Evaluation of the Prevalence of Anemia in High School Going Adolescent Females in a Rural Area of South India

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ABSTRACT

Background: *Anaemia is the major serious preventable public health problem in Indian rural adolescent females. WHO report of 2002 states anaemia as the most common factor in infant mortality, maternal mortality and pre-term births. Simple health intervention programmes such as vitamin A and Iron supplementation with deworming can decrease the occurrence of anaemia. The present study was conducted to estimate the prevalence of anaemia among adolescent females, to assess the severity of anaemia and to correlate the association of factors like diet, anthropometry, socioeconomic status and menstrual flow with anemia.*

Methodology: *The cross sectional study included 100 high school-going adolescent females whose Hemoglobin was estimated by three part automated hematology analyzer KX 21. Detailed history was elicited regarding socioeconomic status and menstrual flow. Anthropometric measurements were noted.*

Results: *The prevalence of anaemia among adolescent females in our study in a rural area was found to be 40%. Amongst them, 55% had mild anaemia, 35% moderate anaemia and 10% severe Anaemia.*

Conclusion: *Prevalence of mild to moderate anaemia is higher than severe anaemia in adolescent females. This may be attributed to the impact of school based intervention programs which exist since 2009, vitamin A supplementation, iron supplementation, deworming and dietary education.*

Keywords: *Nutritional, Anemia, Iron deficiency, Adolescence*

INTRODUCTION

Anaemia is one of the most common nutritional problems globally. The worldwide incidence and prevalence of nutritional anaemia indicate a disproportionately high incidence in developing countries like India due to factors like poverty, lack of proper nutrition and diet, worm infestations, early pregnancy and lactation in women and poor health services.[1] The most common deficiency in nutritional anaemia, from the public health point of view, is iron deficiency.

Adolescence is the period of life spanning the ages between 10 to 19 years. It is the transition from childhood to adulthood which is a vulnerable period in the adolescent life cycle for the development of nutritional anemia.[2] This is because, 30% of adult weight gain and more than 20% increase in adult height occurs during adolescent age group, which we call growth spurt.[3] It is the formative period of life when maximum amount of physical, psychological and behavioral changes take place. Since adolescence constitutes the formative years, this is a vulnerable period in human life for the development of nutritional anaemias. In India, adolescent females are largely neglected due to various reasons like utilisation for labour and poor education.[4] Since adolescence has the lowest rate of mortality it has been assigned the least priority.[5] Anaemia during the age group of 10-19 years severely affects the physical and mental development thereby decreasing the physical development and even the working performances. [6,7,8] It not only affects the present health status of girls but also adversely affects future pregnancy with the risk of low birth weight babies or perinatal mortality in addition to 30% incidence of maternal deaths.[2] Globally, the prevalence of anemia is around 40% with three to four times increase in developing countries like India as compared to developed countries. Most studies have shown that the most common anemia is of nutritional type.

Low socio – economic status, poor diet and ignorance are the most common factors contributing to increased prevalence of anaemia in rural adolescents than the urban.[9]

MATERIALS AND METHODS

This was a cross sectional study. 100 adolescent female high school students between 10 to 15 years of age were employed for the study using stratified random sampling method. After obtaining the written consent, blood samples were collected and students were asked to fill the questionnaire which included name, age, age at menarche, menstrual history, socioeconomic status including personal details, family details, food habits and health awareness. Anthropometric measurements were recorded in the same setting.

Methods: Under asceptic precautions, 2cc of venous blood was aspirated in K3 (EDTA) vacutainers and peripheral blood smears were prepared.

Inclusion criteria:
1. Students between the age group of 10-15 yrs.
2. Students residing in the study area for a minimum period of 6 months.
3. Students who had given written consent for their blood testing.

Exclusion criteria:
1. Students who were terminally ill.
2. Students at the time of menstruation, during collection of blood sample

Processing of samples:

The blood samples were analysed in clinical laboratory. Haemoglobin estimation was done using three part automated hematology analyzer KX 21. Fresh peripheral blood smears were prepared. Peripheral smears were stained with Leishman's stain. The smear was examined under oil immersion. Based on the size of RBC's and its haemoglobin concentration, it was classified morphologically as; microcytic hypochromic anaemia, normocytic normochromic anaemia and macrocytic anaemia.

RESULTS

Our study comprises population of 100 adolescent girls student. The overall prevalence of anemia among adolescent girls was 40% (40/100). The Haemoglobin value ranged from 6g/dl to 11.9g/dl. Prevalence of anemioa was significantly higher amongst late adolescent(14-15 yr) than early adolescent.(Table 2and Graph 2). Forty five girl student were pure vegetarians (Table 4), 55 girls were non vegetarians and 65 students were taking iron / multivitamin supplementation given by anganav-adi workers through nation programme. Overall prevalence of anemia (Both mild and severe form) is reported among pure vegetarians compared to non vegetarian/mixed diet. Prevalence of anemia in girls taking iron supplementation is only 3.05% and no moderate or severe anemia are seen. (Table 4 and Graph 4) Our study showed that student who are taking iron / multivitamin with deworming have less prevalence of anemia irrespective of height, weight and menstrual fow.

Table 1: Percentage distribution of students based on severity of anemia

Indicators	Number of Students (%)
Non-Anaemic (Hb levels > 12g/dl)	60%
Mild Anaemia (Hb levels 10- 11.9g/dl)	55%
Moderate Anaemia (Hb levels 7-9.9g/dl)	35%
Severe Anaemia (Hb levels <7 g/dl)	10%
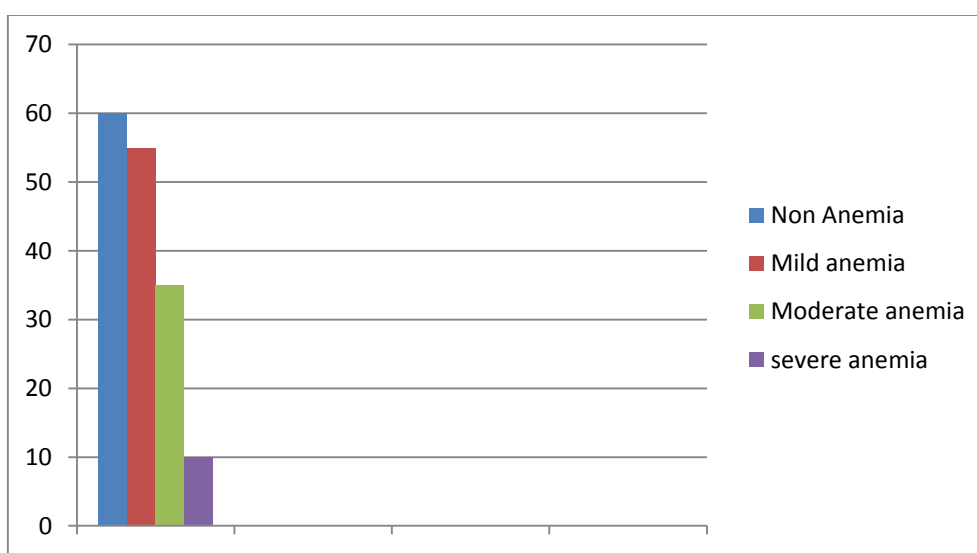
Graph 1: Bar graph showing percentage distribution of students based on severity of anemia

Table 2: Prevalence of anemia among Early and late adolescents

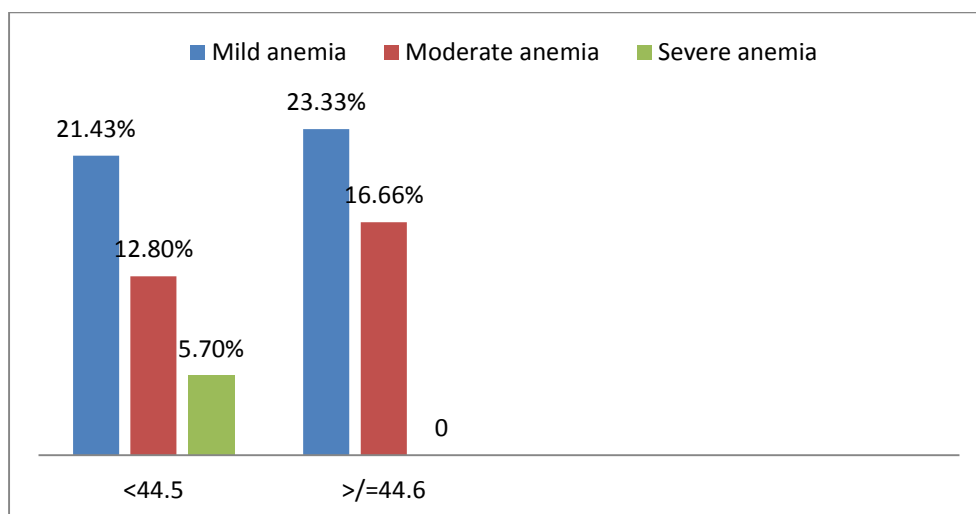| Age	No of Girls	Mild Anemia	Moderate Anemia	Severe Anemia
10-13(Early adolescent)	67	10(14.00%)	09(13.43%)	02(2.9%)
14-15(late adolescent)	33	12(36.3%)	05(15.15%)	02(6.06%)
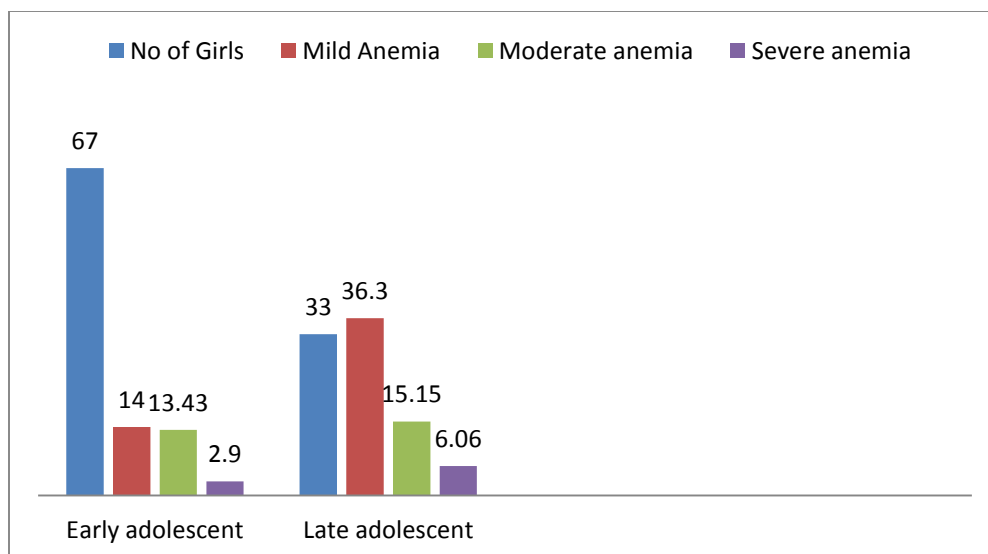
Graph 2: Bar graph showing of anemia among Early and late adolescents

Anthropometric values:

**Table 3: Prevalence of anemia among Girls belonging to two different height and weight**

Height(cm)	No of Girls	Mild Anemia	Moderate Anemia	Severe Anemia
<144	68	16(23.5%)	10(14.7%)	03(4.34%)
>/=144	32	06(18.75%)	04(12.5%)	01(3.12%)
Weight(kg)	**No of Girls**	**Mild Anemia**	**Moderate Anemia**	**Severe Anemia**
<44.5	70	15(21.42%)	09(12.8%)	04(5.7%)
>/=44.6	30	07(23.33%)	05(16.66%)	00(00)

Graph 3: Bar graph showing of anemia based weight.

Table 4: Prevalence of anemia based on diet pattern of Girls

Dietary pattern	No of Girls	Mild Anemia	Moderate Anemia	Severe Anemia
Vegetarian	45	15(33.33%)	10(22.2%)	04(8.8%)
Non-vegetarian	55	05(09.09%)	04(7.27%)	00(00)
Iron/multivitamin tablets	65	02(3.07%)	00(00)	00(00)
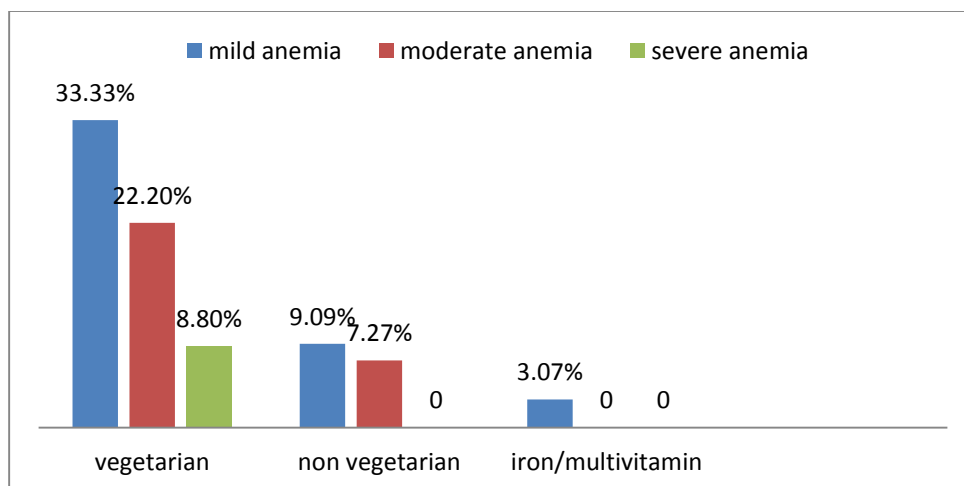
Graph 4: Bar graph showing Prevalence of anemia based on diet pattern of Girls.

DISCUSSION

Anaemia is the major public problem in the developing world like India with wide spread prevalence especially among adolescent female and pregnant women. Different studies have done on the above two risk groups but there is a paucity of data on anemia among pregnant women and adolescent female in complex context of malnutrition and poverty. Control of anemia in these two group i.e adolescent female and pregnant women can be more easily achieved by giving iron and folic acid supplementation & health education on the consumption of iron rich foods. The main cause reasons for high prevalence of anaemia among the adolescent female includes increased iron requirements due to increased growth, menstrual blood loss, low intake of iron rich foods like green leafy vegetables and consuming iron absorption inhibitors in food like phytates/tannins.

Though there are many factors that contribute to the prevalence of anaemia, the present study in rural school girls has helped to narrow down major factors such as literacy socioeconomic status, menarche and anthropometry. Anaemia is defined as a decrease in the circulating total red cell mass and haemoglobin concentration below normal limit with respect to the age and sex of individuals.[10,11,12] According to WHO criteria the cut off level to call anaemia is less than 12g/dl.[13] Hall G.S (1844-1924) was the first psychologist who systemically conducted research on adolescents and collected enormous data. According to his study, adolescence is the beginning of 10-13yrs of age and ends when full adult status is attained. It is a time of storm and stress. [14] Indian Institute Of health And Family Welfare, Hyderabad, conducted a study during the year 2002 on prevention and control of anaemia in adolescent female among school girls in rural areas of Andhra Pradesh between VI to X standard and found out that 81% of anaemia was the most due to nutritional problem. Mild, moderate and severe degree of anaemia was reported in 63.2%, 12.5% and 5.3% of respondents respectively.[15]

In the year 2003, data from district nutritional project (Indian Council of Medical Research) in 16 districts of 11 states, on prevalence of anaemia in non-pregnant adolescent girls (11-18yrs) revealed high rates as 90.1% with severe anaemia (Hb<7g/dl) in 7, 1%.[16] In another study during the year 2004, which is conducted on iron status of adolescent female in Rajasthan reported that 96.3% of adolescent girls had nutritional anaemia.[17] In the year 2008, a study in rural area of Raigad district, Maharashtra on prevalence of anaemia has revealed the incidence of anaemia to be of very high magnitude in rural areas with a prevalence of 61%. [18] A study in rural adolescents of South India on overall prevalence of anaemia, conducted in the year 2010 has showed 41.865% of girls to be anaemia and only 16% of the boys to be anaemic. [19] In the study in rural areas of Karnataka, South India, on the prevalence of anaemia among adolescent female reported 45.2% of the rural adolescents female suffered anaemic. [20] Kaur et al in his Studies on anemia showed that anaemia was more in girls who had excessive menstrual blood loss during the cycle.[1] Correlation between the age and hemoglobin concentration in the present study revealed that age was directly related with hemoglobin concentration. Incidence of anaemia increased with age and was highest among the female who are in the period of increasing growth and adolescence. A negative association of body mass index to haemoglobin mean concentration was observed in our study among adolescent female who were obese and overweight. Similar results were observed by Bully et al in non-school going adolescent girls and

foundto be statistically very significant. [21]

In our present study, 40% prevalence of anaemia is found to be in rural adult female. But different studies conducted in the different states of rural India, observed high prevalence of anaemia varying from 46% to 98%. International centre for research on women (ICRW) carried out a multi country study on the nutritional status of adolescent female and was found to be the most prevalent problem and its prevalence ranged from 32%-55%. [16] Another study which was conducted in Vadodara among the girls who belonged to the low income families reported that 67% of the adolescent females were anaemic. [22] Studies conducted in rural Wardha and Lucknow found that the prevalence of anaemia in those areas was 59.8% to 65% respectively. [23] The higher haemoglobin percentage observed in the adolescent females in the present study among a rural area in South India is probably due to better nutrition, healthier living conditions, health education and awareness programmes and iron supplementation by the school regularly.

CONCLUSION

Prevalence of mild to moderate anaemia among adolescent school girls is more as compared to severe anaemia. The decreased prevalence of severe anaemia in our study group could be due to the impact of school based intervention programs that exist since 2009, the vitamin A supplement-ation, iron supplementation, deworming and dietary education. These interventions could have widespread implications for prevention of anaemia in rural areas. The 40% prevalence must be probably because of lack of motivation and awareness among the adolescents to seek medical and nutritional advice. In order to fill these lacunae, there is a need to strengthen our national programmes at the community level.

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