Screening and Management of Anemia in Adolescent Girls in Lower Socioeconomic Strata

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Abstract:

Background: Adolescence is an opportune time for interventions to address anemia especially among girls in Indian population. Apart from the supplementation and additional requirements in antenatal mothers, improving the iron status before pregnancy is required. Preventing iron deficiency among adolescent girls is primordial thereby number of maternal morbidity and related mortality may be reduced. By keeping these issues, this study is aimed to screen the anemic status of the adolescent girls and addressing the importance of iron supplementation to improve hemoglobin levels.

Methods: This study was conducted at Institute of Social Obstetrics and Government Kasturba Gandhi Hospital, Chennai. Around 500 adolescent girls were screened anemia and related socio economic status.

Results: As a result, 68% were found to be anemic under various degrees. Upon iron folic acid supplementation and deworming, all the girls showed significant improvement in their hemoglobin levels. Severely classified anemic girls required long term supplementation to reach the normal level. In this study, the lower socioeconomic status, hookworm infestations were found to be attributable causes of anemia.

Conclusion: Thus providing healthy supplementary foods to the adolescent girls in the home is advisable; if not possible prescribing supplements in order to improve the iron status. Taking steps by prophylaxis treatment, dietary modifications and helminthic control would increase the hemoglobin levels.

Keywords: Anemia – Adolescent girls – socioeconomic status.

Introduction

Globally, anemia is considered as the major nutritional problem which is defined due to the deficiency of iron. Even though all age groups are affected, but severity is higher among adolescent girls and pregnant women.[1] In India, maximum health programmes are concentrated for pediatrics, geriatrics and reproductive age groups, but neglected for adolescence.[2] Higher risk of nutritional anemia was largely observed among adolescent girls who are signaling at the beginning of menstruation. Lower birth weight outcomes and increasing risk of anemia in pregnancy is observed.[3]

Adolescence in both genders are vulnerable to hemoglobin deficiency due to blood volume expansion, rapid growth and weight gain; additionally menstruation among girls.[4] This nutritional imbalance and the prevalence of anemia has been observed in both developing (27%) and developed (6%) countries with systematic consequences for health and socioeconomic growth.[2.5] Various small studies were conducted

to determine the prevalence of anemia in Indian states revealed 62% in Gujarat,[6] 56% in Uttar Pradesh,[7] 53% in Madhya Pradesh,[8] 50% in Bihar[9] and 41% in Karnataka.[10]This age group (Adolescence of 10 to 19 years) is largely affected for anemia, where six out of every ten adolescent girls are anemic. India accounts for 29 to 54% of anemic adolescents predominantly due to poor nutrition and lower socioeconomic status.[11]

The major causes of anemia are poor dietary intake and low bioavailability of iron; dietary deficiency of vitamins, hookworm infestation, malarial infection, teenage marriage and early pregnancy. Huge number of women affected with anemia during their pregnancy period of time; thus supplementation may be started prior to pregnancy or even earlier. Clinically, the iron deficiency among adolescent girls leads to delayed menarche, growth retardation, impaired mental development, poor reproductive outcomes and morbidity.[12.13]The signs and symptoms of anemia may not be clinically visible until the state

is serious (Hb less than 7gms/dL). The adolescent age is intermediate period of childhood and adulthood, where so many physical, physiological and psychological changes observed thereby, more nutrition required meeting out such changes; but due to poor socioeconomic status and intake irrelevant diet, nutritional deficiency observed. With this background, this study has been undertaken to screen and manage the anemia in adolescent girls comparing with their socioeconomic status.

Material and Methods

This prospective analytical study was conducted in the tertiary care teaching hospital, Tamilnadu with 500 adolescent girls aged between 12 to 19 years belonging to the lower socioeconomic strata. The girls who are not having any hematological lesions, non-pregnant and not supplemented with iron folic acid were included in this study. The girls who are below 12 and above 19 age, pregnant, having bleeding tendency, long term medications for hematological complications, menstrual disturbances, malaria fever in recent past, not willing to consume IFA supplements, not sure about the follow up visits and not willing for changing the food habits were excluded from the study.

A semi-structured questionnaire was used to obtain the information related to socio-demographic and socioeconomic details, past health history and knowledge about anemia among the adolescent girls included in this study. The capillary blood sample was collected from all the subjected recruited for this study by pricking the tip of the finger in an aseptic way. A 10 µl blood sample was collected by finger pricking with a sterile disposable lancet and the second blood drop was taken for hemoglobin measurement. The result was read within one minute.

The Sahli's hemoglobinometer was calibrated before every session using a provided standard. Hemoglobin level was determined by trained laboratory technicians and the anemic status of adolescent girls was assessed using the WHO (World Health Organization) classification. An individual adolescent girl was considered anemic if the Hb value was below 12.0 g/dL. Girls having anemia were further categorized into different grades such as mild (10–11.9 g/dL), moderate (7–9.9 g/dL) and severe (< 7.0 g/dl).[14] All the anemic girls were screened for the presence of hookworm infestation by microscopic stool examination. About 20 to 40 grams of formed stool were collected aseptically and parasites were detected within one hour of collection. If the stool is contaminated with urine, water, soil or menstrual blood, then the samples were rejected and fresh specimens were requested. The macroscopic examination like consistency, color, presence of blood, mucus and adult worms were recorded before processing the samples.

The foods which are rich in iron were recommended for their daily diet including meat, pork and poultry, seafoods, beans, dark green leafy vegetables like spinach, dried fruit like raisins and apricots, iron-fortified cereals, breads and pastas and peas. It is also suggested to not have coffee. All the girls (all degrees of anemia) who are subjected to this study were provided with single dose of Tab. Albendazole (400mg). Iron folic acid supplementation were also provided (100mg of elemental iron and 500µg of folic acid) and suggested to have for one year which is recommended under adolescent anemia prevention programme. All are instructed to take the supplements half an hour before lunch, since acidity increases iron absorption. Transient side effects like nausea, vomiting and abdominal pain were assessed and recorded.

In order to follow up the anemic girls, blood examination were done by pin prick method at the end of third, sixth, ninth and twelfth months for Hb estimation. For assessing the knowledge about anemia among adolescent girls, a gallery of questions asked including what is anemia, causes, iron rich foods, anemia in menstruation and pregnancy, signs and symptoms, hook work infestations, iron and folic acid supplementation and preventive measures.

Results

Among 500 adolescent girls included in this study showed maximum belongs to the age group from 16 to 18 years (44.8%) and the number of anemic girls in specific to the age group is also more in 16 to 18 years. Among 500 adolescent girls in the study population, overall prevalence of anemia was found to be 67.2% (*n* = 336). The detailed age group verses anemic state was depicted in table 1.

Table 1: Age group descriptions of anemia in adolescent girls

| Age group (in years)	Number of girls included	Number of anemic girls
12 to 15	86 (17.2)	17 (5.1)
16 to 18	224 (44.8)	173 (51.5)
19	190 (38)	146 (43.4)
Total	500	336 (67.2)

[Figures in parenthesis is percentages]. Most of these girls (73.8%, *n* = 248) had moderate degree of anemia. Overall, the mean Hb level was 10.16 ± 1.12 and the description related to age group verses hemoglobin status is depicted in table 2. The degree of Hb status was depicted figure 1.

Table 2: Degree of Hb and age groups

Age group (in years)	Degree of Hemoglobin (g/dL)		
	Mild (10 – 11.9)	Moderate (7 – 9.9)	Severe (<7)
12 to 15 (n=17)	17 (100)	0	0
16 to 18 (n=173)	29 (16.8)	132 (76.3)	12 (6.9)
19 (n=146)	6 (4.1)	116 (79.5)	24 (16.4)

[Figures in parenthesis is percentages; p value 0.000]
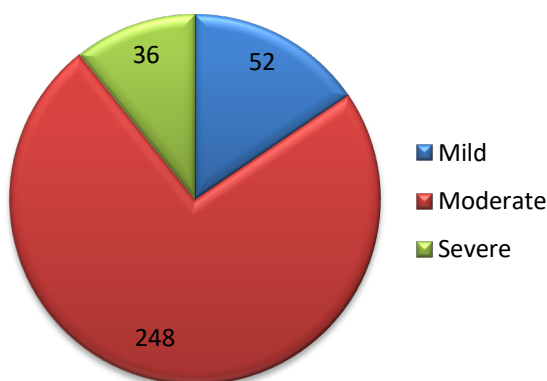
Figure 1: Degree of Hb status among adolescent girls

The socio economic status of the anemic girls was also determined thereby 218 (64.9%) girls are come under class 5 (lower class). The detailed description of socioeconomic status and various grades of Hb status were impregnated in table 3. The microscopic observation of hookworm infestation among anemic patients were recorded, 81.5% of adolescent girls have hookworm infestations. Table 4 describes hookworm infestation and anemic state.

Table 3: Socioeconomic status and anemia

Socioeconomic status	Degree of Hemoglobin (g/dL)		
	Mild (10 – 11.9)	Moderate (7 – 9.9)	Severe (<7)
Class 4 (n=118)	52 (44.1)	66 (55.9)	0
Class 5 (n=218)	0	182 (83.5)	36 (16.5)
Total (n=336)	52 (15.5)	248 (73.8)	36 (10.7)

[Figures in parenthesis is percentages; p value – 0.000]

Table 4: Hookworm infestation versus anemia

Hookworm infestation	Degree of Hemoglobin (g/dL)		
	Mild (10 – 11.9)	Moderate (7 – 9.9)	Severe (<7)
Absence (n=62)	52 (83.9)	10 (16.1)	0
Presence (n=274)	0	238 (85.6)	36 (13.1)
Total (n=336)	52 (15.5)	248 (73.8)	36 (10.7)

[Figures in parenthesis is percentages; p value – 0.000].

After 3 months of IFA supplementation therapy and deworming, 265 (78.9%) patients anemic status become normal. Further extending the therapy for six months resulted 275 (81.8%) patients anemic status was normal. While evaluating the anemic status after 9 months, total of 36 (10.7%) patients still anemic and all resulted normal after one year of treatment. The overall description of the improvement of Hb status among the patients was depicted in table 5.

Table 5: Changes in the observations of anemic state among patients

Degree of Anemia	Number of adolescent girls with anemia on				
	Initial (n=336)	Three months (n=71)	Six months (n=61)	Nine months (n=36)	One year (n=0)
Mild	52 (15.5)	0	0	0	0
Moderate	248 (73.8)	35 (49.3)	25 (41)	0	0
Severe	36 (10.7)	36 (50.7)	36 (59)	36 (100)	0

[Figures in parenthesis is percentages; p value – 0.000].

The assessment of the knowledge about anemia and its related queries, the participants' response is better after counseling. Thus, counseling play vital role in the learning process as well as to improve them for better outcome. Table 6 defined the knowledge about anemia among adolescent girls and most of the improvements are observed after counseling.

Table 6: Knowledge assessment about anemia among adolescent girls

No.	Question	Participants positive response (n=336)	
		Pre-counseling	Post-counseling
1	About anemia	36 (10.7)	265 (78.9)
2	Causes of anemia	31 (9.2)	262 (78)
3	About iron rich foods	69 (20.5)	232 (69)
4	Availability of iron and folic acid tablets	43 (12.8)	240 (71.4)
5	Hookworm infestation and anemia	12 (3.6)	243 (72.3)
6	Anemia in menstruation	43 (12.8)	212 (63.1)
7	Impact of anemia during pregnancy	13 (3.9)	252 (75)
8	Signs and symptoms of anemia	-	212 (63.1)
9	Prevention of anemia	12 (3.6)	250 (74.4)

[Figures in parenthesis is percentages; p value – 0.000]

Discussion

The nutritional anemia is largely observed in developing countries. In this study, the overall prevalence rate was 67.2% which is found higher compared studies with 44.8%[15], 48.6%[1] and lower with 78.7%,[16] 71.7%.[17] The grades of anemia showed higher numbers in moderate (248; 49.6%) followed with mild anemia (52; 10.4%) and severe anemia (36; 7.2%). There was a decrease in the prevalence as the age increased, however the difference was statistically insignificant.[15]

The girls who are in high socioeconomic status have normal to mild anemia due to their regular dietary intake of iron and vitamins.[18] This study also support the same having high prevalence among low socioeconomic individuals than high. Parents' education, monthly income, hygienic household location, community factors, consuming iron rich foods, menarche and awareness about nutrition play a very important role in association with anemia.[19]

In this study, we included only adolescent girls. But reports revealed about the strong evidence between iron deficiency and anemia in Indian adolescent boys and girls. In India various community based studies were presented on adolescent girl.[20,21,22] Symptoms like weakness and headache indicated higher risk in both genders. But larger observation of blood loss and gastrointestinal malabsorption found among female gender, thus anemia is considered as the major risk for females.[23]

Variable prevalence of anemia in adolescent girls has been reported in this study thereby mild, moderate and severe anemia was observed among 15.5, 73.8 and 10.7% individuals respectively. The dispersion of such anemic grades were interchanged in other studies like 44, 33 and 55%,[24] 25.7, 42.3 and 5%,[25] 19.1, 1.9 and Nil%.[26] Predominantly more cases were recorded mild anemic cases, whereas in our study, moderate anemia was more.

Socioeconomic and sociodemographic factors of the households play a vital role in the anemia, especially older girls (15 to 19 years), illiterate girls and early married girls[27] are previewed. The review information revealed underweight status and thinness are the common factors for the anemic prevalence in adolescents.[11,28]

The relationship between hookworm infestation and anemia are found very common in rural areas thereby recommendation of personal hygiene practices, improving environmental sanitation and proper waste water disposal stop the hookworm infestation thereby related factors support the anemic state.[29] In this study also, it was recorded that most of the girls are exposed to waste water in their area with barefoot. Impaired absorption of iron caused by hookworm infestation takes place, thus dietary modification, deworming and iron supplementation for increasing hemoglobin levels.[30]

Mild hookworm infection may cause anemia in individuals with low iron intake and stores in the body mainly due to blood loss from the intestines. Hookworms also release anti-clotting factors that make blood excretion continuously.[31] The integrated IFA supplementation and deworming has changed the level of hemoglobin and reducing the anemia state. There is an evidence of combination of nutritional diet, Albendazole deworming and IFA supplementation gave very effective outcome than providing separately.[32]The IFA supplementation (100mg elemental iron and 500µg folic acid) for a period of 3 months showed mild variations; extensively, after 52 weeks of IFA supplementation, the Hb levels may increase and severe anemic become normal.[33,34,.35,36] A study suggested that the regular intake of IFA improved appetite and improvement in food intake.[37]

The assessment of knowledge about anemia in this study inferred that having lower awareness before counseling (8.6%), but after getting information's, the knowledge gets improved (71.7%).

Adolescents do receive nutrition-related information and services at school, but unless they are detected as having anemia, they are not usually aware of the condition, nor necessarily associate it with potential problems and predominantly no having much awareness.[38,39]

From this study, we recommended that all educational institutions have to come forward to organize a monthly health care awareness camp which addressing various health issues including anemia. Social media also take some responsibilities to provide awareness either by means short videos, pamphlets, skits etc.

Conclusion

This study has demonstrated that anemia among rural girls is high. This indicates the importance of including adolescents in the risk group to improve their iron status and the need for planning intervention programs that would increase the hemoglobin levels among adolescent girls through prophylaxis treatment, dietary modification and hookworm control. Increasing the educational level of rural girls would also ensure safe motherhood. Adolescent girls should be supplied regularly with IFA supplements so that they can enter pregnancy without serious iron deficiency handicaps.

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