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An Examining The Interplay Of Nutritional Anemia And Blood Group Diversity In Adolescent Females

Yogita Shivaji Thakare[1] & Dr. Sonia[2]
Ph.D. Research Scholar, Department of Biochemistry,
Shri J.J.T. University, Rajasthan, India.
Ph.D. Research Guide, Department of Biochemistry,
Shri J.J.T. University, Rajasthan, India.
Corresponding Author - Yogita Shivaji Thakare
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Abstract:

The purpose of this cross-sectional research was to evaluate the incidence of anemia and its contributing variables among teenage girls living in an urban slum in Bhopal, Madhya Pradesh, India. The recruitment of participants and blood collection were made easier by the cooperation between Anganwadi workers and Auxiliary Nurse Midwives, as well as the acquisition of ethical approval. Hemocue (Hb 201) was used to test haemoglobin levels, and WHO categories were used to determine the prevalence of anaemia. 57.65% of the 85 individuals, who were between the ages of 10 and 19, had anaemia, with differing degrees of severity found. Anaemia prevalence was not significantly correlated with age group, education level, dietary preferences, socioeconomic situation, menarche status, or body mass index. Nonetheless, participants' anaemia-related knowledge gaps were noted, emphasizing the need of focused educational interventions. The significant prevalence of anaemia among teenage girls living in urban slums is highlighted by this research, which also highlights the need of customized treatments to address this public health concern and enhance health outcomes. To better understand the underlying causes and to raise awareness and educate people about sustainable anaemia prevention and treatment, further study and intervention activities are necessary.

Keywords: Anaemia, Adolescent Girls, Severity, Associated Factors, Demographic Factors, Knowledge Gaps, Educational Interventions.

Introduction:

Globally, nutritional anemia is a common health problem, especially in teenage girls. This population group has particular difficulties because of their quick development, rising nutritional needs, and sometimes poor eating habits. Anaemia, which is defined as low haemoglobin levels, may affect general health and quality of life by causing weariness, weakness, and cognitive decline. Simultaneously, blood type diversity—a genetic characteristic based on the presence or lack of certain antigens on red blood cells—may impact anaemia susceptibility via a number of processes, such as altered food intake and use during erythropoiesis. To successfully address

this public health challenge, it is essential to investigate the relationship between blood type diversity and nutritional anaemia in order to comprehend individual variability in anaemia risk and to design tailored treatments.

Magnitude of Nutritional Anaemia in Adolescent Females:

Due to a number of reasons, including the start of menarche, increased blood volume, and fast skeletal development throughout puberty, teenage girls are more susceptible to nutritional anaemia. The World Health Organization (WHO) estimates that anaemia affects 20% of teenage girls globally, with poorer nations having a greater frequency. The burden of anaemia in this group is exacerbated by inadequate nutritional intake, poor absorption, recurrent infections, and monthly blood loss. These factors underscore the need of comprehensive efforts to treat this problem.

Blood Group Diversity and Anaemia Susceptibility:

Blood group diversity affects anaemia susceptibility differently in communities and ethnic groups. New research points to possible links between anaemia risk and certain blood types. For example, decreased stomach acid output and poor iron absorption may make people with blood type A more susceptible to iron deficiency anaemia. On the other hand, those with blood type O may be at a lesser risk because of their increased iron bioavailability. Knowing these links may help shed light on the underlying causes of anaemia and provide individualized preventative and treatment strategies.

Rationale for Investigating the Interplay:

It is important to look at how blood type diversity and nutritional anemia interact in teenage girls for a number of reasons. First of all, it may help with the creation of focused treatments suited to the blood type profiles of specific individuals, maximizing dietary approaches to both prevent and treat anemia. Second, the accuracy and efficacy of anemia screening programs may be improved by adding blood group analysis, especially in environments with limited resources. Furthermore, by comprehending how blood group variety affects nutrient metabolism and utilization, precision nutrition strategies that target certain nutritional deficits and enhance overall health outcomes may be more easily developed. Lastly, the results of this study may help shape public health initiatives targeted at lowering the prevalence of anemia and enhancing teenage girls' nutritional status on a population-wide basis.

Literature Review:

Zhou, H., Wu, Y., Raat, H., Li, L., Feng, J., & Rozelle, S. (2023) Cancel Pregnant women in rural western China were selected using a multi-stage random cluster sampling procedure. Dietary variety was recoded into terciles and measured using the Woman's Dietary variety Score. The relationships between the degree of prenatal anaemia and dietary

diversity score terciles were examined using multinomial logistic regression models. By including the product term of dietary variety together with a number of sociodemographic and maternal factors in the regression models, multiplicative interactions were examined. Of the 969 individuals, 54.3% had anaemia, with mild anaemia accounting for 28.6% and moderate to severe anaemia for 25.7% of cases. Between self-reported and measured anaemia status, there was no agreement (κ = 0.28, 95% CI [0.22–0.34]). After correcting for possible confounders, those in the highest dietary variety score tercile had decreased risks of being moderately to severely anaemic (RRR = 0.65, 95% CI [0.44, 0.98]). Significant interactions were seen between age, parity, and dietary variety score terciles in patients with moderate to severe anaemia (p for interaction < 0.05). Pregnant women in rural China continue to experience high rates of prenatal anaemia, and their awareness of their anaemia status is inadequate. To address prenatal anaemia in rural settings, there has to be an improvement in nutritional variety.

A. Iyassu, S. Mogues, S. Chitekwe, K. Tilahun, F. Workneh, A. Laillou, & K. Baye (2023). The purpose of the current research was to evaluate the variables influencing teenagers' eating habits in urban Ethiopia. Focused group conversations with a gender breakdown (n = 70) were held with teenagers (n = 432) aged 15-19 in Addis Ababa, Bahir Dar, and Dire Dawa, in 36 private and public schools (n = 12/city). A subset of participants (n = 216) was given photovoice in order to get more understanding of how teenagers saw their school food situation. Key informant interviews with school administrators (n = 36) were carried out. Although adolescents recognized the value of a variety of diets and had a fair understanding of nutrition, there were some misconceptions. Although they recognized fruits and vegetables as healthful foods, worries about food safety prevented them from being consumed. The teens knew that processed and packaged meals, as well as foods rich in fat, salt, and sugar, were bad, yet they continued to eat them often because they were convenient, inexpensive, and available near schools. Bullying and social isolation in schools have been connected to both undernutrition and overweight/obesity. It takes effective behavioural change communication to dispel prevalent misconceptions. To guarantee food safety, school nutrition programs should include water, sanitation, and hygiene initiatives. Policies that encourage a nutritious diet while discouraging unhealthful eating habits are essential. It is critically necessary to implement interventions to increase the availability, affordability, and accessibility of nutrient-dense, healthful foods in order to enhance teenage nutrition and health outcomes.

In 2023, Ampomah, P., Buadii, E., and Aboagye, B.The goal of the current research was to look into the relationship between the risk of severe malaria and the ABO blood group typology.The research included 280 people in total—140 of

whom were P. falciparum malaria patients and 140 of whom were healthy controls—who had been tested using the Tile technique to determine their ABO blood type. For falciparum-infected patients, thick and thin blood films stained with 10% Giemsa were made, and their complete blood counts were acquired using the haematology analyzer (Cell Dyn 1800, Abbot Diagnostic Division, USA). The counts of parasites were divided into two categories: those with severe and simple malaria, and those with different levels of parasitaemia. After that, the impact of parasite densities on a few haematological parameters was examined. Thrombocytopenia, malarial anemia, and hyperparasitis were considered indicators of severe malaria. Compared to other blood groups, individuals with severe malaria had a considerably greater frequency of blood type "A" ($p = 0.042$). While blood groups "A" and "AB" had low platelet counts, blood groups "A" and "B" displayed greater parasite concentrations. Blood types "A" and "O" had severe anemia ($p < 0.05$). Previous research, as well as this one, has shown that blood type "O" is resistant to severe malaria ($p < 0.05$).

Munshea, A., Tazebew, B., and Nibret, E. (2021).The purpose of this research was to ascertain the prevalence of malaria among patients at Mekaneeyesus Primary Hospital in the Estie District of northwest Ethiopia, as well as any potential correlations between the disease and hemoglobin level and ABO blood type. 390 randomly chosen participants provided sociodemographic information and pertinent data via a structured questionnaire. After that, finger prick blood samples were used to create thick and thin smears, which were then stained and inspected under a microscope to look for and identify malaria parasites. The identical participants' hemoglobin levels and ABO blood group were also ascertained. Models for logistic regression and descriptive analysis were performed on the obtained data. Explanatory factors in multivariable logistic regression were defined as those with a p-value less than 0.05. Plasmodium vivax (5.6%) was the most common species, followed by P. falciparum (2.3%), and mixed infections of the two species (0.5%), accounting for the 8.5% total prevalence of malaria. The risk of malaria was shown to be substantially correlated with being male (AOR = 3.48), under five years old (AOR = 72.84), living in a rural area (AOR = 2.64), and not using a bed net (AOR = 4.65). The majority of malaria-positive cases (14.6%) were found in participants with blood type "A," while those with blood group "O" had the fewest instances. The risk of malaria was almost four times higher in those with blood type "A" than in those with blood group "O" (AOR= 3.74). Anemia was present in 23.1% of cases and was strongly correlated ($p<0.05$) with malaria. The current study's malaria prevalence remains elevated when compared to some earlier studies from Ethiopia. Therefore, there is a need to step up efforts to prevent malaria among population segments that may be at risk, such as men, people living in rural areas,

and children under five. Additionally, there is a need to encourage the usage of ITNs within the community. For those with iron-deficient anemia, an iron-rich food supplement is required.

Research Methodology:

Following the institute's ethical approval, the Anganwadi personnel and ANM were given a short overview of the study's subject. They were given information on the research, blood collection procedures, and the significance of the current investigation.

Cross-sectional research was carried out in a particular urban slum in the city of Bhopal. According to Bhopal Municipal Corporation's 2012 city profile, there are 380 slums in the city. 4 At random, one of the slums was chosen. 12,000 people live in the chosen slum (census 2011). Three of the eight Anganwadis in the chosen urban slum were chosen at random. All females between the ages of 10 and 19 who were enrolled with Anganwadi and gave permission for hemoglobin estimate were required for inclusion. Of the 98 females who were registered, 85 agreed to have their hemoglobin levels estimated, and as a result, they were included to the research. Hemocue (Hb 201) was used in this investigation to assess the hemoglobin level. Hemocue has a range of 88–100% for specificity and 75–91% for sensitivity. 5. Anaemia prevalence was determined by testing hemoglobin. The research was carried out from March 1, 2017, to May 30, 2017, a duration of three months.

With the assistance of AWW, parents of the chosen research participants were informed about the study's premise and study subjects were contacted. For the sake of making blood collection easier, the research participants were instructed to gather at the Anganwadi center on the designated day with the assistance of AWW. The research subjects' parents provided informed permission.

A semi-structured questionnaire was used to collect data on their knowledge about anemia's causes, symptoms, and therapy, as well as their menstrual cycle, dietary habits, and sociodemographic characteristics. After removing all potential errors, weight was measured to the closest 100 grams using a portable manual weighing machine without shoes and with the least amount of clothes. A measuring tape that was affixed to the wall was used to measure height in centimeters. Hemocue (Hb 201) was also used to assess the hemoglobin level. The WHO categorization system was used to determine the reference range of hemoglobin for anemia, which includes three categories: mild (11–11.9 g/dl), moderate (8–10.9 g/dl), and severe (<8 g/dl). Six MS Excel was used to compile the data, and Epi Info 7 was used to analyze it.

Results and Discussion:

To determine the frequency of anaemia and the characteristics that are linked with it in teenage females, cross-sectional research was carried out. 85 females in all provided permission for

haemoglobin measurement, making them part of the research.

Table 1: Distribution of adolescent girls according to severity of anaemia.

Anaemia	Frequency	Percentage
Anaemia (≥12) absent	36	42.35
Anaemia (<12) present	49	57.65
Total	85	100

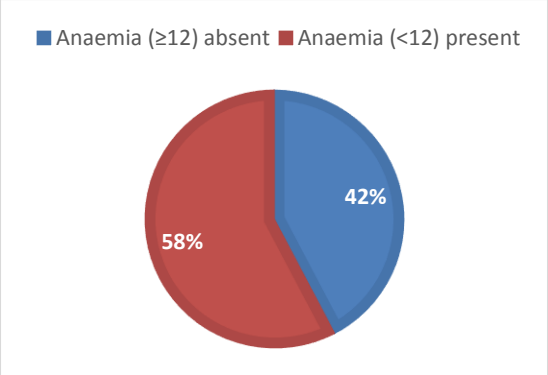

Figure 1: Graphical Representation Of Distribution Of Adolescent Girls According To Of Anaemia

The data that has been given indicates the incidence of anemia among the 85 research participants. Of these, 36 people, or around 42.35% of the sample, did not show any symptoms of anemia, which is defined as having a hemoglobin level of 12 or above. On the other hand, the majority of 49 people, or around 57.65% of the sample, had anemia, as shown by hemoglobin levels below the cutoff of 12. The distribution illustrates the noteworthy prevalence of anemia in the population under investigation, since more than 50% of the subjects had hemoglobin levels below normal. These results highlight the need of treating anemia, a common health problem in this population. In order to design and implement targeted treatments aimed at minimizing the burden of anemia and improving overall health outcomes among afflicted persons, further study and inquiry into the underlying causes behind this high incidence is necessary.

Severity of Anaemia (n=49):

Severity of Anaemia	Frequency	Percentage
Mild (11-11.9)	17	34.7
Moderate (8-10.9)	22	44.9
Severe (<8)	10	20.4

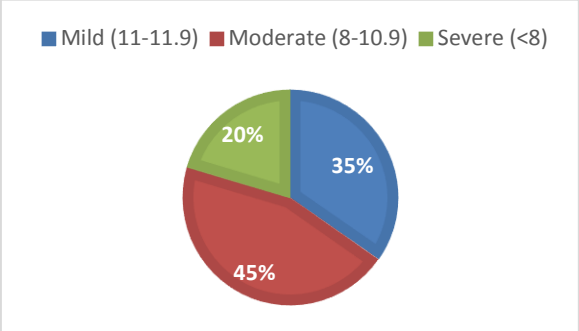

Figure 2: Graphical Representation Of Distribution Of Adolescent Girls According To Severity Of Anaemia

The presented data, which is divided into three groups according to haemoglobin levels, provides information on the degree of anaemia in the study population. There are three different levels of anaemia among persons with a diagnosis: mild, moderate, and severe. A total of 17 people, or around 34.7% of the anaemic population, had mild anaemia, defined as haemoglobin levels between 11 and 11.9 grams per decilitre (g/dL). Between 8 to 10.9 g/dL of haemoglobin, or 22 people, were found to have moderate anaemia, which accounts for about 44.9% of the anaemic group. Furthermore, 10

people (or around 20.4% of the anaemic population) had severe anaemia, which is defined as haemoglobin levels below 8 g/dL. This distribution highlights the range of anaemia severity levels among the impacted people, with a notable percentage suffering from severe anaemia. Healthcare professionals must comprehend these differences in severity in order to deliver individualized interventions and therapies that suit patients' unique requirements and lessen the negative consequences of varying degrees of anaemia severity.

Table 2: Distribution Of Anaemia According To Various Risk Factors.

Risk Factor	Anaemia present (%)	Anaemia absents (%)	P value
Age group (years)			
10-13 (early adolescence)	17 (60.7)	11 (39.3)	>0.05 NS
14-16 (middle adolescence)	19 (61.2)	12 (38.8)	
17-19 (late adolescence)	13 (50)	13 (50)	
Education			
Primary	7 (77.8)	2 (22.2)	>0.05 NS
Middle	25 (62.5)	15 (37.5)	
Secondary	12 (44.4)	15 (55.6)	
College	5 (55.6)	4 (44.4)	
Dietary Habits			
Veg	15 (55.6)	12 (44.4)	>0.05 NS
Non Veg	34 (58.6)	24 (41.4)	
Socioeconomic status			
Upper middle	3 (75)	1 (25)	>0.05 NS
Middle	5 (71.4)	2 (28.6)	
Lower Middle	28 (59.6)	19 (40.4)	
Lower	13 (48.1)	14 (51.9)	
Menarche			
Attained	37 (54.4)	31 (45.6)	>0.05 NS
Not attained	12 (70.6)	5 (29.4)	
BMI			
<18.5	27 (52.9)	24 (47.1)	>0.05 NS
18.5-24.99	20 (62.5)	12 (37.5)	
>25	2 (100)	0 (0)	

The data that is being given looks at the relationship between a number of risk variables and the prevalence of anemia in various demographic groups. The p-values (>0.05) show that there was no statistically significant variation in the prevalence of anemia across the age categories, indicating that age may not be a relevant risk factor for anemia in this research population. Similarly, non-significant p-values (>0.05) suggested that there was no significant connection between the prevalence of anemia and education level, dietary habits, socioeconomic status, menarche status, or BMI.

The frequency of anemia did not seem to be substantially influenced by education level, with no discernible pattern seen in the elementary, intermediate,

secondary, or college education categories. In a similar vein, eating habits—vegetarian or not—did not seem to have a substantial effect on the occurrence of anemia. The categories of upper middle, medium, lower middle, and lower socioeconomic class did not exhibit a discernible correlation with the frequency of anemia.

Furthermore, there was no discernible variation in the prevalence of anemia according to menarche status—attained or not. Finally, while the percentages of anemia prevalence varied between BMI groups (<18.5, 18.5-24.99, >25), the variations were not statistically significant.

Overall, the findings point to the possibility that anemia prevalence in this research group may not be strongly correlated with characteristics including age, education, dietary preferences, socioeconomic position, menarche status, and BMI. To further understand and treat anemia in this group, more research into other possible risk factors or underlying causes would be necessary.

Table 3: Knowledge of the study participants regarding anaemia.

Causes of Anaemia	Frequency	Percentage
Iron deficiency	17	22.3
Vitamin deficiency	21	25.8
Underlying infection	7	7.05
Improper diet	24	29.4
Excessive blood loss	8	8.2
Don’t know	25	29.4

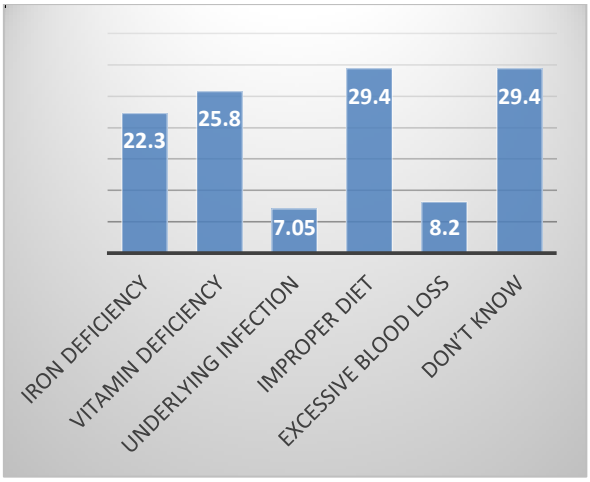

Figure 3: Graphical Representation Of The Study Participants Regarding Anaemia

Table 3 sheds light on the participants' understanding of the causes of anaemia. Of the explanations mentioned, vitamin insufficiency and an unsuitable diet seem to be the most often acknowledged issues, as identified by 25.8% and 29.4% of participants, respectively. The next most common cause of anaemia, according to 22.3% of participants, is iron deficiency. A lower percentage of people (8.2%) and 7.05%) understand other possible reasons, such as significant blood loss and underlying illness. Interestingly, a sizable percentage of participants—29.4%—said they had no idea why they had anaemia. This indicates that there may be a lack of information or awareness of anaemia within the research group, emphasizing the need for educational initiatives or awareness campaigns to raise awareness of this crucial health concern.

Table 4: Symptoms of Anaemia Among Study Participants

Symptoms of Anaemia	Frequency	Percentage
Fatigue	24	29.4
Weakness	53	61.7
Dizziness/vertigo	30	37.6
Headache	18	20
Pallor	9	9.4
Others	6	5.9
Don't know	19	23.5

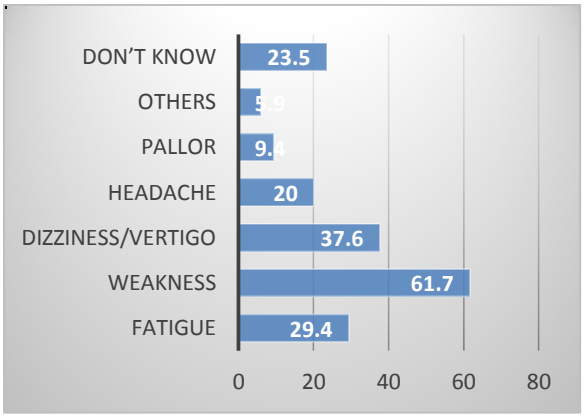

Figure 4: Graphical Representation Of Symptoms Of Anaemia Among Study Participants

The symptoms of anaemia that research participants experienced are included in Table 4, which provide important context for understanding their experiences and opinions. Weakness is the most often reported symptom on the list, as indicated by 61.7% of participants. Dizziness/vertigo and fatigue come in second and third, respectively, with 29.4% and 37.6% of people reporting these symptoms. Participants reported headache and pallor at rates of 20% and 9.4%, respectively, suggesting differing levels of symptom prevalence in the research group. Furthermore, a noteworthy percentage of participants—23.5%—stated that they were unaware of the signs and symptoms of anaemia. This points to a possible lack of knowledge or comprehension of anaemia symptoms within the research group, highlighting the need of education and awareness efforts to enhance symptom detection and encourage people who are at risk of anaemia to seek medical attention..

Table 5: Treatment of Anaemia Among Study Participants

Treatment of Anaemia	Frequency	Percentage
IFA supplementation	34	38.8
Vitamin Supplementation	17	21.1
Balanced diet	33	37.6
Treatment of underlying illness	9	9.4
Don't know	44	51.7

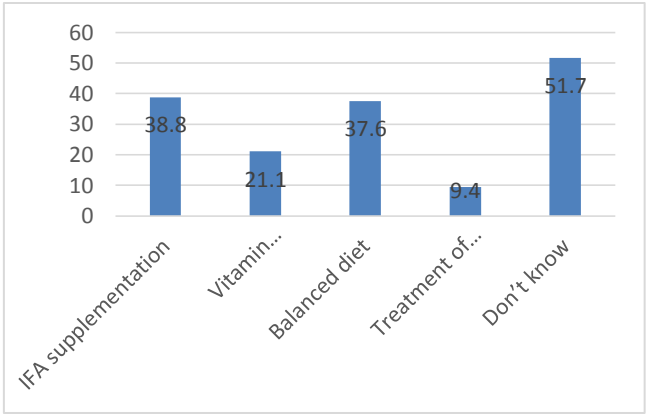

Figure 5: Graphical Representation Of Treatment of Anaemia Among Study Participants

Table 5 presents the anaemia treatment approaches that research participants reported, providing insight into their treatment habits and preferences. Iron-folic acid (IFA) supplementation is the most popular therapy among the given options, selected by 38.8% of participants. Another common option is a balanced diet, as shown by 37.6% of individuals who

said this was their chosen course of therapy. Vitamin supplementation comes in second place, chosen by 21.1% of participants. Just 9.4% of participants said they would rather treat an underlying condition in order to address their anemia. It's interesting to note that 51.7% of participants said they were unclear about the best course of action for treating anemia. This indicates that there may be a knowledge or awareness gap about the best ways to treat anemia among the study group, emphasizing the need for healthcare providers to provide education and assistance to ensure the illness is managed as best they can.

Table 6: Knowledge Among Study Participants Regarding Food Item Rich In Iron

Food Item	Frequency	Percentage
Green Leafy Vegetable	38	45.8
Pomegranate	2	27
Chakundar	6	5.8
Jaggery	4	4.7
Carrot	2	1.1
Others	8	8.2
Don’t know	44	54.1

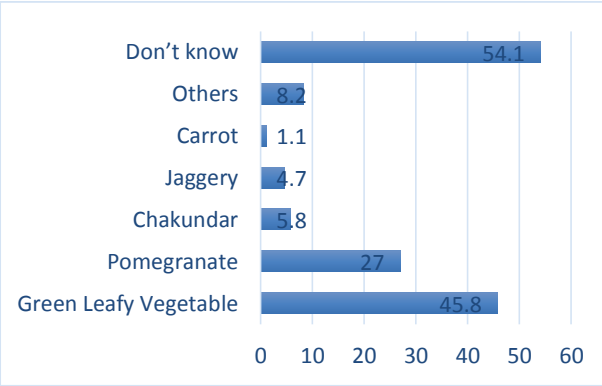

Figure 6: Graphical Representation Of The Study Participants Regarding Food Item Rich In Iron

Table 6 provides information on the foods high in iron that research participants are aware of, providing insight into their understanding of dietary sources of this vital vitamin. Of all the dietary categories on the list, green leafy vegetables are the most often acknowledged as an iron source (45.8% of participants). Notably, a significant percentage of participants (27%) identified pomegranates as an iron-rich meal. A lower percentage of participants identify carrots, jaggery, and chakhdar (beetroot), at 5.8%, 4.7%, and 1.1%, respectively. Interestingly, a sizable percentage of participants—54.1%—said they had no idea what foods were high in iron. This implies that the research group may not have been aware of all the dietary sources of iron, which emphasizes the need for iron-rich food promotion and education to address any possible deficiencies and enhance overall nutritional status.

In our research, the overall prevalence of anemia among adolescent girls was found to be 57.65%; of these, 34.7% had mild anemia, 44.9% had moderate anemia, and 20.4% had severe anemia. In contrast, Shinde et al.'s study on 267 schoolgirls in an urban area of central Madhya Pradesh found that the overall prevalence of anaemia was 52.06%; of these, 70.5%, 28.06%, and 1.44% of the girls had mild, moderate, and severe anaemia, respectively. In early, middle, and late adolescence, anaemia was found in 42.8%, 45.2%, and 23% of the girls in our study, and the p value was determined to be significant. In contrast,

anaemia was found in 11.6% of early adolescent girls, 52.1% of middle adolescent girls, and 36.3% of late adolescent girls in a study by Shinde et al. Additionally, a strong correlation was discovered between dietary components and anaemia. In this research, there was no correlation between anaemia and BMI, socioeconomic position, or menarche attainment. However, in a study by Chaudhary et al. on 296 teenage girls in Nagpur, there was a significant correlation between anaemia and socioeconomic status, mean weight, and height.

Conclusion:

This study's approach and analysis reveal some important findings on anaemia prevalence and risk factors in Bhopal's chosen urban slum's teenage females. The institution gave the research ethical approval, and Anganwadi staff and Auxiliary Nurse Midwives (ANM) helped educate participants and collect blood. The three-month cross-sectional research comprised 85 10-19-year-old females from the designated urban slum. Hemocue (Hb 201) evaluated haemoglobin levels, and WHO categories graded anaemia prevalence. A significant number of subjects (57.65%) had anaemia. They included 34.7% mild, 44.9% moderate, and 20.4% severe anaemia. Demographic characteristics such age, education, nutrition, socioeconomic position, menarche status, and BMI did not significantly affect anaemia prevalence. However, further research into additional risk variables may be needed to fully explain anaemia drivers in this group. The study also found gaps in participants' knowledge and awareness of anaemia-related factors, emphasizing the need for targeted educational interventions and awareness campaigns to promote healthy behaviours and improve anaemia prevention and management among adolescent girls in similar settings. The research emphasises anaemia as a public health issue and the need for specific treatments to reduce prevalence and improve health outcomes in adolescents. Sustainable anaemia prevention and management improvements need further study and intervention on underlying factors and awareness and education.

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