

PREVALENCE OF ANEMIA AND ITS ASSOCIATED RISK FACTORS AMONG ADOLESCENT GIRLS

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Abstract

Background: Adolescence is a vulnerable period in the human life cycle for the development of nutritional anemia, which has been constantly ignored by public health programs. Girls are more likely to be a victim due to various reasons. This study was conducted to analyze the prevalence of anemia and its associated risk factors among adolescent girls. **Material and Methods:** 308 adolescent girls between the ages of 10 to 19 years who were confirmed cases of anemia were enrolled in this study. Information about their medical backgrounds, symptoms, and any relevant factors contributing to their anemia were recorded on predesigned proforma. **Results:** 74.02% girls were suffering from mild anemia. 46.75% girls were moderately nourished and 29.55% girls were malnourished. Anemia more in urban (58.77 %) adolescent girls than in rural (41.23%). **Conclusion:** Anemia during adolescence can have an impact on women's entire life cycle. It also has negative consequences for the survival, growth, and development of their children later in life. Anemia is a major public health problem among women of reproductive age group of urban slums. It is essential to develop various strategies to improve dietary intake and bioavailability of iron; nutritional supplementation of iron and folic acid tablets and fortification of edible dietary items with iron.

INTRODUCTION

Adolescence is a vulnerable period in the human life cycle for the development of nutritional anemia, which has been constantly ignored by public health programs. Girls are more likely to be a victim due to various reasons. In a family with limited resources, the female child is more likely to be neglected.^[1] Anemia causes adverse consequences as the disease progresses. It not only affects the growth of adolescent girls but also affects their attentiveness, memory, school performance and retention in school and attendance. It also causes a delay in the onset of menarche, and affects immune system leading to infections. If the anemic adolescent girl becomes pregnant, it may increase fetal morbidity and mortality, increase the perinatal risk, increase the incidence of Low Birth Weight (LBW), and overall increase in Infant Mortality Rate (IMR) and Maternal Mortality Rate (MMR).

As growing pregnant adolescents compete with the growing fetus for nutrients anemia in pregnancy will

be worse than in older women.^[2] A new strategy called the "12 by 12" initiative for controlling adolescent anemia was implemented on 25th April 2007 by the Government of India (GOI), the World Health Organization (WHO), the United Nations Children's Fund (UNICEF) and the Federation of Obstetric and Gynecological Societies of India (FOGSI) collaboration. The main goal of this strategy was to achieve 12 gms of haemoglobin by 12 years of age by 2012. So, by decreasing the prevalence of anemia in adolescents, 20-40% of maternal deaths can be prevented. Infant mortality and child mortality can also be reduced thereby reaching the goals of Reproductive Child Health (RCH) and the National Rural Health Mission (NRHM program).^[3] This study was conducted to analyze the prevalence of anemia and its associated risk factors among adolescent girls.

MATERIALS AND METHODS

This research was carried out in the Department of Pathology at Dr Vasant Rao Pawar Medical College

Hospital and Research Center (From June 2021 to December 2023). This study was focused on adolescent girls between the ages of 10 to 19 years who were confirmed cases of anemia. This research topic included a thorough examination of complete blood counts and other investigation reports for adolescent girls.

Inclusion Criteria

1. Adolescent girls (Age between 10 to 19 years).
2. Confirmed cases of anemia with complete blood count.
3. Admitted to the tertiary care hospital and visited the OPD.

Exclusion Criteria

1. Age less than 10 years and more than 19 years.
2. Incomplete investigations.

Patients who visited the hospital and those admitted to various wards of the hospital were enrolled. Their comprehensive information and detailed medical histories were recorded. This involved obtaining information about their medical backgrounds, symptoms, and any relevant factors contributing to their anemia. The collected data were entered in the Excel spreadsheet and analysis was done in the Excel.

RESULTS

The study was conducted from January 2019 to August 2023, during which participants with a confirmed diagnosis of anemia were enrolled (n=308). Out of 308 adolescent girls, 232 were mildly anemic, 65 were moderately anemic and 15 girls were severely anemic. Grading of the severity of anemia was done according to WHO classification: mild (10 – <12 g/dl), moderate (7 – <10 g/dl) and severe (<7 g/dl)⁴.

In this study, microcytic hypochromic anemia was predominant (106 cases, 34.42%) followed by macrocytic anemia (20.78%). Dimorphic anemia and normocytic normochromic were 23.70 % and 21.10% respectively. [Table 2]

The appearance of 46.75% of adolescent girls were moderately nourished, 29.55% were malnourished and 23.7 % were well nourished. [Table 3]

In the present study, girls of families living in urban areas were more affected than girls living in rural areas. The prevalence of anemia was high in urban slums. [Table 4]

Of all anemic girls, 31.17% (96) of girls were in the age group 10-13 years and 68.83% (212) of girls were in the age group of 13 to 19 years. [Table 5]

Most of the parents were either less educated (up to 10th std) or uneducated. Fathers and mothers of girls were either uneducated or educated up to secondary school (90.26% and 88.96% respectively). [Table 6] Most of the parents were farmers with monthly income less than 10000 followed by income between 10000 – 1lac monthly. More prevalence was found in family size with family members 5 or

more. Irrespective of the family's socioeconomic status; anemia was high in every group. [Table 7]

In our study, girls with a mixed diet were more than girls with a vegetarian diet. Consumption of milk and frequent intake of citrus fruits was seen in 61.69% of girls. Frequent intake of green leafy vegetables was noted in 58.77 % of girls. But occasional consumption of beetroot and consumption of nuts was seen, which was 71.10% and 56.82% respectively. Hence though girls were anemic, anemia was mild in 74.02% of girls (228 girls out of 308) and moderate and severe were less prevalent. [Table 8]

Three girls out of 308 (0.97%) and 2 girls out of 308 (0.65%) were known cases of sickle cell anemia/trait and thalassemia trait respectively. Two of three girls had sickle cell trait and one had sickle cell anemia. Both girls with sickle cell trait had moderate anemia and one of them previously was severely anemic (Hb < 7 gm/dl) and required a single blood transfusion. Next CBC report showed Hb > 9 gm/dl during the time of the study. One had mild anemia (10.3 gm /dl) at the time of study and received blood transfusion thrice in the last five years. Two girls (0.65%) with the thalassemia trait had moderate anemia. [Table 9]

16 out of 308 cases had a history of infection with either malaria and/or dengue. Of these 11 girls suffered from malaria, four from dengue and one with both malaria and dengue. Parents of 3 out of 16 girls were laborer at construction site.

32 out of 308 (10.39%) girls were suffered from worm infestation and deworming was done in 91 girls, either during hospital stay at the time of study duration or previously. 17 out of these 32 girls were from pediatric ward and 13 from medicine, one each from obstetric and surgery department.

In the current study, a total of 26 girls were transfused blood either once or more. Of these, 15 girls were severely anemic, 9 moderately anemic (Hb around 7 gm/dl to 8.6 gm/dl). One girl was married, who was not pregnant from obstetric department and one from the surgery department (a case of haemorrhoids).

18 girls (5.84 %) in the present study had a history of blood in the stool. 14 girls were from the surgery ward and 4 girls were from the pediatric ward. Haemorrhoids, anal fissure, rectal prolapse, bacterial enteritis, diverticular disease, volvulus, arterio-venous malformation, peptic ulcer disease and rectal polyp were some of the causes of blood in stool in these girls.

6 girls (1.94%) had hematuria. 5 girls were from the pediatric ward and one from the surgery ward with orthopaedic consultation (case of trauma with anemia). Out of 5 girls from the pediatric ward, 3 had history of nephritic syndrome: one case was diagnosed as Wilms tumor and one under investigation for hematuria. [Table 10]

In the present study, associated chronic diseases were observed in 49 cases such as febrile convulsive disorder, pyrexia of unknown origin,

bronchopneumonia, chronic kidney disease, tuberculosis, protein-energy malnutrition, rheumatic heart disease, nephrotic syndrome, nephritic syndrome, uncontrolled type 1 diabetes with urinary tract infection

Menarche was attained in 146 girls (13-19 years of age). History of heavy menstruation was given by 31 girls (13.60%). Two out of these 31 girls had gynaecological consultation for the same and five had severe anemia. Out of 308 girls, 23 were married and 6 were pregnant.

Table 1: Distribution of anemia according to the severity

| Hb level (gm/dl) | Type of anemia | No. of girls (N) | Percentage |
|------------------|----------------|------------------|------------|
| 10-11.9 | Mild | 228 | 74.02% |
| 7-10 | Moderate | 65 | 21.11 % |
| Less than 7 | Severe | 15 | 4.87 % |
| Total | | 308 | 100 % |

Table 2: Type of anemia

| Type of anemia | Variable (N) | Percentage |
|-------------------------|--------------|------------|
| Microcytic hypochromic | 106 | 34.42 % |
| Macrocytic anemia | 74 | 20.78 % |
| Dimorphic anemia | 63 | 23.70 % |
| Normocytic normochromic | 65 | 21.10 % |
| Total | 308 | 100 % |

Table 3: General appearance of girls

| General Appearance | No. of girls (N) | Percentage |
|----------------------|------------------|------------|
| Well-nourished | 73 | 23.70% |
| Moderately nourished | 144 | 46.75 % |
| Malnourished | 91 | 29.55% |
| Total | 308 | 100% |

Table 4: Distribution according to urban and rural dwelling of family

| Locality | No. of girls (N) | | Percentage |
|----------|------------------|-----|------------|
| Urban | Slum | 103 | 41.23% |
| | Non-slum | 78 | |
| Rural | 127 | | 58.77 % |
| Total | 308 | | 100 % |

Table 5: Age distribution among adolescent girls

| Age in years | No. of girls (N) | Percentage |
|--------------|------------------|------------|
| 10-13 | 96 | 31.17% |
| 13-19 | 212 | 68.83% |
| Total | 308 | 100% |

Table 6: Education of parents

| Education | Father (N) | Percentage | Mother (N) | Percentage |
|------------|------------|------------|------------|------------|
| Uneducated | 68 | 22.08 % | 96 | 31.17 % |
| Primary | 116 | 37.66 % | 137 | 44.48 % |
| Secondary | 94 | 30.52 % | 41 | 13.31 % |
| Above | 30 | 9.74 % | 34 | 11.04 % |
| Total | 308 | 100% | 308 | 100% |

Table 7: Socio-economic status of family

| Socio-economic status | Variables | Number | Percentage |
|-----------------------|------------------------|--------|------------|
| Occupation of parents | Farmer | 79 | 25.65 % |
| | Labourer | 152 | 49.35 % |
| | Others | 77 | 25 % |
| Income /Month | Above 1 lac | 66 | 21.43 % |
| | 10000-1 lac | 101 | 32.79 % |
| | Below 10000 | 141 | 45.78 % |
| Family size | Greater than 5 members | 98 | 31.82% |
| | 5 members | 73 | 23.70 % |
| | Less than 5 members | 137 | 44.48 % |

Table 8: Dietary habits among girls

| Dietary habits | Variables | Number | Percentage |
|----------------|------------|--------|------------|
| Type of diet | Vegetarian | 126 | 40.91 % |
| | Mix diet | 182 | 59.09 % |

| | | | |
|----------------------------------|--------------|-----|---------|
| Consumption of milk | Yes | 203 | 65.91 % |
| | No | 105 | 34.09 % |
| Intake of citrus food | Frequently | 118 | 38.31 % |
| | Occasionally | 190 | 61.69 % |
| Intake of green leafy vegetables | Frequently | 181 | 58.77 % |
| | Occasionally | 127 | 41.23 % |
| Consumption of beetroot | Frequently | 89 | 28.90 % |
| | Occasionally | 219 | 71.10 % |
| Consumption of nuts | Frequently | 133 | 43.18 % |
| | Occasionally | 175 | 56.82 % |

Table 9: Presence of Sickle cell anemia and thalassemia in Adolescent girls

| Sickle cell anemia and thalassemia | Variable | Number | Percent |
|--|-----------|--------|---------|
| Presence of sickle cell anemia or trait in girls | Yes | 3 | 0.97 % |
| | No | 7 | 2.27% |
| | Not known | 298 | 96.76 % |
| Presence of thalassemia or trait in girls | Yes | 2 | 0.65 % |
| | No | 7 | 2.27 % |
| | Not known | 299 | 97.08 % |

Table 10: Distribution of associated pathological and physiological conditions

| Pathological and physiological conditions | Variable | Number | Percent |
|---|----------|--------|---------|
| History of malaria and dengue | Yes | 16 | 5.19 % |
| | No | 292 | 94.81 % |
| History of worm infestation | Yes | 32 | 10.39 % |
| | No | 276 | 89.61 % |
| History of blood transfusion | Yes | 26 | 8.44 % |
| | No | 282 | 91.56 % |
| Loss of blood in stools | Yes | 18 | 5.84 % |
| | No | 290 | 94.16 % |
| Loss of blood in urine | Yes | 6 | 1.94 % |
| | No | 302 | 98.06 % |
| Presence of chronic disease | Yes | 49 | 15.91 % |
| | No | 259 | 84.09 % |
| Menarche Attained | Yes | 146 | 47.40% |
| | No | 162 | 52.6% |
| Heavy menstruation | Yes | 31 | 10.06 % |
| | No | 277 | 89.94 % |
| Married | Yes | 23 | 7.47 % |
| | No | 285 | 92.53 % |
| Currently pregnant | Yes | 6 | 1.94 % |
| | No | 302 | 98.06 % |

DISCUSSION

In our study majority of girls were suffering from mild anemia (228 out of 308, 74.02%). A study done by Rani GS et al, Mistry SK et al., Chandrakumari AS et al., and Kamble BD et al., were comparable to our study and observed most girls were mild anemic (38.5%, 46%, 55.64 % & 48 % respectively).^[3,5,6,7] However, in a study done by Bodat S et al., adolescent girls had moderate anemia predominantly followed by mild anemia.^[8]

We observed microcytic hypochromic anemia in most of the girls (34.42% cases) which was comparable to the study done by Chaudhary SM et al.^[1] However in the study by Kumar A et al., macrocytic anemia was more as compared to microcytic and in the study by Siva PM et al., normocytic normochromic anemia was commonly seen in anemic girls.^[9,2]

In the present study, girls were moderately nourished (46.75%) most commonly followed by malnourished girls (29.55 %). Similarly, study done by Gupta BS et al., observed that 64% of anemic

adolescent girls' appearance was well nourished.¹⁰ However, a study done by Mistry SK et al., observed that malnourished girls were more than well-nourished girls (60.2%).^[5]

We observed anemia more in urban (58.77 %) adolescent girls than in rural (41.23%). The prevalence of anemia was significant in girls in urban slums. This was close to a study done by Kulkarni MV et al., Panigrahi A et al., and Verma A et al., who observed anemia in girls in slum areas was remarkable.^[11,12,13] However in the study by Jana A et al., (64.97%) noted more anemia in rural girls. This could be due to the reason that girls from rural areas might have lack of information about adequate nutrition and economic factors.^[14] Regasa RT et al., gave explanation for increased anemia in rural adolescent girls this could be more due to insufficient awareness about diet and financial aspects.^[15]

In the current study, illiteracy and less education were common among parents of anemic adolescents. Also, most parents were labourers followed by farmers and many families' per month income was

below 10000 rupees per month in our study. In the study done by Regasa RT et al., most anemic adolescent girls' parents were illiterate and less educated.¹⁵ According to Rajaratnam J et al., a significant correlation was observed between anemia and maternal education.^[16] A study done by Chaudhary SM et al., Chandrakumari AS et al., and Lilare RR et al., observed most anemic girls were from lower socioeconomic status.^[1,6,17] Chaudhary SM et al., further stated that there was a significant association between anemia and parent's educational status which depicts awareness about quality of food in his study.^[1] Jana A et al., in his study stated that low income families can't afford for health care facilities, hence untreated diseases cause anemia.^[14] Siva PM et al., in his study, stated that poor dietary pattern in upper socio-economic group with more of snacks and junk foods, which lack micro-nutrients leads to a higher prevalence of anemia among them.^[2]

Most girls in our study had less than 5 family members and most girls' birth orders were second followed by first birth order. No significant association between birth order and the prevalence of anemia was noted. In the study by Bodat S et al., Kulkarni et al and Panigrahi A et al., predominant girls were from nuclear families.^[8,11,12] Mishra P et al concluded in their study that low-income group are more vulnerable to the risk of anemia because of malnutrition.^[18]

In our study girls with mixed diet were more than vegetarian diets. Most of the girls had regular consumption of milk and frequent consumption of green vegetables. However citrus fruits, beetroot and nuts were consumed occasionally. This could be the reason for more number of mildly anemic girls in our study. In study by Kumar A et al., and Jana A et al., there was significant association between vegetarian diet and anemia.^[9,14] Panigrahi A et al., found in his study that inadequacy of green leafy vegetables and pulses with anemia was found to be statistically significant. However, association of anemia with intake of fish, meat, milk and milk products etc. was found to be insignificant.^[12]

The current study observed presence of non-nutritional causes of anemia such as sickle cell anemia or trait and thalassemia or trait was observed 0.97 % and 0.32 % in adolescent girls respectively. Study done by Panyang R et al., showed 2.7 % of population suffered from sickle cell homozygous (HbSS) and 14.2% of the studied population had HbAS (Sickle cell trait).^[19]

In the present study, 5.19 % of girls had suffered from malaria or dengue or both. 10.39 % of cases had history of worm infestation. 8.44 % of cases had history of blood transfusion. Loss of blood in stool and in urine was observed in 5.84% and 1.94% of girls respectively. Kaur S et al., in their study, found 87.7 % of adolescent girls suffered from worm infestation.^[20] A study by Stolfus RJ et al., revealed 74.2 % of anemia was due to hookworm infestation

and 19.8 % of anemia was due to plasmodium vivax malaria parasitemia.^[21]

In our study, 15.91% of cases had chronic diseases. These diseases included febrile convulsive disorder, pyrexia of unknown origin, bronchopneumonia, chronic kidney disease, tuberculosis, protein energy malnutrition, rheumatic heart disease, nephrotic syndrome, nephritic syndrome, uncontrolled type 1 diabetes with urinary tract infection. In study by Singh J et al., also observed different conditions like cold & cough (25.8%) lymphadenopathy (22.2%), scabies (16.2%), inflamed tonsils (7.8%) and ear discharge (7%) of girls.^[22]

In this study, we observed 212 (68.83%) cases more than 13 years of age. Of these, 146 girls (68.87%) had attained menarche and 31 cases (10.06%) gave a history of heavy menstruation. 23 (7.47 %) of girls were married and 6 (1.94%) were currently pregnant. According to a study by Rajaratnam J et al., the prevalence of anemia is more in girls who had attained menarche.^[16] In a study by Siva PM et al., and Panigrahi A et al., observed that the prevalence of anemia was higher among those who had heavy menstruation due to increased blood loss during menstruation.^[2,12] A study by Mistry SK et al. observed that non-pregnant adolescent girls were more vulnerable to becoming anemic compared to that pregnant girls. He further quoted that, this could be due to non-pregnant adolescent girls would require more attention.^[5] Lilare RR et al., in their study, observed that the prevalence of anemia was higher among pregnant women as compared to non-pregnant women.^[17]

CONCLUSION

Anemia during adolescence can have an impact on women's entire life cycle. It also has negative consequences for the survival, growth, and development of their children later in life. Anemia is a major public health problem among women of reproductive age group of urban slums. It is essential to develop various strategies to improve dietary intake and bioavailability of iron; nutritional supplementation of iron and folic acid tablets and fortification of edible dietary items with iron. The community should participate in mass screening sessions for anemia and also for deworming and nutritional supplementation activities.

Limitations

This was a single Centre-based study with a small sample size, so the results of this study cannot be generalised. Anemia is a disease condition involving several factors; a few other important associated factors such as worm infestation, nutritional status, and open-air defecation were not included in the study. Taking this study as a reference point, multicentric research involving a larger sample size can be planned.

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