10 and 19 years.[1] This period has been considered as the transitional phase from childhood to adulthood. During this phase, major psychological, behavioral, and physical developments ensue; because of marked physical activity and rapid growth spurt, adolescence needs additional nutritional requirements.[2,3] Increased nutritional needs at this juncture relate to adolescents gaining up to 50% of their adult weight, more than 20% of their adult height, and 50% of their adult skeletal mass during this period.[4]

Access this article online

Quick Response Code

Website: www.iapsmupuk.org

DOI: 10.47203/IJCH.2023.v35i01.005

India is home to over 250 million adolescents (between the ages of 10 and 19), constituting 20% of the total population, making adolescent health crucial to achieving the country's Sustainable Development Goals (SDGs).[5] As adolescent age is the formative years for development, anemia at this stage of life has some long-term consequences, such as stunted growth, poor school performance, reduced immunity,

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How to cite this article: Nair A, Doibale MK. Prevalence of Anemia among Adolescent Girls in Rural Area of a District of Maharashtra. Indian J. of Com. Health. 2023;35(1):21-26.
Received: 03-09-2022, **Accepted:** 15-02-2023, **Published:** 31-03-2023

menstrual irregularities, and later poor pregnancy outcomes such as intrauterine growth restriction, low birth weight, and increased perinatal morbidity and mortality.[6]

Among adolescents, girls constitute a vulnerable group, particularly in developing countries where they are traditionally married at an early age and exposed to a greater risk of reproductive morbidity and mortality. In a family with limited resources the female child is more likely to be neglected. She is deprived of good food and education and is utilized as an extra hand to carry out household work. The added burden of menstrual blood loss, normal or abnormal, precipitates anemia too often.[7]

The prevalence of anemia in adolescent girls is disproportionately high in developing countries like India, due to poverty, inadequate diet, certain diseases (malaria, parasitic infestation etc.), pregnancy/lactation and poor access to health services.[8] As per the National Family Health Survey 5 (2019-21) in India, 59.1% of women of age 15–19 years were anemic (Hb < 12.0 g/dl), while comprehensive national nutrition survey (2016-18) showed that 39.6% adolescent females (10–19 years) were anemic.[9,10] The prevalence of anemia among adolescent girls in rural area of Osmanabad district, Maharashtra and rural areas of Tamil Nadu was observed to be 67.4 and 48.63%, respectively in previous studies.[11,12]

Adolescents are the future generation of any country and their health and well-being are important for the progress of society. Anemia in adolescent girls not only affects the present status of their health but also shows its deleterious effect when they become mothers. The control of anemia in pregnant women can be more easily achieved if a satisfactory nutritional status can be ensured during adolescence. Several sociodemographic factors affect the nutritional status of adolescent girls, most of which are preventable causes. There is limited data regarding nutritional anemia, particularly in rural areas of Marathwada region of Maharashtra, India therefore, the present study was undertaken to find out the magnitude of anemia in adolescent girls in rural areas and to study the sociodemographic factors related to anemia.

Material and Methods

This study was a community-based cross sectional study conducted to find out the prevalence of anemia among adolescent girls and some associated sociodemographic factors. The study data was collected from January 2015 to June 2015 from 10 villages included under the primary health centre area of a predominantly rural district (rural population > 65% of total population) of Marathwada region of Maharashtra, having a population of around 15,189. As per Anganwadi centres record, there were 1759 adolescent girls in that rural area. The study population comprised all girls aged 10–19 years in the selected rural area of a district. Ethical committee approval (IEC Ref No. 17/2014 dated 29/1/2014) was obtained prior to the start of the study from

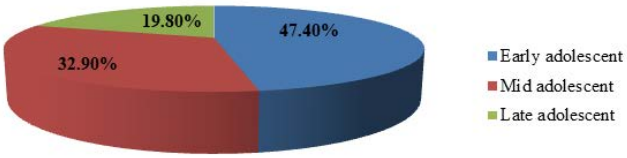

Figure 1: Distribution of girls according to adolescent age group

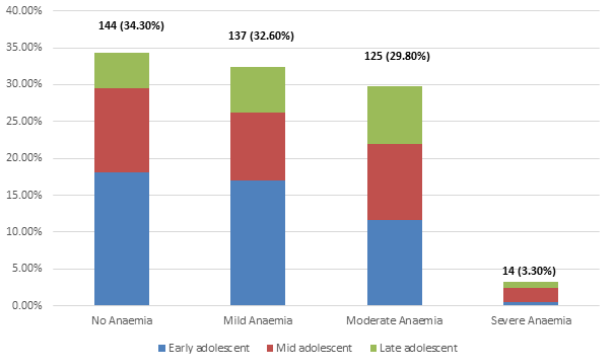

Figure 2: Severity of Anemia among adolescent girls (n = 420)

the Institutional Ethics Committee of the Medical College. Girls who were not permanent residents of the study area (Permanent residents are those who lived in the study area for a period of 6 months or more) and those who could not be traced even after 3 visits were also excluded from the study. The prevalence of anemia (Hb<12 gm%) in adolescent girls was 41.9% in one of the studies on rural adolescent girls in Ratnagiri, Maharashtra in 2009,[13] which was taken into consideration for sample size estimation. The sample size (N) was calculated by using Cochran's formula, $N= Z^2 P (1-P) / e^2$, where Z=1.96 for 95% of the confidence interval, P=estimated prevalence in study population, e=absolute error or precision, here taken as 5%. 10% margin was taken as dropouts/non-responsive. Finally, we got sample size of 416 which we rounded off to select 420 adolescent girls from the study area.

The data regarding adolescent girls' population was obtained from the district health office. Out of the total adolescent girls, the desired sample size of 420 was selected by systematic random sampling. From the list of adolescent girls of every village which we got from Anganwadi, one girl was randomly selected using random number table, and then we selected every 4th adolescent girl (sampling interval = 4) till we got our calculated sample size of 420 adolescent girls.

House to house visit of all the selected girls was done. They were contacted and interviewed, and a blood sample was taken after getting written informed consent from their parents and assent from the adolescent girl. Data regarding sociodemographic variables was collected using predesigned and semi-structured questionnaires. Variables included were age, religion, education status, type of family, marital status,

parents' education and occupation, socioeconomic class (modified BJ Prasad Classification) and status of menarche of adolescent girls. The blood sample was collected under aseptic conditions and transported to the pathology laboratory of the medical college and hemoglobin estimation was done by using Cell Counter named Mythic Haematoanalyzer.

For interpretation of anemia, the cut-off point for hemoglobin (Hb)% was taken as < 12 gm/dL. The severity of anemia was graded as mild (10 to < 12 gm/dL), moderate (7 to < 10 gm/dL), and severe (<7 gm/dL).[12] The collected data was numerically coded, entered in Microsoft Excel 2007, and then transferred to the SPSS 16 (version). Descriptive statistics in terms of percentage was used to present the sociodemographic variables, the prevalence and severity of anemia. Chi-square test was used to assess the statistically significant association between the presence of anemia and the sociodemographic variables of the adolescent girls. A *p-value* of less than 0.05 was considered statistically significant.

Results

A total of 420 adolescent girls were selected for the study using systematic random sampling.

The mean age of the girls was found to be 14.01 ± 2.57 years and the majority (47.4%) of them belonged to early adolescent age group (10–13 years) Figure 1. Most of the girls were hindu (64.8%) by religion and lived in a nuclear family set up (53.6%). The majority of the girls were educated up to higher secondary level (45.2%). Parents of most of the girls were illiterate (26.7 fathers and 43.3% mothers). Almost half of the mothers were homemakers (50.7%) and majority of the fathers belonged to the class of semi-skilled workers (50.0%). As per the modified BJ Prasad classification, the maximum girls belonged to socioeconomic Class IV (45.9%) and V (43.1%).

Mean haemoglobin level of the study sample was 10.90 ± 1.94 gm/dL. Anemia (Hb < 12 gm/dL) was present in 65.7% of adolescent girls. Most of the girls had mild anemia (32.6%)

Table 1: Association between some sociodemographic variables and anemia among adolescent girls

Variables	*Anemia*		*Total*	*Chi-square test*
	Present	*Absent*		
Age group				
Early adolescent	119 (59.8%)	80 (40.2%)	199 (47.4%)	χ2 = 8.994, df = 2, p = 0.011
Mid adolescent	92 (66.7%)	46 (33.3%)	138 (32.9%)	
Late adolescent	65 (78.3%)	18 (21.7%)	83 (19.7%)	
Total	276 (65.7%)	144 (34.3%)	420 (100.0%)	
Type of family				
Nuclear	152 (67.6%)	73 (32.4%)	225 (53.6%)	χ2 = 0.783, df = 2, p = 0.676
Joint	58 (64.4%)	32 (35.6%)	90 (21.4%)	
Three generation	66 (62.9%)	39 (37.1%)	105 (25.0%)	
Total	276 (65.7%)	144 (34.3%)	420 (100.0%)	
Education status				
Illiterate	0 (0.0%)	1 (100.0%)	1 (0.2%)	χ2 = 6.713, df = 4, p = 0.152
Primary	35 (57.4%)	26 (42.6%)	61 (14.5%)	
Secondary	82 (63.1%)	48 (36.9%)	130 (31.0%)	
Higher secondary	130 (68.4%)	60 (31.6%)	190 (45.2%)	
Graduation	29 (76.3%)	9 (23.7%)	38 (9.1%)	
Total	276 (65.7%)	144 (34.3%)	420 (100.0%)	
Marital status				
Unmarried	265 (65.1%)	142 (34.9%)	407 (96.9%)	χ2 = 2.127, df = 1, p = 0.145
Married	11 (84.6%)	2 (15.4%)	13 (3.1%)	
Total	276 (65.7%)	144 (34.3%)	420 (100.0%)	
Socio economic class				
Class I	1 (50.0%)	1 (50.0%)	2 (0.5%)	χ2 = 5.380, df = 4, p = 0.251
Class II	8 (61.5%)	5 (38.5%)	13 (3.1%)	
Class III	19 (61.3%)	12 (38.7%)	31 (7.4%)	
Class IV	118 (61.1%)	75 (38.9%)	193 (45.9%)	
Class V	130 (71.8%)	51 (28.2%)	181 (43.1%)	
Total	276 (65.7%)	144 (34.3%)	420 (100.0%)	

Table 2: Association between parents' education and occupation, and anemia among adolescent girls

Variables	Anemia		Total	Chi-square test
	Present	Absent		
Father's education				
Illiterate	75 (67.0%)	37 (33.0%)	112 (26.7%)	
Till Secondary	101 (70.1%)	43 (29.9%)	144 (34.3%)	$\chi2 = 2.971$, df = 3, p = 0.396
Till Higher Secondary	54 (60.7%)	35 (39.3%)	89 (21.2%)	
Graduation and above	46 (61.3%)	29 (38.7%)	75 (17.8%)	
Total	276 (65.7%)	144 (34.3%)	420 (100.0%)	
Mother's education				
Illiterate	129 (70.9%)	53 (29.1%)	182 (43.3%)	
Till Secondary	105 (67.7%)	50 (32.3%)	155 (36.9%)	
Till Higher Secondary	25 (47.2%)	28 (52.8%)	53 (12.6%)	$\chi2 = 11.617$, df = 3, p = 0.009
Graduation and above	17 (56.7%)	13 (43.3%)	30 (7.1%)	
Post-graduation	1 (33.3%)	2(66.7%)	3 (0.7%)	
Total	276 (65.7%)	144 (34.3%)	420 (100.0%)	
Father's occupation				
Unemployed	22 (71.0%)	9 (29.0%)	31 (7.4%)	
Unskilled	67 (65.0%)	36 (35.0%)	103 (24.5%)	
Semi-skilled	140 (66.7%)	70 (33.3%)	210 (50.0%)	$\chi2 = 0.997$, df = 4, p = 0.910
Skilled	28 (62.2%)	17 (37.8%)	45 (10.7%)	
Semi-professional	19 (61.3%)	12 (38.7%)	31 (7.4%)	
Total	276 (65.7%)	144 (34.3%)	420 (100.0%)	
Mother's occupation				
Unemployed	132 (62.0%)	81 (38.0%)	213 (50.7%)	
Unskilled	49 (73.1%)	18 (26.9%)	67 (16.0%)	
Semi-skilled	87 (68.5%)	40 (31.5%)	127 (30.2%)	$\chi2 = 4.878$, df = 4, p = 0.300
Skilled	7 (70.0%)	3 (30.0%)	10 (2.4%)	
Semi-professional	1 (33.3%)	2 (66.7%)	3 (0.7%)	
Total	276 (65.7%)	144 (34.3%)	420 (100.0%)	

and only few had severe anemia (3.3%) Figure 2. Majority of the girls (65.0%) in the study sample had attained menarche.

In the present study, it was observed that the prevalence of anemia was higher (78.3%) in the late adolescent age group (17–19 years) as compared to mid (14–16 years) and early adolescent (10–13 years) age group, and this association was found to be statistically significant (p=0.011) Table 1. Post hoc analysis (multiple 2x2 analysis adjusted for *p-value*) revealed higher proportion of anemia among late adolescents compared to mid and early adolescents ($p < 0.01$). There was statistically significant association between mothers' educational status and presence of anemia in the adolescent girls Table 2. A statistically significant association ($p<0.05$) was found between anemia and status of attainment of menarche, girls who attained menarche were found to be more anaemic as compared to those who did not Table 3. Anemia was found to be more prevalent among girls belonging to the nuclear family, those who were married, whose parents were unemployed and who belonged to lower socioeconomic status, but the association of these variables with the presence of anemia in adolescent girls was statistically not significant.

Discussion

Anemia is one of the major public health problems among adolescent girls, especially in the rural areas of a developing country like India. In 2018, Anemia Mukt Bharat (AMB) was launched in India to reduce anemia in vulnerable age groups, including adolescent girls using life cycle approach, providing preventive and curative mechanisms.[14] The weekly iron and folic acid supplementation (WIFS) Program is an evidence-based response to the prevailing anemia situation among adolescents and includes weekly supervised ingestion of iron and folic acid supplementation and bi-annual helminthic control. These interventions are complemented by a comprehensive communication program to raise awareness and improve anemia knowledge.[15,16]

In the present study, prevalence of anemia among adolescent girls was 65.7, with 32.6% adolescent girls being mildly

Table 3: Association between status of attainment of menarche and anemia among adolescent girls

Status of attainment of menarche	*Anemia Present*	*Anemia Absent*	*Total*	
Attained	197 (72.2%)	76 (27.8%)	273	$\chi 2 = 14.389$, df = 1, p = 0.000 (<0.05)
Not attained	79 (53.7%)	68 (46.3%)	147	
Total	276 (65.7%)	144 (34.3%)	420 (100.0%)	

anemic and 29.8% moderately anemic. This prevalence of anemia among adolescent girls corroborated with the studies conducted by Mitkari K *et al.* (67.4%)[11] and Dutt R *et al.* (61%)[17] in Osmanabad, Maharashtra and Raigad, Maharashtra, respectively. Srivastava A *et al.* in his community-based cross-sectional study among adolescent girls of age 13–19 years in Amroha, Uttar Pradesh observed similar prevalence of anemia (69.2%) with 39.7% of them having mild anemia and 28.3% moderate anemia.[18] A very high prevalence of anemia (78–92%) was observed in few of the studies done on adolescent girls, which can be attributed to different study settings.[7,19,20]

The majority (47.4%) of the adolescent girls in our study belonged to the early adolescent age group (10–13 years) and anemia was more prevalent in the late adolescent age group compared to mid and early adolescent age group; this association was found to be statistically significant. This can be attributed to menstrual blood loss, post menarche, in late adolescent age group. Similar observations were reported by Chandrakumari A *et al.* in their study, where large numbers of girls (73.73%) were from the early adolescent age group (10–14 years), and prevalence of anemia (52.24%) was high among the late adolescent which was found to be statistically significant too.[12] Biradar SS *et al.* also observed high prevalence of anemia among girls who were more than 14 years of age, with a statistically significant association.[21] Majority of the girls (65.0%) in the study sample had attained menarche, and there was a statistically significant association between anemia and attainment of menarche, which was also observed by Kulkarni *et al.* in their study on adolescent girls in an urban slum of Nagpur in 2009.[19]

This study noted a statistically significant association between mothers' educational status and presence of anemia in adolescent girls. This can be related to mothers' awareness about anemia and its prevention, how to improve the quality and quantity of meals, maintaining personal hygiene and basic sanitation, and proper health-seeking behavior. Similar findings were observed by Upadhye JV *et al.*[22] Their study on 12–18 year old girls was conducted in an urban area in Nagpur and Mitkari K *et al.*[11] in their study on adolescent girls of age in rural area of Osmanabad district, Maharashtra. They both noted that a statistically significant association of anemia was found with the mothers' and fathers' educational status, where the majority of illiterate parents were anemic compared to educated parents.

Our study could not find any statistically significant association between socioeconomic status and the prevalence of anemia mong adolescent girls, though anemia was more prevalent among girls belonging to lower socioeconomic status, similar to study by Reshmi PS *et al.*[23] conducted in rural Telangana, where the prevalence of anemia was higher in subjects belonging to socioeconomic class V. In contrast, Patel S *et al.*[24] in their study on school going girls of age group 1018 years in rural areas of Raipur district, India observed statistically significant association between anemia and socioeconomic class. The increased prevalence of anemia among lower socioeconomic class girls recommends the need for developing and implementing policies to improve and eliminate these socioeconomic disparities.

Conclusion

The prevalence of anemia was high (65.7%) among the study population, with the majority of girls being mildly anaemic (32.6%). As most girls fall into mild and moderate categories of anemia, urgent intervention needs to be done to reduce the prevalence of anemia before it becomes severe. The major factors that were statistically significantly associated with anemia were the increasing age of the adolescent girls, attainment of menarche and low educational status of mother. Further studies are needed to explore the factors that can be targeted to reduce the prevalence of anemia among rural adolescent girls.

Limitation

Anemia is a disease involving multiple factors; the study did not include other important factors such as nutritional status, worm infestation, open air defecation, and consumption of iron & folic acid tablets. Only hemoglobin estimation was done in our study. Other hematological parameters that would have given a better insight into the type and cause of anemia could not be estimated due to economic constraints.

Acknowledgment

The authors are grateful to the anganwadi workers of the rural for their help and to all the adolescent girls for their participation in this study. The authors acknowledge the immense contribution of all laboratory professionals of the medical college hospital.

Financial support and sponsorship

Nil

Conflicts of Interest

There are no conflicts of interest.

References

1. World Health Organization. Strategic guidance on accelerating actions for adolescent health in South-East Asia Region (2018–2022). Geneva: World Health Organization; 2018.
2. Kishore J. Editor. National Health Programs of India. 6th ed. New Delhi: Century Publications; 2006. p. 82-4.
3. Lal S, Pankaj A. Editors. Textbook of Community Medicine (Preventive and Social Medicine).1st ed.. New Delhi: CBS Publishers and Distributors; 2007. p. 166-8.
4. Meier PR, Nickerson HJ, Olson KA, Berg RL, Meyer JA. Prevention of iron deficiency anemia in adolescent and adult pregnancies. Clinical Med Research. 2003 Jan 1;1(1):29-36.
5. Mukherjee D, Behal S, Kurian OC. Investing in adolescent health: harnessing India's demographic dividend. Observer Research Foundation (ORF) Special Report. 2020 Jul 29;115:2.
6. Melwani V, Dubey M, Khan A, Toppo M, Choudhary Y, Priya A. A study to assess the prevalence of anemia amongst adolescent girls residing in selected slum of Bhopal city. Int J Community Med Public Health 2018;5:1096-9.
7. Pattnaik S, Patnaik L, Kumar A, Sahu T. Prevalence of anemia among adolescent girls in a rural area of Odisha and its epidemiological correlates. Indian Journal of Maternal and Child Health. 2013 Jun;15(1):5.
8. Kumar A, Goyal A, Verma N, Mahesh A. Study of anemia among adolescent school girls and young adults. Int J Adv Med 2018;5:877-81.
9. International Institute for Population Sciences (IIPS) and ICF. 2021. National Family Health Survey (NFHS-5), 2019-21: India. Mumbai: IIPS. (Accessed on Nov 15 2022).
10. Ministry of Health and Family Welfare (MoHFW), Government of India, UNICEF and Population Council. 2019. Comprehensive National Nutrition Survey (CNNS) National Report. New Delhi. (Accessed on Nov 15 2022).
11. Mitkari K, Wadgave HV, Haralkar SJ. Anemia in school-going adolescent girls of age between 11 and 16 years in rural area – A cross-sectional study. Int J Med Sci Public Health 2020;9(9):508-513.
12. Chandrakumari AS, Sinha P, Singaravelu S, Jaikumar S. Prevalence of anemia among adolescent girls in a rural area of Tamil Nadu, India. J Family Med Prim Care 2019;8:1414-7.
13. Patil SN, Wasnik V, Wadke R. Health problems amongst adolescent girls in rural areas of Ratnagiri district of Maharashtra, India. J Clin Diagn Res. 2009 Oct 1;3(5):1784-90.
14. Anemia Mukt Bharat | A programme by Ministry of Health and UNICEF Internet. Anemia Mukt Bharat dashboard. Available from https://anemiamuktbharat.info (Last accessed on 2023 Feb 8).
15. Operational framework. Weekly Iron and Folic Acid Supplementation Programme for Adolescents. Ministry of Health and Family Welfare. Government of India; 2012. Available from: http://www.nrhm.gov.in/ images/pdf/programmes/wifs/operationalframeworkwifs/operational_framework_wifs.pdf. (Last accessed on 2023 Feb 8).
16. Natekar P, Deshmukh C, Limaye D. A micro review of a nutritional public health challenge: iron deficiency anemia in India. Clinical Epidemiology and Global Health. 2022 Feb 9:100992.
17. Dutt R, Patil S, Joshi S, Mhatre R. Ramdev.. Prevalence of anemia among adolescent girls in rural area of Raigad district Maharashtra. Indian J PrevSoc Med. 2009;40:143-6.
18. Srivastava A, Kumar R, Sharma M. Nutritional anemia in adolescent girls: an epidemiological study. Int J Community Med Public Health 2016;3:808-12.
19. Kulkarni MV, Durge PM, Kasturwar NB. Prevalence of anemia among adolescent girls in an urban slum. National journal of community medicine. 2012 Mar 31;3(01):108-11.
20. Chaturvedi D, Chaudhuri PK, Priyanka, Chaudhary AK. Study of correlation between dietary habits and anemia among adolescent girls in Ranchi and its surronding area. Int J Contemp Pediatr 2017;4:1165-8.
21. Biradar SS, Biradar SP, Alatagi AC, Wantamutte AS, Malur PR. Prevalence of anemia among adolescent girls: A one year cross-sectional study. Journal of Clinical and Diagnostic Research 2012 May (Suppl-1);6(3):372-377.
22. Upadhye JV, Upadhye JJ. Assessment of anemia in adolescent girls. Int J Reprod Contracept Obstet Gynecol 2017;6:3113-7.
23. Reshmi PS, Takalkar AA. Prevalence of anemia in adolescent girls and its association with certain demographic variables: our experience from rural Telangana. Int J Community Med Public Health 2020;7:1007-11.
24. Patel S, Dhuppar P, Bhattar A. Nutritional anemia status in adolescent girls in rural schools of Raipur, India. Med Chem (Los Angeles). 2017;7:853-6.