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PREVALENCE OF ANAEMIA AMONG ADOLESCENT GIRLS: A COMMUNITY-BASED STUDY IN DELHI, INDIA

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ABSTRACT

Anaemia is a major public health issue in India. As per the National Health Family Survey (NFHS), the prevalence of anaemia has increased (55.8% to 59.1%) from NFHS-4 to NFHS-5. Anaemia among adolescent girls is higher (56% to 59%) than among boys (30% to 31%). According to NFHS 5, infant and child mortality rates have improved since the previous round; therefore, attention is required for adolescents because they are future mothers. It is relevant to bring out the prevalence of anaemia in adolescent girls to prevent maternal and child health in the future. This cross-sectional study was conducted among 250 adolescent girls in Munirika urban village, Delhi. 60.4% of anaemia cases were found among 250 study participants. The study revealed that anaemia was highly prevalent among adolescent girls. Anaemia was associated with less literate, lower starta, poor diet and underweight factors. Anaemia was found to be significantly more common in adolescent girls, and this incidence was higher in lower socio-economic strata, parents who were less educated, poor diet habits, and underweight causes. To have an early impact on reducing adolescents' anaemia, school teachers and Frontline Health Workers (FHWs) should educate and counsel them during home visits. There is a need for IFA supplementation and regular diet pattern awareness among adolescent girls. Interpersonal counseling needs to be strengthened at the community level through home visits and initiating awareness programs. The nutritional status of adolescent girls can be improved through counseling and health education. T3 camps should be held at the school level to raise awareness of anaemia among adolescent girls.

Keywords: Adolescent, Urban poor, Anaemia, Delhi.

1. INTRODUCTION

The WHO defines adolescents as anyone aged 10 to 19 years. This stage of development occurs between childhood and adulthood. The maximum growth and overall physical, psychological, and behavioral development occurred in this phase [1]. According to the National Health Mission, there are 253 million adolescents aged 10 to 19 in India. Around 200 million adolescents (45%) globally live with anaemia in India and China [2]. India has a higher incidence of anaemia, with six out of ten adolescent girls being anaemic [3]. They are vulnerable to a variety of preventable and treatable health issues, anaemia is one of the major health issue. The World Health Organization (WHO) defines anaemia as a condition in which the percentage of red blood cells, and thus the oxygen-carrying capacity of the blood, falls alarmingly, resulting in a situation in which the body's physiological requirements are not met (WHO, 2019). As per the National Health Family Survey (NFHS), the prevalence of anaemia has increased (55.8% to 59.1%) from NFHS-4 to NFHS-5. Anaemia among adolescent girls is higher (56% to 59%) than among boys (30% to 31%). Adolescent girls are more vulnerable because they marry young, exposing them to the risk of reproductive morbidity and mortality [4]. Siva et al. (2016) found various factors, including poor socio-economic status, blood loss during the menstrual period, lack of nutritional status, poor hygiene, and worm infestation associated with lead anaemia [5]. Studies show that poor households with limited resources have a higher

prevalence of anaemia, and female children are more vulnerable and live with anaemic conditions [6-9]. The prevelance of anaemia is found higher among adolesnts girls who belonged from low economic starta [10]. Studies are highlighted that the prevalence of anaemia was higher among adolescent girls who belonged to poor households, were less educated, belonged to SC/ST households, were in rural residences, and had no exposure to mass media [11-13].

Nutrition plays a vital role in adolescents' overall growth and development. Nutrient requirements are higher during adolescence than at any other stage of life. Low nutrients or inadequate food causes iron/calcium deficiency in the body, which leads to increased infection, maternal-child deaths, poor physical growth, and decreased adult productivity [14]. Studies have found a significant relationship between insufficient iron-rich foods and irregular consumption of weekly iron-folic acid supplements, increasing the prevalence of anaemia among adolescent girls [15, 16]. Studies found that the most common causes of anaemia due to poor dietary habits, lack of IFA/folic acid supplementation, vitamin B-12 deficiency, and due to chronic diseases [17-18]. This percentage is most significant among adolescent girls group. Adolescent girls face discrimination both at home and in the society. Even the anaemia control program focuses on the iron-folic acid supplementation program broadly. The main reason behind Iron deficiency, especially at the menarche, is several remarks that policymakers hardly identify [19, 20]. Anaemia occurs in undernourished adolescent girls, and is likely to consume less nutritious food, leading to moderate to severe anaemia. During the age of transition phase, the adolescent has more demand for fast food, which are easily available for them in urban village locations. Less-income families opt to consume unbalanced meals that are less nutritious and risk iron deficiency later [21].

Adolescents are mostly found to be very thin and short in height. Another study discussed that 45% of skeleton growth occurs at this crucial age phase, and micro and macronutrient deficiency occurs if the body does not receive adequate food. Socio-economic status, poor lifestyle, early marriage, early pregnancy, and parents' education negatively impact the adolescent body and threaten her reproductive life [6]. More than half of the malnourished adolescent lives in India because the family believes in cultural practices during menstruation, and they hardly pay attention to food and nutrient supplements. The amount of blood loss makes adolescents more anaemic steadily because they never recover in the deprived family due to negligence towards the girl child regarding health and education [20]. Considering the adolescent girl's vulnerable health condition, this study aims to determine the prevalence factor associated with anaemia among urban poor adolescent girls aged 10-19 years in Delhi.

2. MATERIAL AND METHODS

A cross-sectional study was conducted among adolescent girls aged 10-19 years residing in a Munirika (25,000 HHs) urban village in south Delhi. The data collection period is Sept 2017 to April 2018. The total sample size is 250. Muniraka urban village is divided into eight clusters, including all eight clusters in the study. The number of adolescent girls 10-19 years included in each cluster was determined using proportional allocation. The first household was chosen randomly in each cluster, followed by the next until the required number of study subjects in each cluster area was obtained. The same procedure was used in clusters until the required sample size was achieved. The pilot study was conducted to test the study tool. Data were collected through the study participants using a pre-test tool. Both structured and semistructured questions were used to collect quantitative and qualitative information from the study participants. The field diary was also used to record the observation about study participants and their anaemic status. Inclusion criteria: adolescents girls of the age group between 10-19 years at the time of the field survey. Adolescent girls who have resided in the study area for a minimum period of one year. Adolescents were willing to sign the consent form and participate in the study. Exclusion criteria based on adolescent girls who were severely ill, adolescent girls who were pregnant, and adolescent girls who did not give consent were excluded. Data analysis was used in SPSS 23 version, and a Chi-square test was done in the study.

3. RESULTS

The majority (38.4%) of adolescent girls were 16-19, and the mean age was 14.56 + 1.45 years. Out of 250 adolescent girls, around (31.2%) were middle school educated as followed by primary school (23.2%), secondary school (18%), higher secondary (14.4%), graduation educated (7.2%), and while (6%) were illiterate. Data collected on social identity showed that the majority (66.4%) of respondents belonged to Schedule Caste (SC) as followed by other backward

castes (20.8%), non-SC, ST, and OBC (12%), and only 0.8% of respondents belonged to schedule tribe (ST) community. In the present study, the majority (92.8%) of respondents followed the Hindu religion as followed by Muslim (5.6%) and Christian (1.6%). The mean size of the family members is 4.3, and 74.4% belonged to the nuclear family. Regarding types of houses, data shows the majority (93.2%) of respondents were living in pucka houses. Around 74% of households had access to improved water supply sources, while 37.2% had improved toilet facilities. Almost all the households have electricity facilities at the time of the field visit (Table 1).

Table 1: Socio-Demographic characteristics of the study population

Age of the respondents	N (%) =250
10-12	87 (34.8)
13-15	67 (26.8)
16-19	96 (38.4)
Education	
Class >5	52 (23.2)
Class 6-8	78 (31.2)
Class 9-10	45 (18)
Class 11-12	36 (14.4)
Graduation	18 (7.2)
Illiterate	15 (6)
Social Identity	
SC	166 (66.4)
ST	2 (0.8)
OBC	52 (20.8)
Non-SC, ST and OBC	30 (12)
Religion	
Hindu	232 (92.8)
Muslim	14 (5.6)
Christian	4 (1.6)
Average income	15000
Mean of family size	4.3
Family Type	
Nuclear family	176(74.4)
Joint family	74 (29.6)
Residing pucca house	233 (93.2)
Improved source of drinking water facility	187 (74.8)
Improved source of toilet facility	93 (37.2)
Electricity facility as a source of lighting	250 (100%)

Source: Fieldwork

Table 2 provides information about dietary pattern practices by the study respondents. Data shows the majority (60.4%) of respondents were vegetarian by diet, and 39.6% had taken veg and non-vegetarian foods. Regarding the body mass index (BMI), more than half percent of the respondents (50.8%) were underweight, followed by an average (38.4%), and 10% of respondents were overweight.

Table 2: Diet pattern and BMI

Dietary patterns	N (%)
Mix (Nonveg and Veg)	99 (39.6)
Vegetarian only	151 (60.4)
Body Mass Index (BMI)	
Underweight/Malnourished	127 (50.8)
Normal	98 (39.2)
Overweight	25 (10.0)

Source: Fieldwork

Body mass index value indicates that more than half (52%) of the girls (10-12 years) were overweight according to their BMI. The average age of adolescent girls who are overweight, normal, and malnourished is 13.6, 15.1, and 14.3 years respectively. We have further found that 12- and 15-years old girls were overweight by 20 %each. The maximum number of malnourished girls was ten years, followed by 19 and 12 years. Overall average BMI has been found 20.4. Over half (50.8%) of girls were malnourished, and 10 % were overweight (Table 3).

Diet pattern and opinion on the importance of a balanced diet shows that more than two-thirds of them (69.6%) have responded that a balanced diet is crucial. About 20 % of them also expressed that it is essential in the diet. Even a few of them have also reported that it is insignificant. And these are 10 to 12 years old girls. It might be that they do not know well what a balanced diet and it is essential. That is why they should be aware of food items in health issues. We have further asked what you eat in daily meals, and more than half of them (54.85) have reported simple homemade meals such as *dal, chawal, sabji*, and *roti* followed by regular daily home food (39.6%). Most of them (95.2%) have not taken any nutritional supplements. There were 5% of adolescent girls (10-12 years) who were taking dietary supplements of iron and protein. There were 13-15-year-old girls taking iron supplements only, whereas 15-19-year-old girls consumed supplements for calcium and protein. We have observed that adolescent girls rarely drink milk in their diet and seasonal fruits and vegetables sometimes. At this growing age, they are not taking a balanced or nutritional diet in their meal which is very alarming and a threat of food security or nutritional security among adolescent girls. It is also found that they have never

consumed dry fruits, fish, and other non-vegetarian foods. Many aspects came to light while encountering adolescent problems regarding access to government ration (Table 4). One of the FGDs find that-

"We migrated three years back. We are not getting any ration from the government. People here tell us government scheme is for us or only for the natives. We are not getting any facilities from the government. Whatever we earn that we spend on our family." [FGD2, Cluster 3].

Table 3: Body mass index value

Age (in years)	Body Mass Index value (%)			
	Malnourished (<18.5)	Normal (18.6-24.9)	Overweight (>25)	Total
	N (%)	**N (%)**	**N (%)**	**N (%)**
(10-12)	49 (38.6)	25 (25.5)	13 (52.0)	87 (34.8)
(13-15)	32 (25.2)	29 (29.6)	6 (24.0)	67 (26.8)
(16-19)	46 (36.2)	44 (44.9)	6 (24.0)	96 (38.4)
Mean age	14.3	15.1	13.6	14.5
Average BMI	**15.8**	**21.1**	**25.2**	**20.4**
Total (N)	**127(50.8)**	**98(39.2)**	**25(10.0)**	**250**

Figures in parenthesis are the percentage; Source: Fieldwork

Table 4: Diet pattern and opinion on the importance of a balanced diet pattern

Item	Age Group (in years)			
	(10-12)	**(13-15)**	**(16-19)**	**Total**
	N (%)	**N (%)**	**N (%)**	**N (%)**
Opinion on the Importance of Balance Diet				
Not at all important	1 (1.1)	-	-	1 (0.4)
Low important	2 (2.3)	-	-	2 (0.8)
Slightly important	-	2 (3.0)	-	2(0.8)
Neutral	6 (6.9)	7 (10.4)	3 (3.1)	16 (6.4)
Moderately important	1 (1.1)	3 (4.5)	2 (2.1)	6 (2.4)
Very important	58 (66.7)	42 (62.7)	74 (77.1)	174 (69.6)
Extremely important	19 (21.8)	13 (19.4)	17 (17.7)	49 (19.6)
What do you eat generally				
Regular daily home food	33 (37.9)	30 (44.8)	36 (37.5)	99 (39.6)
All type of foods and sometimes outside	3 (3.4)	5 (7.5)	6 (6.3)	14 (5.6)
Dal, chawal, Sabji and roti	51 (58.6)	32 (47.8)	54 (56.3)	136 (54.8)
Nutrition Supplements				
Yes	5 (5.7)	2 (3.0)	5 (5.2)	12 (4.8)
No	82 (94.3)	65 (97.0)	91 (94.8)	239 (95.2)
Total(N)	**87**	**67**	**96**	**250**
If Yes (Local dispensary and Government Hospital)				
Iron	59.6	100.0	-	41.7
Calcium	-	-	59.6	25.0
Protein Syrup	40.4	-	40.4	33.3
Total(N)	**5**	**2**	**5**	**12**

Source: Fieldwork

Table 5 shows that 65.2 %of adolescent girls have suffered from anaemia with multiple symptoms. At the national level, all ages adolescents have suffered from anaemia, indicating the level of awareness of anaemia through various responses such as Anaemia symptoms observed by themselves (65.2%), getting any treatment for anaemia (14%), and low hemoglobin tested in the last three months (50.8%) to diagnose anaemic condition by them. They asked, "What kind of symptom and sign have you observed?" They have reported ten symptoms related to anaemia. These are loss of appetite, pain in the waist, pain in legs, exhaustion,

weakness, fainting, low hemoglobin count, paleness in the tongue, paleness in the lower eyelids and nail beds, and paleness of the face.

Table 5: Distribution of anaemia status symptom observed, tested, and treatment

Anaemia Status of Adolescent Girls	N (%)
Total (N)	**250 (100)**
Anaemia Symptoms were Observed, and Low Hb reported	163 (65.2)
Get any Treatment for Anaemia	35 (14.0)

Source: Fieldwork

Data shows 31.2% of respondents had heard about anaemia. At the same time, only 3.6% of respondents were aware of the color of the IFA tablet. The majority of the respondents were not aware about the color of the IFA tablet. Table 6 clearly shows that pain in the waist and leg are the main symptoms of anaemia they reported. Forty-two percent and 38 % of them reported waist pain and leg pain, respectively, as symptoms of Anaemia. The scientific study of anaemia is the hemoglobin count in the blood; about 27 %of them have reported a low hemoglobin count as a symptom of anaemia. Fainting has been reported by 23 % of adolescents, and paleness in the lower lid of the eye and nail beds and paleness in the face have been reported by 14.4 and 17.2 % of them, respectively, as the symptoms of anaemia. The researcher said that adolescents from lower-income families are found to be reluctant when answering researchers regarding their health issues. They are found very shy; their hands are rough. The skin was very dry; hair was brownish, and even eyes were yellowish. We can see sharp differences between girls who go to school and those who drop out of school regarding their health issues.

Table 7 provides information about respondents who availed of the anaemia treatment. Data shows around 24.5% of respondents were not taking any health services related to the treatment of anaemia. At the same time, 75.5% of respondents did not use any anaemia-related treatment. Reasons why adolescents did not seek treatment for anaemia? Data reveals that 65% were unaware that anaemia is treatable because of shyness and nervousness (55%) to go to the health center for treatment. Around 40% of respondents felt that anaemia is not a severe disease and there is no need to take any medicine to cure this menace. About one-fourth of them have no money for the treatment. It was observed that many adolescents believed that anaemia is only related to unhealthy diet trends and any doctors and medicine cannot cure it because they are poor. They have accepted that because they are poor, and must live in this suffocated atmosphere where nobody listens to their problem. Although many Anganwadi centers are working in the field of study, the level of awareness is undetectable while collecting data.

Table 6: Awareness of signs and symptoms of anaemia

	Total N (%)
Heard anaemia	78 (31.2)
Color of IFA tablet	9 (3.6)
Anaemia signs and symptoms	
Loss of Appetite	30 (12)
Pain in waist	105 (42)
Pain in Legs	95 (38)
Exhaustion	64 (25.6)
Weakness	92 (18.8)
Fainting	57 (22.9)
Low Haemoglobin Count	65 (26.9)
Paleness in Tongue	19 (7.6)
Paleness in Lower Lid Eye and Nail Beds	36 (14.4)
Paleness of Face	43 (17.2)
Total	**(N=250)**

Source: Fieldwork

Table 7: Received treatment of anaemia

Received Treatment	N (%)
Yes	40 (24.5)
No	123 (75.5)
Reasons for not taking treatment (N=123)	
Not Considered as a serious problem to get treated in Clinics	15 (37.5)
I am not Aware	26 (65)
I am under heart Surgery	1 (2.5)
Not Sharing with anyone	16 (40)
Feeling Shy and Nervous	22 (55)
It is not a Serious as to take treatment	16 (40)
I thought it is usually happen with every Girl	13 (32.5)
Not having enough money for treatment	10 (25)

Source: Fieldwork

Anaemia association with selected study variables

Table 8 data shows that the prevalence of anaemia was higher among the <15 adolescent groups 62%,

compared to 43% in >15 adolescent groups. But the difference was not statistically significant (P=69). Likewise, the prevalence of anaemia is higher among the illiterate adolescent group (63.2%) compared to the literate adolescent group. But the difference was not statsically significant (P=81) Similarly, in religion, the prevalence of anaemia was found 67% of the non-Hindu followed group compared to 60% in the Hindu followed group, but the difference was not statistically significant (P=72). Data shows that adolescents from other castes had more anaemic than adolescents from SC-ST and OBC groups (59%). But the difference was not statistically significant (P=52). Regarding the family type, data shows the prevalence of anaemia was higher among joint families (67.7%) than the nuclear family (57%). And the difference was not statistically significant (P=29%). It shows that factors like ege, education, religion, caste, and family types were not associated with anaemia (P>0.05). Regarding diet patterns, vegetarian adolescents (72%) were more anaemic than mixed dieters. And this difference was statistically significant (P<0.001). Likewise, the anaemia prevalence was higher among the underweight adolescent group (66%) as compared (31%) to those with a normal BMI, which was statistically significant (P<0.001).

Table 8: Anaemia association with selected study variables

Selected study Variables		Anaemia reported		Total (N=250)	
		(Hb <12) N (%)	(Hb >12) N (%)	N (%)	P
Age	<15	96 (62.4)	58 (37.6)	154 (100)	0.69
	>15	41 (42.7)	55(57.3)	96 (100)	
Education	Illiterate	9 (63.2)	6(36.8)	15 (100)	0.81
	Literate	146 (62)	89 (38)	235 (100)	
Religion	Hindu	139 (59.9)	93 (40.1)	232 (100)	0.72
	Others	12 (66.7)	(33.3)	18 (100)	
Caste	SC-ST and OBC	130 (59.1)	90 (41.9)	220(100)	0.52
	Others	21 (67.7)	09 (32.3)	30 (100)	
Family type	Nuclear	100 (57)	76 (43)	176 (100)	0.29
	Joint	50(67.7)	26 (32.3)	74 (100)	
Diet	Veg	108(72)	43 (38)	151(100)	<0.001
	Mix	45 (45)	54 (55)	99 (100)	
BMI	Underweight	84 (66)	43 (44)	127(100)	<0.001
	Normal	47(38)	76 (62)	123 (100)	

Source: Fieldwork

4. DISCUSSION

The overall prevalence of anaemia was 65.2% among adolescents aged between 10 and 19. Their Hb level is lower than 12 g/dL. Srivastava et al., 2022 study reported a similar prevalence result in Bihar and Uttar Pradesh [14]. Subramanian et al. (2022), a study found 71.7% prevalence of anaemia among adolescents girls from 8 villages of Ballabgarh Block of district Faridabad, Haryana with severe, moderate, and mild anaemia found in 4.8%, 41.2%, and 25.7% respectively [12]. Ahankari et al., (2022) study found 87% prevalence of anaemia among 1,010 adolescent girls from 34 villages of Osmanabad district, Maharashtra. The prevalence of mild, moderate, and severe anaemia was 17%, 65% and 5%. Another study was conducted among 625 adolescent girls, and the prevalence of anaemia was found to be 56.3%. which was very similar to that reported by NFHS-4, 55.8% and NFHS-5, 59% [22]. The study was conducted in western Rajsthan (Verma & Baniya, 2022); Choudhry et al. (2006) study, where 300 participants were involved, and 246 (82%) had anaemia. Of these, 102 (34%) girls had mild anaemia (Hb: 9-12 gm), 91 (30.3%) had moderate anaemia (Hb: 6-9 gm), and 53 (17.6%) had severely low hemoglobin (Hb: 6 gm) [23]. And further study reveals anaemia was treated with iron supplementation and a balanced diet. Another study by Kumari et al. (2017) mentioned that more than 50% of adolescent girls were found to be 50% anaemic out of 200 girls. 43.3% of the population had mild anaemia, 3.3% had moderate anaemia, and 3.3% had severe anaemia [20].

In this study, factors like age, education, religion, caste, and family types were not associated with anaemia (P>0.05). This result is also reflected in Subramanian et al. (2022) studies in Haryana, Kishore et al. (2020) Uttarakhand. Adolescents who were vegetarian diet

(72%) were more anaemic than mixed diet. And this difference was statistically significant (P<0.001) [24]. A similar finding was reported by Singh et al. (2021) in Uttar Pradesh, Gayakwad and Shankar (2019) in Karnataka, Chaturvedi et al. (2017) in Ranchi, Jharkhand anaemia prevalence is more among vegetarians than non-vegetarians [25, 26]. Likewise, the anaemia prevalence was higher among the underweight adolescent groups (66%) as compared (31%) to those with an average weight, which was statistically significant (P<0.001). A similar finding was reported by Kamble et al. (2021) in Delhi, Varma and Baniya. (2022) in Rajasthan, Khan et al., (2018) in Haryana that the prevalence of anaemia is higher among those under adolescents group [13, 23, 27].

5. CONCLUSION

The prevalence of anaemia was higher (65.2%) among adolescent girls of urban poor in the study area. Factors like BMI and diet patterns were associated with anaemia among adolescent girls. Anaemia prevalence was found to be higher among vegetarians than non-vegetarians. The study participants had less awareness about anaemia and its signs and symptoms. Similarly, the anaemia prevalence was higher among the underweight adolescent group than normal girl. Urgent attention needs to be taken to emphasize the corrective mesuresures of treatment of anaemia and increase the screening for anaemia at school and community level. There is a need for IFA supplementation and regular diet pattern awareness among adolescent girls. School teachers and FHW (ANM/ASHA/AWW) should educate and counsel them during home visits to have an early impact on reducing adolescents' anaemia. Interpersonal counseling needs to be strengthened at the community level. Frontline workers' skills and capacity must be developed. The nutritional status of adolescent girls can be improved through counseling and health education. T3 camps must be held in schools to raise awareness of anaemia among adolescent girls.

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Conflict of Interest

The author states that there is no conflict of interest.

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