International Journal of Community Medicine and Public Health
Singh P et al. Int J Community Med Public Health. 2022 Mar;9(3):1350-1355
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040
DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20220694

Original Research Article

A study on prevalence and risk factors associated with anaemia among school going adolescent girls in Chargawan block of Gorakhpur district

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Received: 24 December 2022
Revised: 22 February 2022
Accepted: 23 February 2022

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ABSTRACT

Background: Adolescent anaemia is most common nutritional problem affecting the reproductive period, pregnancy and childbirth. Although there are several epidemiological studies to determine the prevalence and risk factors associated with anaemia among adolescent girls in India, but limited data regarding the prevalence and risk factors associated with anaemia in adolescent girls of Eastern Uttar Pradesh (UP) is available. To estimate the prevalence of anaemia among school going adolescent girls in Chargawan block of Gorakhpur district of UP and to study specific factors like sociodemographic factors, dietary factors and menstrual factors.
Methods: A cross-sectional survey was conducted in the government higher secondary schools of Chargawan block, district Gorakhpur, UP. A total of 430 adolescent females (10-19 years old) were included in this study. The study took place from September 2019 to August 2020. In most of cases Chi-square test was applied as test of significance for comparing. Microsoft excel 2010 and statistical calculator has been used for statistical calculation.
Results: The prevalence of anaemia found from this study was 61.39%. The statistically significant risk factors associated with anaemia were age, nuclear family, low socio-economic status, high intake of junk food; low intake of green leafy vegetables, citrus fruit, no iron folic acid intake and menorrhagia.
Conclusions: A high prevalence of anaemia among adolescent females was found, which was higher in nuclear family, low socio economic strata; girls who were consuming less citrus fruits, less green leafy vegetables, more junk food and not taking any iron folic acid (IFA) supplement.

Keywords: Anaemia, Adolescent, Prevalence, Dietary factor, Menstrual factor

INTRODUCTION

Anaemia is a common and intractable nutritional problem worldwide. It is an issue of public health concern for all countries.[1] According to World Health Organization (WHO) estimates, 2 billion people all over the world are anaemic. Among them, 50% are due to iron deficiency. Iron deficiency anaemia can occur at each stage of the life cycle. Although, certain critical stages of life include antenatal period, first five years of age and adolescence.

Global prevalence of anaemia is 29.9% according to global prevalence of anaemia report 2011.[2] The situation is even more serious in case of developing countries such as India, where the prevalence of anaemia is 53.1% among all non-pregnant women of reproductive age group. According to National Family Health Survey-4 data, the prevalence of anaemia in Uttar Pradesh (UP) is 52.5% among all non-pregnant women of reproductive age group.[3]

According to the WHO, adolescence has been defined as the period of life between 10-19 years of age. The world population has 1 to 2 billion adolescents out of which, one-fifth live in India. Adolescents constitute over 21.4% of the population in India and adolescent girls constitute about 10% of Indian population. This age group needs special

attention because of the turmoil of adolescence which they face due to the different stages of development they undergo, different circumstances they come across, their different needs and diverse problems.[4]

Menarche further cause for special attention because of physical and emotional problems associated with it. Adolescents remain a largely neglected difficult to measure and hard to reach population in which the needs of adolescent girls in particular are often ignored.[4] Anaemia and malnutrition are the major nutritional health consequences in adolescent girls. Caloric and protein requirements are maximal in this age group. Increased physical activity combined with poor eating habits and other considerations (menstruation, pregnancy, acute and chronic infection) contribute to accentuating the potential risk for adolescents of poor nutrition.[4]

Anaemia can occur due to multiple reasons, out of which Iron deficiency plays an important role. The relative proportion of causes can probably vary between different populations and geographical regions according to the conditions prevalent there.[5] Adolescent girls need extra iron requirement due to onset of menstruation in addition to physical growth.

Iron deficiency anaemia in addition to affecting the motor and cognitive development, also causes fatigue and low productivity in young adults and adolescents. Reduced iron stores during childhood might manifest as impaired immune response and delayed menarche. Anaemia in adolescent girls, in future attributes to high maternal mortality rate, high perinatal mortality and increased incidence of low birth weight babies. It can also have a negative impact on the infant's iron status.[6]

Adolescent anaemia is most common nutritional problem affecting the reproductive period, pregnancy and childbirth. Although there are several epidemiological studies to determine the prevalence and risk factors associated with anaemia among adolescent girls in India, but limited data regarding the prevalence and risk factors associated with anaemia in adolescent girls of Eastern UP is available. Hence, this study was planned to be conducted to estimate the prevalence of anaemia as well as to study specific associated factors like socio demographic factors, dietary factors and menstrual factors.

METHODS

Type of study

It was a cross sectional study.

Duration of study

The study was conducted from September 2019 to August 2020.

The study was conducted in the government higher secondary schools of Chargawan block, district Gorakhpur, UP. Taking p=0.60 (based on earlier study done by Kaur et al), allowable error (L) =5% of p, and using this in the formula of sample size.

$$n = Z_{1-\alpha}^2 P(1-P)/L^2$$

Sample size was estimated to be 384.[7] Considering the non-response of data 15%, collection was done for 442 individuals, but 12 denied to participate in the study even after consent. Therefore the study was done on 430 students. Socio-demographic characteristics were taken of 430 school going adolescent girls. Out of these 430 adolescent girls, 25 did not attained menarche, so the menstruation related variables were taken of only 405 adolescent girls. Approval from institutional ethical committee of BRD Medical College, Gorakhpur was taken before the start of study.

There are total 32 government higher secondary schools in Chargawan block, out of which 4 schools (Janta Inter College, Kaushalya Devi Girls Inter College, Maharana Pratap Krishak Inter College and Jyoti Inter College) were selected randomly for the study. The selected schools were approached. The aim and procedure of study was explained to the head master of the school. After getting the permission from the head master of the school, the objectives, procedure and the benefits of the study was explained to the adolescent girls. From each school, adolescent girls from 8–12th standard were chosen for the study. Girls were randomly selected from each std. using the attendance register as the sampling frame.

Girls who were willing to participate in the study; ready to give blood sample and ready to respond to questionnaire were included in the study, were given an informed consent form to get it signed by their parents. Girls whose parents signed the consent form were included in the study and rest were excluded. Adolescent girls who were under treatment of anaemia were also not included in the study.

Pre-phrased questionnaire was used for data collection. Pre-phrased pre-tested questionnaire was designed at Department of Community Medicine, BRD Medical College in consultation with guide and co guide to assess Prevalence and risk factors associated with anaemia among school going adolescent girls in Chargawan block. Socio demographic details, dietary factors and menstruation related factors were collected by interview method. Socio demographic variables includes age, type of family, father's education, mother's education, father's occupation, and socio-economic class. Dietary variables includes: assessing the frequency of intake of green leafy vegetables, citrus fruits intake, milk intake, junk food intake, jaggery intake and iron folic acid (IFA) intake. Menstruation related variables include the age of onset of menstruation, frequency and duration of menstruation.

Anthropometric measurements were used to assess the physical development of adolescent girls. Anthropometric measurement of the study participant includes measuring the height, weight and body mass index (BMI) calculation. Height and weight of the study participants were done by single trained person and standardized procedure to reduce the inter-observer variations. Height was measured using a portable stadiometer. After removing the shoes, with the possible minimal clothing, weight was measured using electronic digital weighing machine with nearest accuracy of 0.1 kg. The weighing machine was checked and corrected if required, for zero error before measuring the weight. BMI is defined as body weight in kilograms divided by the square of height in metres (kg/m^2), is a weight-for-height index that meets to assess the underweight, normal weight, overweight and obese adolescents.

BMI for age percentiles

Less than 5th percentile underweight, 5th to 85th percentile – normal, 85th to 95th percentile - risk of overweight, and 95th percentile – overweight.

The calculated BMI was plotted on clinical growth chart (CDC) and inference was taken accordingly.

Haemoglobin was estimated by using portable instrument "haemoglobinometer with strips". Blood sample was collected by using all aseptic precaution by finger prick using disposable lancet with pen and white coloured puncture proof container was used to store these used lancets and was disposed according to BMW guidelines at our institute.

Data collected was classified, tabulated & analysed by using relevant statistical tools. In most of cases Chi-square test was applied as test of significance for comparing. Microsoft excel 2010 and statistical calculator has been used for statistical calculation.

RESULTS

In this study, 264 of the study participants were found to be anaemic (i.e. haemoglobin level <12 gm/dl) in which majority of the participants (36.34%) were having mild anaemia, 93 (21.62%) were having moderate anaemia and only 14 (3.26%) were severely anaemic. Remaining 166 (38.60%) participants were non-anaemic.

Out of total 139 early-adolescents, 71 (51.07%) were found anaemic and 68 (48.92%) were found non-anaemic. Total number of mid-adolescents were 194 in which 129 (66.49%) were found anaemic and remaining 65 (33.50%) were non-anaemic. Total late-adolescents were 97, in which 64 (65.97%) were found anaemic and 33 (34.02%) were non-anaemic. In this study, prevalence of anaemia was higher among obese (66.66%), followed by normal (57.14%), then underweight (48.27%) and overweight (21.4%).

The statistically significant risk factors associated with anaemia were age, nuclear family, low socio-economic status, high intake of junk food; low intake of green leafy vegetables, citrus fruit, no iron folic acid intake and menorrhagia. Type of family, socio economic status, frequency of citrus fruit intake, green leafy vegetable intake, junk food intake, IFA intake were identified to be highly significant (p value <0.01). The association between BMI and haemoglobin in the study group was found non-significant. Factors like religion, father's education, mother's education, father's occupation, birth order of the participant, deworming, milk intake, jaggery intake, irregularity of menstrual cycles, polymenorrhea and dysmenorrhea were not significantly associated with anaemia in our study population. Overall, joint families, mother's education of middle school and above, less frequent consumption of junk food, consumption of citrus fruit and green leafy vegetables, IFA supplementation were protective factors for anaemia, while menorrhagia is associated with an increased odds of anaemia.

Table 1: Association between age group of adolescent girls and haemoglobin.

Age groups (years)	Anemic (%)	Non-anemic (%)	Total	(χ2)	P value	OR (95% confidence interval)
10–12	71 (51.07)	68 (48.92)	139			
13–16	129 (66.49)	65 (33.50)	194	9.2299	0.009903	(a versus b); OR 1.91; C.I (1.07-3.39)
17–19	64 (65.97)	33 (34.02)	97			(a versus c); OR 1.86; C.I (0.93-3.7)

Table 2: Association between BMI and haemoglobin in study group.

BMI	Non-anaemic	Anaemic			Total
		Mild	Moderate	Severe	
Underweight	30	16	8	4	58
Normal	121	127	80	7	335
Overweight	12	11	3	2	28
Obese	3	3	2	1	9

Table 3: Association between sociodemographic variables and anaemia.

Variables	Anaemic n (%)	Non-anaemic n (%)	Total	Test of significance ($\chi 2$)	P value
Father's education					
Illiterate/primary school	140 (63.88)	80 (36.12)	220	0.95	0.32
High school and above	124 (59.07)	86 (40.93)	210		
Total	264	166	430		
Mother's education					
Illiterate/primary school	157 (65.97)	81 (34.03)	238	2.68	0.101
High school and above	107 (56.03)	85 (44.27)	192		
Total	264	166	430		
Father's occupation					
Employed	232 (60.26)	153 (39.74)	385	2.01	0.16
Unemployed	32 (71.12)	13 (28.88)	45		
Total	264	166	430		
Type of family					
Nuclear family	227 (63.88)	130 (36.12)	357	4.25	0.0039
Joint family	37 (50.69)	36 (49.31)	73		
Total	264	166	430		
Socio-economic class					
Upper, upper middle, middle	33 (34.40)	63 (66.60)	96	38.07	<0.000001
Lower middle, lower	231 (69.30)	103 (44.58)	334		
Total	264	166	430		

Table 4: Dietary factors and anaemia.

Variables	Anaemic (%)	Non-anaemic (%)	Total	Test of significance ($\chi 2$)	P value
Citrus fruits intake					
>Once a week*	153 (56.4)	116 (43.12)	269	6.84	0.008
≤Once a week	111 (70.1)	50 (31.05)	161		
Total	264	166	430		
GLV intake					
>Once a week*	191 (58)	139 (42.12)	330	8.09	0.004
≤Once a week	73 (73)	27 (27)	100		
Total	264	166			
Milk intake					
>Once a week*	216 (60.64)	141 (39.49)	357	0.97	0.32
≤Once a week	48 (65.90)	25 (34.24)	73		
Total	264	166	430		
Junk food intake					
>Once a week*	217 (67.85)	107 (33.02)	324	23.47	<0.00001
≤Once a week	47 (42.18)	59 (55.66)	106		
Total	264	166	430		
Jaggery intake					
>Once a week	22 (50)	22 (50)	44	2.68	0.1
≤Once a week	242 (62.69)	144 (37.30)	386		
Total	264	166	430		
IFA intake					
Yes*	112 (46.66)	128	240	49.71	<0.0001
No	152 (80)	38	190		
Total	264	166	430		

Table 5: Menstrual factors and anaemia.

Variables	Anaemic (%)	Non-anaemic (%)	Total	Test of significance ($\chi 2$)	P value
Frequency of cycles					
Normal	105 (42)	145 (58)	250		
Polymenorrhea	139 (89.67)	16 (10.33)	155	0.02	0.88
Total	244	161	405		
Regularity					
Regular	124 (46.26)	144 (53.74)	268		
Irregular	120 (87.59)	17 (12.40)	137	1.08	0.297
Total	244	161	405		
Menorrhagia					
Present	152 (73.42)	55 (26.57)	207		
Absent	92 (46.66)	106 (53.53)	198	5.58	0.01
Total	244	161	405		
Dysmenorrhea					
Present	144 (64.57)	79 (35.42)	223		
Absent	100 (54.94)	82 (45.05)	182	0.48	0.48
Total	244	161	405		

DISCUSSION

Compared to NFHS-4 survey (49.7%), this study found higher prevalence (61.39%) of anaemia in the study area. Abilash et al found the prevalence of anaemia as 48.63% in adolescent girls.[8] A higher prevalence was noted by Kumar et al in Bareilly.[9] Based on severity of anaemia, participants were classified into mild, moderate and severe. In which one third (36.34%) of the adolescence were affected by mild anaemia, 21.62% were suffered from moderate anaemia and only 3.26% were affected by severe anaemia. Remaining 38.60% of the adolescent girls were found to be healthy. Mild anaemia was found to be higher in this study group and this is consistent with findings of Siva et al in Kerala.[10] The difference between the age groups was statistically significant. This study found that prevalence of anaemia is high in mid-adolescents (30%) compared to early (16.53%) and late (15%) adolescents. Similarly a study conducted in Kanchipurum by Asher et al showed that there was no significant association between the age and level of haemoglobin of the study participants.[11] This study found a higher proportion of anaemia in adolescent girls belonging to nuclear families (p value=0.0039). However, another study conducted by Asher et al showed that there was no significant association between the type of family and level of haemoglobin in the study participants.[11] In present study, the association between deworming and anaemia was not found significant. The finding coincide with the findings of Siva et al.[10] This study found that there was a non-significant association between mother's education as well as father's education and anaemia. Similar studies were reported in four populous villages of India and the urban slum of Kanpur, UP, India, adolescent girls whose mothers were either illiterate or had only primary education developed anaemia than their counterparts.[13] In this study prevalence of anaemia was significantly associated with lower socio economic status (p<0.01). In contrary, a study conducted by Siva et al showed that prevalence of anaemia was more or less equally distributed in all socio-economic category, with highest among upper class 33% and least among upper lower class with 20.5%.[10] Another study conducted by Asher et al showed that there was no significant association between the type of family and level of haemoglobin of the study participants.[12] Dietary variables studied in this study were frequency of citrus fruits intake, green leafy vegetables intake, consumption of milk, junk food intake, jaggery intake and IFA supplementation intake. This study found a strong association between frequency of citrus fruit intake, green leafy vegetables, junk food intake, and the prevalence of anaemia. No significant association was found between prevalence of anaemia and consumption of milk in this study. But, study conducted by Siva et al in North Kerala showed that there was no significant association between the dietary habit and level of haemoglobin of the study participants.[10] Strong association between IFA intake and prevalence of anaemia (p value <0.01) was found in this study. Goyal et al found that adolescent girls consuming IFA tablets were less likely anaemic compared to those not consuming.[14] In this study there was a statistically significant association (p value=0.01) between menorrhagia and the prevalence of anaemia. These results are similar to some studies where statistically significant association was found between age at menarche and heavy menstrual bleeding lasting for more than 5 days.[15]

Limitations

Being a cross sectional study follow-up of anemia among adolescents' girls has not been done.

CONCLUSION

In this study, the overall prevalence of anaemia was high among the study population i.e. 61.39%. Majority of the girls were found to have mild anemia (36.34%). High prevalence of anaemia (66.49%) was found in mid-age

adolescents. Prevalence of anaemia was significantly associated with age, nuclear family, lower socio economic status, no or less intake of citrus fruits and green leafy vegetables, more intake of junk food, no intake of IFA supplement and menorrhagia.

Recommendations

The prevalence of anaemia estimated from this study was found to be higher when compared to the NFHS-4 estimates. Hence, Chargawan block of Gorakhpur district may be included as a high focus area. Periodic surveys should be done in schools on anaemia for updating prevalence. For the prevention of anaemia, interventions should commence from childhood. Hence efforts may be targeted to include children as a part of iron supplementation measures. In addition to the existing government programmes on nutrition, mothers of adolescent girls may be included as a target group for health education regarding consumption of nutritious diet and promotion of a healthy lifestyle. Since a significant proportion of adolescent girls were found to be non-compliant in consuming IFA tablets, efforts can be made to increase the compliance among them. Educating the adolescent girls regarding the importance of consuming iron rich foods and the consequences of anaemia may be given a greater focus as a part of health education. In addition, they may be made aware of the harmful consequences of consuming junk foods. Health education regarding personal hygiene and periodical deworming to reduce the burden of anaemia among adolescent girls.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Singh P, Tiwari HC, Sampriya A, Srivastava AK, Srivastava DK. A study on prevalence and risk factors associated with anaemia among school going adolescent girls in Chargawan block of Gorakhpur district. Int J Community Med Public Health 2022;9:1350-5.