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Research Article

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A study showing correlation between anaemia and common parasitological diseases among adolescent girls in villages of PHC Belkhera, Madhya Pradesh, India

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ABSTRACT

Background: India continues to be one of the countries with the highest prevalence of anaemia, especially in rural population. Among adolescents, the girls constitute a more vulnerable group because it is a crucial period particularly with reference to reproductive health. The onset of menarche and early marriage predispose to anaemia. Worm infestation (poor hygiene, open field defecation) also blood loss through menstruation could be probable reason for anaemia in rural population of India. In order to prevent high maternal mortality and high incidence of low birth weight babies in India, there is a need to combat anaemia during adolescence.

Methods: This was a Cross sectional (Observational) study carried out during period of August 2007 to July 2008. **Results:** A total of 200 adolescent girls of 10-19 years participated in this study. Prevalence of anaemia was very high in girls with excessive loss of blood during menses i.e. 80% as compared to girls with normal Bleeding (47%) (p<0.02). Prevalence of anaemia in girls going to open field for defecation was 57% (p<0.045). The prevalence of anaemia was also higher in girls ((83%) having worms in their stool as compare to other girls. It was also found statistically significant (p<0.046).

Conclusions: We can infer that certain attributes that are prone to cause anaemia in adolescent girls can be modified by timely and periodically education, and therapeutic intervention.

Keywords: Anaemia, Adolescence, Prevalence, Worm infestation, Maternal mortality

INTRODUCTION

Anaemia is a world- wide problem most commonly due to wide-spread nutritional deficiencies. Anaemia is defined as a reduction in the haemoglobin concentration, the haematocrit or the number of red blood cells to a level below the normal level.

The world is home to 1.2 billion individuals aged 10-19 years. India has the largest population of adolescents (243 million) followed by China (207 million) and United States (44 million).³

Among adolescents, girls constitute a vulnerable group, particularly in developing countries where they are traditionally married at an early age and exposed to a greater risk of reproductive morbidity and mortality.⁴ In India the prevalence of anaemia among adolescent girls is 90%.⁵

A high prevalence of anaemia in adolescent girls is a matter of great concern as they enter reproductive life soon after menarche. Thus worldwide attention over iron deficiency anaemia in pregnancy has shifted recently from providing nutritional supplements during pregnancy

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to attempting to ensure that women especially adolescent girls have adequate iron stores prior to conception.⁵

Variations in prevalence rate of anaemia are seen within the country with the lowest prevalence of 33% being reported from Andhra Pradesh to highest of 98% in Rajasthan.⁶

Iron requirements are increased during adolescence reaching a maximum at peak growth and remaining almost as high in girls after menarche to replace menstrual losses. Adolescent iron requirements are even higher in developing countries because of infectious diseases and parasitic infections cause iron loss.⁷

The highest prevalence of anaemia (60-88%) exists in the developing world where its causes are multi-factorial (8). In the developing world 53% of children 5–14 years of age are anaemic.⁹

Anaemia has been related to reduce work capacity, poor pregnancy outcomes reduced ability to execute activities of daily living, and reduced cognitive function. ¹⁰⁻¹³

Though iron deficiency in anaemia is the leading cause other forms do exist in the developing world therefore anaemia and iron deficiency anaemia are often used interchangeably¹⁴.

It is estimated that iron deficiency is liable to affect the health of more than one billion people worldwide. Typically, most of the anaemia cases in developed as well as developing countries result from iron deficiency. The prevalence of anaemia and iron deficiency coexist much greater in these less developed regions of Asia and Africa, but many other factors such as infections especially with malaria and worms and other nutritional deficiencies also contribute to the greater prevalence and severity of anaemia. ¹⁵

Adolescents constitute over 23% of population in India. However higher birth rate will continue to increase this number. Half of this group is sexually active before marriage. Fertility rate is estimated to be high in adolescent group leading to early conception-motherhood and slowing population growth resulting in risk of death and disability for both the mother and her newborn child. There is little knowledge and access of family planning methods.

In a country like India with varying social customs and taboos against females predisposes the malnutrition among girls. The nutritional status which is often poor during early life gets worsened as the adolescent growth spurt occurs. ¹⁶

The prevalence of anaemia may be attributed to poor iron intake from the diet known for poor bioavailability of iron from typical cereal based diets (vegetarian diet), infection like malaria (which is endemic in our country),

worm infestation (poor hygiene, open field defecation) and heavy blood loss (menorrhagia) through menstruation could be probable reasons, for anaemia. However, Olsen et al, have documented failure of twice weekly iron supplementation in western Kenya, where worm infestation was one of the predictors, which emphasises need for deworming to combat anaemia especially in presence of high prevalence of worm infestation.¹⁷

Uddin, et al. showed 71.01% parasitic infection in the adolescent girls of two rural areas and infestation rate was significantly correlated with anaemia.¹⁸ In another study, Huq & Sheikh showed the prevalence of parasites as 65.8%.¹⁹

India continues to be one of the countries with the highest prevalence of anaemia. National Family Health Survey (NFHS-3) estimates reveal the prevalence of anaemia to be 52-88% in adolescent girls, 70-80% in children, 70% in pregnant women and 24% in adult men.

In MP, National Family Health Survey (NFHS-3) estimates reveal the prevalence of anaemia to be 52-88% in adolescent girls, 82.6% in children, 57.9% in pregnant women and 24% in adult men.²⁰

METHODS

This was a Cross sectional (Observational) study carried out during period of August 2007 to July 2008.

Research setting

Detailed information was collected on a predesigned and pretested Performa and Haemoglobin estimation by Sahli's Method. After confirmation of anaemia by Hb estimation stool samples were collected from each of the anaemic girl and within 8 hours these samples were examined in the Microbiology Department of NSCB Med College Jabalpur.

Sample size

Population of PHC Belkhera is around 27,478 and it consists of approximately 23% of adolescent's population i.e. 6000. Sex ratio in PHC Belkhera is 927:1000. Taking prevalence of anaemia as 60% the sample size was estimated by using the formula-

N = 4pq / L x L P = (Positive character), In this case P = Prevalence Q = 1-P Q = 100-P L = Allowable error Prevalence of anaemia 60% Q = 100-p Confidence interval 95% Relative precision 10% N = 4 x 60 (100-60) / 7x7 N=196, Approximately, 200.

Selection of villages

PHC Belkhera covers 27 villages. There are 5 Sub Health Centres (SHCs) in Belkhera each SHC Covers 5-6 villages. In order to have an effective coverage of these villages from each SHC one village was selected randomly. Adjacent village was surveyed for study for those villages where adolescent girls were less in number i.e. less than forty girls as per my study samples from each village.

Selection of AWC's (Anganwadi centres)

From each randomly selected village, AWC'S of that village was taken for the study.

Selection of adolescent girls

The sample size of 200 adolescent girls was equally divided among randomly selected villages from each of the 5 Sub-Health Centres (SHC's). These adolescent girls were selected on the basis of Systemic Random Sampling which was obtained from the list of adolescent girls provided by AWWs of villages. In order to have an effective coverage the study was conducted through randomly selected house to house visit till the 40 girls between the age group of 10-19 years in each sub centre village was covered.

According to WHO, Haemoglobin levels indicative of anaemia in population: ²¹

Table 1: Assessment of anaemia.

| Age/Sex group | Hemoglobin level (gm/dl) |
|-----------------------------|-----------------------------|
| Children 6 months-5 years | < 11 |
| Children 6-14 years | < 12 |
| Adult males | < 13 |
| Adult female (Non-Pregnant) | < 12 |
| Adult female (Pregnant) | < 11 |

In this study prevalence of anaemia in adolescent girls were considered to be mild, moderate and severe according to their Haemoglobin concentration.²²

Statistical analysis

Proportion and Chi square test were used for statistical analysis

Study variables

Age, Severity, blood loss during menses, Excreta disposal, Hand wash, stool examination.

Table 2: Prevalence of anaemia.

| Grade of Anaemia | Hb concentration (gm/dl) |
|------------------|--------------------------|
| Mild | 10- 12 |
| Moderate | 7-<10 |
| Severe | < 7 |

RESULTS

Table 3: Age wise distribution of anaemia in adolescent girls.

| Age Group (Years) | Anaemia nt No. % | Anaemia +nt No. % | Total No. % |
|-------------------------|---------------------------|----------------------------|-------------------|
| 10-14 | 54 (43.5) | 70 (56.4) | 12 (62) |
| 15-19 | 41 (54) | 35 (46) | 76 (38) |
| Total | 95 | 105 | 200 |

Chi square test= 2.043; df = 1; P=0.153

Among study population 62% were in the age group of 10-14 and 38% were in 15-18 years of age group. As shown in table-3 the prevalence of anaemia in age group 10-14 years was 56.4% as compared to 46% in age group 15-19 years. However this difference in prevalence of anaemia in relation to age of adolescent girls was not found to be statistically significant (p=0.153).

The overall prevalence of anaemia was 52.5% in adolescent girls which is higher than 27% among rural girls reported by Vasanthi et al.²³

Table 4: Distribution of anaemia in adolescent girls according to its severity.

| Severity | Hb(gm%) | Adolescents | |
|----------|---------|-------------|--|
| | Range | No % | |
| Mild | 10-12 | 57 (54.4) | |
| Moderate | 7-10 | 45 (42.8) | |
| Severe | <7 | 3 (2.8) | |
| Total | | 105 (100) | |

As shown in Table 4 the overall prevalence of anaemia in adolescent girls was found 52.5%. Majority having mild anaemia (54.4%) and only 1.5% had severe anaemia, rest (22.5%) girls were with moderate anaemia.

Indian Council of Medical Research (ICMR) had undertaken a multicentre study "District Nutrition Project" in 18 districts from 13 states of the country The overall prevalence of moderate (7-10 g%) and mild (>10-11.9 g%) anaemia among adolescent girls was 50.9 per cent and 32.1 per cent, respectively whereas overall prevalence of severe anaemia was 7.1 per cent; the highest (24.3%) in Bikaner and the lowest (nil) in both Bishnupur and Kohima districts.²⁴

Study done in rural areas of Meerut District observed that 174 (34.5%) of the 504 adolescent girls were anaemic. The prevalence of mild, moderate and severe anaemia

among adolescent girls was 19 per cent, 14.1 per cent and 1.4 per cent, respectively.²⁵

Table 5: Distribution of anaemia in adolescent girls according to amount of blood loss in menses.

| Amount of blood loss in | Anaemia-nt | | Anaemia+ | Total |
|-------------------------|------------|------|----------|------------|
| menses | No | % | No % | No % |
| Normal | 88 | (53) | 77 (47) | 165 (82.5) |
| Excessive | 7 | (20) | 28 (80) | 35 (17.5) |
| Total | 95 | | 105 | 200 |

Table 5 showing that prevalence of anaemia was very high in girls with excessive loss of blood during menses i.e. 80% as compared to girls with normal Bleeding (47%). This difference was found statistically significant (p<0.02).

Vasanthi G, Pavse AB. Susie et al showed the higher prevalence of anaemia was found in girls with blood dyscrasias could be influencing factors for high prevalence of anaemia. ²⁶

Table 6: Distribution of anaemia in adolescent girls according to excreta disposal.

| Evenete Diamagel | Anem | Anemia -nt | | Anemia +nt | | Total | |
|------------------|------|------------|-----|------------|-----|-------|--|
| Excreta Disposal | No | % | No | % | No | % | |
| Open field | 57 | (42.5) | 77 | (57.5) | 134 | (67) | |
| Service | 38 | (57.5) | 28 | (42.5) | 66 | (33) | |
| Total | 95 | | 105 | | 200 | | |

Chi -square test= 4.01; df=1; P<0.045; OR=2.175

Table 7: Distribution of anaemia in adolescent girls in relation to washing hand before meal.

| Hand weaking hefene meal | Anaem | nia-nt | Anaemia +nt | | Total | |
|--------------------------|-------|----------|-------------|------|------------|--|
| Hand washing before meal | No | % | No | % | No % | |
| Yes | 17 | (46) | 20 | (54) | 37 (18.5) | |
| No | 78 | (48) | 85 | (52) | 163 (81.5) | |
| Total | 95 | | 105 | | 200 | |

Chi -square test= 0.044; df=1; P=0.834

Table 8: Distribution of anaemia in adolescent girls according to presence of worms in their stool examination.

| Anaen | nia-nt | Anaemia+ | Total |
|-------|--------|----------|--|
| No | % | No % | No % |
| 14 | (47) | 16 (53) | 30 (64) |
| 3 | (17) | 14 (83) | 17 (36) |
| 17 | | 30 | 47 |
| | | 14 (47) | No % No % 14 (47) 16 (53) 3 (17) 14 (83) |

Chi -square test= 3.95; df =1; P<0.046

Table 6 shows that majority of 67% adolescent girls were going to open field for excreta disposal and only 33% of the adolescent girls were using service lat for this

purpose. The prevalence of anaemia in girls going to open field for defecation was 57% as compared to girls using service lat 42%. This difference in prevalence of

anaemia in relation to excreta disposal of adolescent girls was found statistically significant (p<0.045). This may be attributed to parasitic infestations and other infections in adolescent girls going open field defecation.

Study done in rural areas of Meerut District on anaemia in adolescent girls also found that maximum girls 63.1% were using open field defecation followed by service type (15.5%), Pit latrine (14.3%). Anaemia was higher in girls going outside for defecation was due to poor hygiene, inadequate environmental sanitation and improper disposal of water which are influencing factors for the high prevalence of worm infestation in the rural poor.²⁵

Table 7 shows that majority of the adolescent girls wash their hand before eating and prevalence of anaemia in these girls was 52% and prevalence in those girls who were not washing their hands was 54%. And this difference in prevalence of anaemia in relation to Occupation of adolescent girls was not significant (p=0.834).

Study done in rural areas of Meerut District on anaemia in adolescent girls' shows that prevalence of anaemia was found to be 33.3% in those adolescent girls who were washing hand before meal and 41.7% in those who were not washing hand before meal.²⁵

Table 8 shows that after stool examination the prevalence of anaemia was higher (83%) in girls having worms in their stool as compare to other girls. This was found statistically significant (p<0.046). 17 samples positive for worm infestation were Hookworm, Ascaris Roundworm, Giardiasis, Teniasis. These worms by robbing the host of its nutrition's causes chronic foods loss and depletion of body's iron stores leading to iron deficiency anaemia.

Garg carried out study in adolescent girls of four villages of Kasturba Rural Health Training Centre; Anji found that Worm infestation may also influence anaemia to a large extent. It was found to be a strong predictor of anaemia in the his study.²⁷

Vasanthi et al showed that adolescent girls having higher prevalence of worm infestations due to poor hygiene, inadequate environmental sanitation and improper disposal of water which are influencing factors for the high prevalence of anaemia.²³

Muttalib reported the gross prevalence of parasites were *A.lumbricoides* 92.9%, *T. trichiura* 52.46%, hookworm9.91%, *G. lamblia* and *E. histolytica* 40.88%.²⁸

Chowdhury & Brig investigated intestinal parasitic infections from Dhaka and found *A.lumbricoides* (23.18%), *T. trichiura* (10%), hookworm (6.2%), *E. vermicularis* (0.28%) and multiple infections(10.5%).²⁹

DISCUSSION

Anaemia is a widely spread disease all over the world especially prevalent in the developing countries (Asia, Africa and Latin America) mainly due to poverty, illiteracy and faulty dietary habits. Of the adolescent, girls are the most effected segment of the society comprising 20-23% of population.

India leads the world in open defecation. At least 636 million Indians lack toilets, according to the latest census data, a crisis that contributes to disease, childhood malnutrition, anaemia and loss of economic output. There are few organisations like Sulabh with the expertise necessary to build low-cost, environmentally sound and user-friendly toilets. Sanitation brings improvement in environmental conditions.

Impaired absorption of iron is caused by certain intestinal infection, such as hookworm infection and other parasites. A concerted effort is needed for dietary modification, deworming and iron supplementation for correction of anaemia.

The indicators of health and literacy level in India as well as in MP are not satisfactory. In rural and remote areas health services are not adequate that lead to the prevalence of disease like anaemia and malaria. Anaemia has an insidious nature and is not detected and corrected timely so the suffering from anaemia goes for the longer duration.

CONCLUSION

We conclude that anaemia in adolescent girls can be modified by timely and periodically interventions measures in society mainly poverty alleviation, raising literacy, health education for healthy dietary habits, generation of employment at village level, vigorous check-up camps and supply and availability of iron and folic acid tablets to adolescent girls. An intensive IEC campaign (information, education and communication) should be launched/carried out in the villages periodically to raise the awareness of the public in general and adolescent girls in special, about the- Personal hygiene, proper hand washing, cleanliness, healthy nutritional habits, and knowledge of certain common diseases like malaria, etc.

Create awareness about improvement in eating habits like, consumption of iron rich food (Green leafy vegetables, spinach, Jaggery, banana etc.), sprouted foods etc. People should be educated to grow the iron rich food and vegetables in their own kitchen gardens. Sanitation measures should be taken regularly at community level.

Education is the key to awareness and awareness is the first step to progress. Education of females is a driving force for better health. Female literacy is considered to be an important index of social development. The adolescent

girls should be taught of making habit of wearing chappals/shoes while going outside the house and in the field for working and also make it habit of always washing hand before taking meal or any eating materials.

The adolescent girls should be taught about the worm infestation, pica, chronic infections (like T.B, Malaria etc.) and its relation to anaemia. Specific control measure should be vigorously intensified so as to effectively complement the efforts towards control of anaemia.

National Iron+ Initiative - Recently Ministry of Health and Family Welfare took a policy decision to develop the National Iron+ Initiative. In this all adolescents (age 10-19 years) are given Weekly dose of 100 mg elemental iron and 500 mcg folic acid with biannual de-worming is in school through teachers and for those out-of-school through AWC (anganwadi centre) Mobilization is done by ASHA(Accredited social health activist) worker. The National Iron+ Initiative also defines a minimums service of packages for treatment and management of anaemia across levels of care.

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