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Research Article

A COMPARATIVE STUDY OF PREVALENCE OF ANEMIA AND ITS RISK FACTORS AMONG SCHOOL-GOING ADOLESCENT GIRLS IN THE FIELD PRACTICE AREAS OF MEDICAL COLLEGE IN GAUTAM BUDDHA NAGAR DISTRICT

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ABSTRACT

Objectives: (1) The study was to determine the prevalence of iron deficiency anemia among adolescent girls in the field practice areas of a medical college of GautamBuddha Nagar district and (2) to assess the risk factors associated with iron deficiency anemia among adolescent girls in the field practice areas of a medical college of GautamBuddha Nagar district.

Methods: A school-based cross-sectional study was conducted to assess the prevalence of anemia among adolescent girls of the field practice areas of the medical college of Gautam Buddha Nagar District. The sample size came out to be 236. One school each from RHTC and UHTC was selected randomly, and all adolescent girls were enrolled in the study.

Results: The present study was conducted on 684 adolescent females (251 from RHTC and 433 from UHTC) in our study period of 3 months. The prevalence of anemia in the whole population was 42%, 54.5% among rural and 35.5% of adolescents in urban area were found to be anemic at the time of the study. The factors that were found to be significantly associated with adolescent anemia were age of onset of menarche, history of albendazole intake, residing in joint family, and lower socioeconomic status.

Conclusion: The prevalence was high among girls who were above 16 years of age and girls who belonged to lower socio-economic groups and belonging to rural area. There is a need for a regular supply of iron and folic acid tablets and for improving medication adherence regarding consuming these tablets among adolescent girls and also about the dietary advice.

Keywords: Prevalence, Anemia, Adolescents, Girls.

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INTRODUCTION

Adolescence is the phase of life between childhood and adulthood, from ages 10 to 19. It is a unique stage of human development and an important time for laying the foundations of good health [1]. This is the formative period of life when the maximum amount of physical, psychological, and behavioral changes take place. This is a vulnerable period in the human life cycle for the development of nutritional anemia, which has been nowadays dealt with by various public health programs. Anemia is a condition in which the number of red blood cells or the hemoglobin concentration within them is lower than normal. This results in symptoms such as fatigue, weakness, dizziness and shortness of breath, among others. The WHO estimates that one-third of all women of reproductive age are anemic [2]. Poor health or risky behaviors during adolescence can have negative impacts on health in adult life [3]. Hence, the Global Strategy to Improve Women's, Children's, and Adolescents' Health (2016–2030) includes a commitment to accelerate action to improve adolescent health [4]. According to the National Family Health Survey 4 (NFHS-4), 53% of women are anemic. 40% of women are mildly anemic, 12% are moderately anemic, and 1% are severely anemic. The prevalence of anemia decreases with schooling, from 56% among women with no schooling to 49% among women with 12 or more years of schooling [5]. Anemia can result in maternal mortality, weakness, diminished physical and mental capacity, increased morbidity from infectious diseases, perinatal mortality, premature delivery, low birth weight, and (in children) impaired cognitive performance, motor development, and scholastic achievement. Anemia is a major health problem in Uttar Pradesh, especially among women and children. 52% of women in Uttar Pradesh have anemia, including 39% with mild anemia, 13% with moderate anemia, and 1% with severe anemia [6]. It has also been noted that in the past 10 years from NFHS 3%–4% point reduction of anemia prevalence has been extremely low in most age groups. Hence, many new programs are also launched by the Government of India to tackle this problem of anemia. Recently, to achieve the targets of the World Health Assembly of 50% reduction of anemia in women of reproductive age by 2025 and POSHAN Abhiyan (2018–2022) to reduce the prevalence among young children (6–59 months), adolescents and women of reproductive age groups (15–49 years) by 3% per year, anemia Mukt Bharat has been launched [7,8]. Hence, with this background, we conducted the present study with the objectives to estimate the prevalence of anemia among school-going adolescent females and to determine risk factors such as socio-demographic factors and practices related to anemia among school-going adolescent girls in our field practice.

METHODS

A school-based cross-sectional study was carried out to assess the prevalence of anemia among adolescent girls of our field practice areas of the medical college of Gautam Buddha Nagar District. The sample size was determined by conducting a pilot study which came out to be 65 %. Hence, taking prevalence as 65 % and an allowable error of 10% of prevalence, non-response rate 10 %, sample size came out to be 236. There were three schools in RHTC and two schools in UHTC catering to this age group of girls both coeducation schools. One school each from RHTC and UHTC was selected randomly, and all adolescent girls were enrolled in the study. Hence, the present study was conducted on 684 adolescent females (251 from RHTC and 433 from UHTC) in our study period of three months (November, December 2019, and January 2020).

Inclusion criteria
All adolescent girls of selected schools aged 10–19 and those who gave valid verbal consent.

Exclusion criteria
Those who did not fulfil the inclusion criteria and refused to participate in the study.

For interpretation of anemia, according to the WHO, the cut-off point for hemoglobin (Hb)% was taken as <12 g/dL. The severity of anemia was graded as mild (10 to <12 g/dL), moderate (7 to <10 g/dL), and severe (<7 g/dL) [2].

Data collection tools
A pre-tested semi-structured questionnaire was framed to collect particulars of the participants such as age, family type, and practices regarding anemia among school-going adolescents. Anthropometric measurements of weight, standing height were taken utilizing standard methodology (WHO, 1995) [9].

Weight
Female was measured in the upright position to the nearest 0.1 kg using calibrated SECA weighing balance.

Height
It was measured using the measuring tape fixed on the wall vertically, and the lower end just touched the floor which was calibrated in centimeters. The subject to be measured was asked to stand after removing all footwear, with feet together, on a hard, smooth horizontal surface. The arms hang freely by the sides with her heels, calves, buttocks, dorsal spine, and head touching the wall. The height was recorded to the nearest 0.1 cm. Hemoglobin estimation was done using a Digital hemoglobin meter.

Personal information was kept confidential, and anonymity was maintained. Appropriate health education was imparted to the study participants about the prevention of anemia after the collection of the data.

Data analysis
Frequency and percentages were calculated. Chi-square test was applied wherever applicable, and yates correction was applied accordingly. All statistical analyses were performed using Statistical Package for Social Sciences 21 trial version, International Business Machines Corporation (IBM, New York, USA).

RESULTS

Out of the 684 girls surveyed, 34% belonged to rural and 66% belong to urban areas. The mean age of the girls was found to be 14.8 years ± 2.6 SD as depicted in Table 1. Table 2 shows the status of anemia among adolescent girls by age group and area of residence. Overall, the prevalence of anemia came out to be 42%, 54.5% (127/233) among rural and 35.5% (160/451) of adolescents in urban area who were anemic at the time of the study. When we classified the anemia, nearly 60% came in the mild anemic category both in the urban and rural area followed by moderate and severe anemia being least in rural area as depicted by color coding in Table 2. Mid adolescents were more affected followed by late adolescents whereas in urban area late adolescents are affected more than the mid and early ones as represented in Table 2.

Table 1: Examination details of adolescent girls as per residence

Examination parameters	Rural	Urban	Total
Age (years)	14.7	15.1	14.8
Height (cm)	140±3	146±4	138±6
Weight (kg)	42±4	43±7	42.5±5.5
BMI (kg/m2)	20±2.2	21±4.8	20.7±5.6
Hemoglobin (g/dl)	10.1±1.9	9.8±2.3	10±2.1

Anemia prevalence was also high among the girls residing with joint families, and the results are also statistically significant, as shown in Table 3. More anemic girls belong to lower or lower-middle socio-economic status both in rural as well as in urban area with a statistically significant difference. When coming to the various associated factors with anemia, in our study, onset of menarche, history of albendazole intake were found to be significant risk factors associated with the presence of anaemia as represented in Table 3. Nearly, 48% and 50% anemic girls have attained their menarche in rural and urban area, respectively, though the results were not found to be significant.

DISCUSSION

Nutritional anemia though global in occurrence, is more of a concern in developing countries because of the high prevalence in these regions and particularly in the female gender. In the present study overall, the prevalence of anemia was found to be 42%, 54% in the rural area and 35 % in urban area, respectively, which is more in comparison to the studies done in Chandigarh [10] and Nagpur [11] as well as in Konkan and Kerala areas [12,13] but far less to the study done in 16 districts in the year 2006 [14] where the prevalence was found to be 90%. This might be due to the large sample size they have catered Aggarwal *et al.* [15] in a government school-based study from a middle socio-economic group of North East Delhi reported a prevalence of anemia as 45%. Similarly, studies on the prevalence of anemia from Meerut [16] and our study came to a common finding though we found few cases of severe anemia also unlike theirs as in studies done in [17, 18]. Different states of rural India reported a prevalence of anemia from 46% to 98% [19-21, 13, 16, 18] which are in concordance with our study. Our study results were found to be concordant with the results of a study done in Nepal [22] and in Tamilnadu [19]. Shashi Kant [20] found the prevalence of anemia in males as 27% quite less than our study. In a study done in Meerut [16] also anemia prevalence was 32% in rural area, quite less than our study. In case of the prevalence of anemia in the urban area, the reason might be due to the exclusive involvement of separate genders in both the studies. In this study, a large number of girls, 234 (34%), were from the early adolescent age group (10–13 years), whereas 217 (31.8%) were in the mid adolescent age group (14–16) years followed by late-adolescent girls that are 204 (29.8%). The prevalence of anemia (35%) was high among the mid and late adolescents in urban areas, whereas it was found to be 52.34% among the mid and late adolescents in rural areas similar to the findings of [23]. Females are at risk of having anemia more because of menstruation [17]. Only 7% prevalence was found in a study done in China, almost one-sixth than the present study shows clear cut differentiating of being developed and developing Country [24]. The likelihood of anemia was significantly higher among older adolescents similar to a study done in Nepal [22] and Kerela [13]. Anemia was significantly less among the urban school-going children as compared to rural school-going ones similar to the study done by toteja [23]. Patil [12] found 60 % as underweight girls in contrast to our study where only 11% of girls were found to be underweight but quite similar to a study done in eastern India [21]. In our study, the prevalence of anemia in rural area, where the majority were from the lower or middle-income group, was 40%. Whereas, in urban girls, who were from middle and high income group the prevalence was 35%.These findings are similar to those described by R Gawarika [14] and Vasanthi, *et al*., [25] unlike the findings of the study done in Lucknow [26] .This might due the local regional regional factors for these findings.

In the present study, the prevalence of anemia was higher among obese (70%) followed by normal and underweight 66.9%, than overweight 53.6 %. This may be due to up-regulated hepcidin expression in obese individuals which hampers iron absorption. This result is not consistent with the study conducted in the United States by Nead *et al.*, [27] Kurtz *et al.,* [28] with 2.1% for normal weight, 5.3% for at risk for overweight, and 5.5% for overweight. This difference can be contributed due to factors responsible in developing countries and also the time differences of the studies.

Table 2: The distribution of anemia according to age group and severity of anemia among the study subjects

Total 684										
Anemia/age group	**Hb%**	**Rural (n=232)**				**Urban (n=451)**				**Grand total, n (%)**
		10–13, n (%)	**14–16, n (%)**	**17–19, n (%)**	**Total, n (%)**	**10–13, n (%)**	**14–16, n (%)**	**17–19, n (%)**	**Total, n (%)**	
Normal	>12	49 (46.2)	37 (35)	20 (18.8)	106 (100)	97 (33.3)	122 (41.9)	72 (24.7)	291 (100)	397 (58.1)
Mild anemia	11–11.9	24 (31.5)	30 (39.8)	22 (29)	76 (100)	33 (34.3)	28 (29.2)	35 (36.4)	96 (100)	172 (25.1)
Moderate anemia	8–10.9	13 (30.2)	10 (23.3)	20 (46.5)	43 (100)	14 (25)	16 (28.6)	26 (46.4)	56 (100)	99 (14.5)
Severe anemia	<8	2 (25)	2 (25)	4 (50)	8 (100)	2 (25)	1 (12.5)	5 (62.5)	8 (100)	16 (2.3)
Total		88 (37.8)	79 (34)	66 (28.3)	233 (100)	146 (32.4)	167 (37.2)	138 (30.6)	451 (100)	684 (100)

Hb: Hemoglobin

Table 3: The association of anemia and various risk factors among the study subjects

Risk factors	**Category**	**Rural, n (%)**	**Urban, n (%)**	**Total, n (%)**	χ^2	**p**
Age group in years						
10–13	Anemic	39 (16.7)	52 (11.5)	91 (13.3)	1.74	0.186
	Nonanemic	49 (21)	94 (20.8)	143 (20.9)		
14–16	Anemic	42 (18)	49 (10.8)	91 (13.3)	13.05	0.0003
	Nonanemic	37 (15.8)	118 (26.16)	155 (22.6)		
17–19	Anemic	46 (19.7)	69 (15.29)	115 (16.8)	7.04	0.0079
	Nonanemic	20 (8.58)	69 (15.29)	89 (13)		
Family type						
Nuclear	Anemic	38 (16.3)	145 (35.6)	183 (26.7)	1.33	0.2484
	Nonanemic	31 (13.3)	161 (35.6)	192 (28)		
Joint	Anemic	89 (38.1)	142 (31.4)	231 (33.7)	75.45	0.0000
	Nonanemic	75 (32.1)	3 (0.66)	78 (11.4)		
Socio-economic status						
Lower	Anemic	18 (7.72)	38 (8,4)	56 (8.18)	0.18	0.6713
	Nonanemic	23 (9.8)	57 (12.6)	80 (11.6)		
Lower middle	Anemic	54 (23.1)	118 (26.16)	172 (25.1)	6.206	0.127
	Nonanemic	44 (18.8)	50 (11.08)	94 (13.7)		
Middle	Anemic	52 (23.1)	115 (25.49)	167 (24.4)	8.699	0.0031
	Nonanemic	36 (15.4)	34 (7.5)	70 (10.2)		
Upper middle	Anemic	3 (1.28)	14 (3.10)	17 (2.5)	0.666	0.4144
	Nonanemic	10 (4.29)	20 (4.43)	30 (4.4)		
Upper	Anemic	0 (0)	2 (0.44)	2 (0.003)	0.178	0.6731
	Nonanemic	3 (1.28)	3 (0.66)	6 (0.009)		
Menarche						
Started	Anemic	111 (47.6)	222 (49.22)	333 (48.68)	2.281	0.131
	Nonanemic	100 (42.9)	154 (34.14)	254 (37.13)		
Not started	Anemic	`16 (6.8)	65 (14.41)	81 (11.8)	4.889	0.0270
	Nonanemic	8 (3.4)	10 (2.21)	18 (2.6)		
BMI						
Underweight	Anemic	8 (3.4)	22 (4.87)	30 (6.65)	0.001	0.9748
	Nonanemic	3 (1.28)	6 (21.33)	9 (1.3)		
Normal	Anemic	101 (43.3)	236 (52.32)	337 (49.2)	45.648	0.0000
	Nonanemic	105 (45)	67 (14.8)	172 (25.1)		
Overweight	Anemic	6 (2.57)	24 (5.3)	30 (4.3)	0.862	0.3532
	Nonanemic	8 (3.43)	18 (3.9)	26 (3.8)		
Obese	Anemic	2 (0.85)	5 (1.1)	7 (1.0)	0.03	0.8625
	Nonanemic	0 ()	3 (0.06)	3 (0.004)		
Pallor						
Present	Anemic	102 (43.7)	194 (43.01)	296 (39.3)	1.944	0.1632
	Nonanemic	44 (18.8)	113 (25.05)	157 (22.9)		
Absent	Anemic	25 (10.7)	93 (20.6)	118 (17.2)	6.848	0.0089
	Nonanemic	62 (26.6)	113 (25.05)	175 (25.5)		
History of IFA intake						
Yes	Anemic	45 (19.3)	116 (25.72)	161 (23.5)	0.539	0.4628
	Nonanemic	75 (32.1)	164 (36.36)	239 (34.9)		
No	Anemic	82 (35.1)	171 (37.9)	253 (36.9)	49.876	0.0000
	Nonanemic	31 (13.3)	0 ()	31 (4.5)		
History of albendazole intake						
Yes	Anemic	82 (35.1)	186 (41.24)	268 (39.18)	9.950	0.0016
	Nonanemic	16 (6.8)	92 (20.3)	108 (15.7)		
No	Anemic	45 (19.3)	92 (20.3)	137 (20.02)	12.094	0.0005
	Nonanemic	90 (38.6)	81 (17.96)	171 (25)		

Limitations

This was school-based cross-sectional study with small sample size done in government schools so results of this study cannot be generalized. Anemia is a disease condition involving several factors; a few other important associated factors such as worm infestation, nutritional history, and open-air defecation were not included in the study. Taking this study as a reference point, multicentric research involving a larger sample size including both government and private schools along with dropout girls can be planned.

CONCLUSION AND RECOMMENDATION

Anemia is a major public health problem among school adolescents in both urban and rural areas. The prevalence was high among girls who were above 16 years of age and girls who belonged to lower socio-economic groups and belonging to rural area. Special importance should be given for developing corrective measures against nutritional anemia among adolescent girls. School-based intervention among school-going adolescent girls plays a key role in the prevention and control of anemia among this group. There is a need for a regular supply of iron and folic acid tablets and for improving medication adherence regarding consuming these tablets among adolescent girls and also about the dietary advice.

AUTHOR CONTRIBUTIONS

All the authors have accepted responsibility for the entire content of this submitted manuscript and approved submission.

CONFLICT OF INTEREST

No conflict of interest has been declared by the authors.

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