

## Original Research Article

# Prevalence of anemia among adolescent girls in a North Karnataka school: a cross sectional study

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## ABSTRACT

**Background:** World Health Organization (WHO) has defined 'Adolescence' as a period between 10 and 19 years. Anemia is a condition characterized by reduction in the number of red blood cells and/or hemoglobin concentration. Adolescent girls are at increased risk of anemia due to rapid growth and developmental process. The objectives of the study were to estimate the prevalence of anemia among adolescent girls in one of the schools in North Karnataka.

**Methods:** A cross sectional study was conducted among adolescent girls in one of the CBSE Schools of north Karnataka. In 347 adolescent girls, data collection was carried out in the month of August 2017 through hematological assessment. All the adolescent girls between grade 7 and 12 were included in the study. Statistical analysis was conducted using statistical package for social sciences (SPSS) software version 20.0.

**Results:** Out of 347 adolescent girls enrolled more than half 196 (56.5%) were mid adolescent with a mean age of  $14.34 \pm 1.8$ . 54 (15.6%) were showing mild thinness and 14 (4.0%) were overweight. Overall prevalence of anemia was 44.4% (n=154). Where in 35.2% (n=122) were mild anemic followed by 8.9% (n=31) moderate anemia. Among the anemic girls, 79.8% (n=123) had attained their menarche and 6.5% (n=10) were reported passing worms in stools.

**Conclusions:** Prevalence of anemia among school adolescent girls was found to be less. Among anemic girls, majority were showing mild anemia.

**Keywords:** Anemia, Adolescent girls, Prevalence

## INTRODUCTION

World Health Organization (WHO) has defined 'Adolescence' as a period between 10 and 19 years. Adolescence in girls has been recognized as a special period of transition from girlhood to womanhood. Adolescent girls comprise one fifth of the female population in the world.<sup>1,2</sup>

Anemia is a condition characterized by reduction in the number of red blood cells and/or hemoglobin concentration which has significant health consequences. It is a major public health problem affecting both developing and developed countries which accounts for 24.8% of world population. Globally, prevalence of

anemia among adolescents is 15%. In developing countries, like India, prevalence of anemia is three to four times more as compared to developed countries.<sup>3-5</sup>

Adolescent girls are at increased risk of anemia due to rapid growth and developmental process which cause increased requirement of both micro and macro nutrients. This period is associated with frequent menstrual blood loss during menarche, hormonal changes and inadequate dietary iron intake precipitating anemia.<sup>6-8</sup>

Inadequate nutrition during adolescent can have serious consequences throughout their reproductive age and beyond. Most of the Indian girls get married and get pregnant even before the growth period is over that

doubles the risk of anemia.<sup>9</sup> Particularly among school adolescent girls, chronic anemia may affect school performance, attendance and physical work capacity.<sup>10</sup>

Hence, this study was conducted to estimate the prevalence of anemia among adolescent girls in one of the schools in Belgaum.

## **METHODS**

A cross sectional study was conducted among adolescent girls in one of the CBSE Schools in Belgaum city, Karnataka. Data collection was carried out in the month of August 2017. A total of 347 adolescent girls were enrolled in this study. All the adolescent girls between grade 7 and 12 were included in the study. Students who were absent during the survey were excluded.

### ***Data collection tools and technique***

Socio-demographic information was collected through face to face interview. While, other specific information pertaining to study subjects were gathered using pre structured questionnaire and anthropometric measurements. A total of 10 skilled post graduates and doctors were recruited for data collection. Intensive training was given to all the data collectors prior to the study. Considering the fact that our main respondents were adolescent girls, we recruited experienced female field enumerators for data collection to minimize bias. Data collection was done under the supervision of investigator.

### ***Variables assessed/measured***

#### ***Sociodemographic profile***

Each respondent was interviewed regarding the age, parent's occupation, religion, diet, type of family.

#### ***Hematological assessments***

Capillary blood was collected from the study subjects by pricking the finger tips by Lancet. A separate lancet was used for each individual to avoid cross infection. Aseptic conditions were maintained during the procedures. Hemoglobin (Hb) estimation was done using hemoglobin cuvette. Hemocue strips were used for each participant and same calibrated instrument was used throughout the study. Researcher frequently visited this school and rechecked the number of adolescent girls for their Hb concentration to validate the enumerator's activities. Anemia was classified according to WHO cut-off points as mild anemia (10.0-11.9 g%), moderate anemia (7.0-9.9 g%) and severe anemia (<7.0 g%).

#### ***Anthropometric measurements***

Height was measured to the nearest 0.1 cm by using a board with an upright wooden base and movable head

piece on a flat surface. Weight was measured using a digital weighing balance at 0.1 kg precision. Girls were asked to remove their footwear before taking their measurements. Body Mass Index (BMI) was calculated using the formula weight (kg)/(height in metre)<sup>2</sup>. WHO recommended BMI-for-age Z-score was used for assessing the nutrition status, as the study subjects were between age of 10 and 19 years. Using the WHO Anthro Plus software, we plotted BMI of each subject on graph and categorized into overweight (>+1 SD), obesity (>+2 SD), thinness (<-2 SD) and severe thinness (<-3 SD). Same calibrated scale was used to ascertain anthropometric data of all the study participants.

### ***Ethical considerations***

Permission was obtained from head of the institution for recruitment of study participants. Assent was taken from children below 18 years and consent was obtained from their teachers. One participant was above 18 years, inform consent was obtained accordingly.

### ***Statistical analysis***

Statistical analysis was conducted using statistical package for social sciences (SPSS) software version 20.0. Descriptive statistics like mean, standard deviation were used to give clear picture of background information and determine the prevalence of anemia in school going adolescent girls.

## **RESULTS**

Table 1 shows the socio-demographic characteristics of study participants. Out of 347 adolescent girls enrolled more than half 196 (56.5%) were mid adolescent (14-17 years) followed by early adolescent constitutes 150 (43.3%) with a mean age of 14.34±1.8. Among them, 72.7% (n=112) were on mixed diet and 88.3% belong to nuclear family. Majority 92.2% (n=320) of the participants were Hindus followed by Muslims 5.2% (n=18), Christians 1.2% (n=4), Jains 0.9% (n=3) and sikhs 0.5% (n=2).

### ***Distribution of students based on their BMI***

Out of 347 girls screened, 54 (15.6%) were mild thinness and 14 (4.0%) were overweight according to WHO age Z-score for adolescents. Table 2 describes about BMI of anemic girls, in which majority 131 (85.0%) were healthy, 17 (11.1%) were underweight and 6 (3.9%) were overweight.

### ***Prevalence and severity of anemia***

Table 3 show that the overall prevalence of anemia was 44.4% (n=154). Among the anemic girls, 79.8% (n=123) had attained their menarche and 6.5% (n=10) were reported passing worms in stools.

**Table 1: Distribution of study participants based on their socio-demographic characteristics.**

Variables	No. of students (n=347)	Percentage (%)
<b>Age</b>		
Early adolescent (11-14 years)	150	43.3
Mid adolescent (14-17 years)	196	56.5
Late Adolescent (17-19 years)	01	0.2
<b>Diet</b>		
Mixed	251	72.3
Veg	96	27.7
<b>Religion</b>		
Hindu	320	92.2
Muslim	18	5.2
Christian	4	1.2
Jain	3	0.9
Sikh	2	0.5
<b>Type of family</b>		
Nuclear	307	88.5
Joint	38	10.9
Extended	2	0.6

**Table 2: Distribution of anemic adolescent girls based on their BMI using Z-score.**

BMI for age Z score	No. of students (n=154)	Percentage (%)
Mild thinness	17	11.1
Healthy	131	85
Over weight	6	3.9

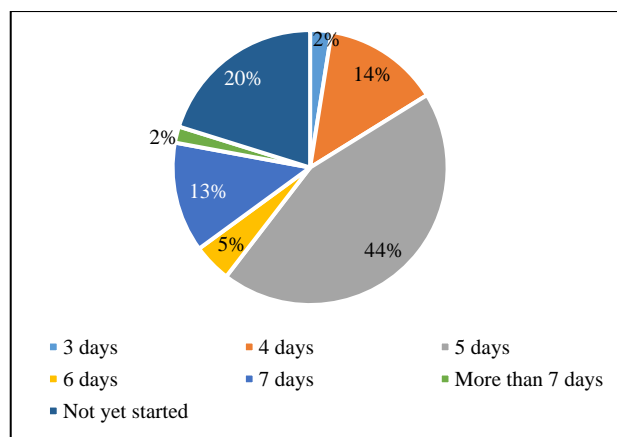
\* BMI-Body Mass Index.

**Table 3: Distribution of study participants according to their Hemoglobin levels.**

Hemoglobin level (g%)	No of students (n=347)	Percentage (%)
Normal	193	55.6
Mild anemia (10.0-11.9)	122	35.2
Moderate anemia (9.9 -7.0)	31	8.9
Severe anemia (below 7.0)	01	0.3

**Menarche history**

Regarding status of menarche, 253 (72.9%) girls had attained their menarche. Out of 154 anemic girls, 79.8% (n=123) had attained menarche, whereas, among non-anemic girls (Hb >12 g%) 67.3% (n=130) had attained menarche.



**Figure 1: Anemic girls according to their menstrual cycle history.**

Figure 1 shows that the length of the cycle varied in anemic girls. Most (44.1%) of them had menstrual cycle for 5 days. Whereas, 1.9% girls had longer cycle for 7 days. 20.1% of study subjects reported that menstrual cycle had not started.

**DISCUSSION**

In current study, 56.5% study participants were between the age 14 and 17 years categorized under mild adolescent whereas 43.3% were in the age group of 11-14 years categorized under early adolescent and remaining 0.2% were categorized into late adolescent. This categorizing has been done. In Nepal, Kanodia et al conducted a study on adolescent girls reported that 55.9% were categorized under late adolescent, 35.3% were under early adolescent and only 8.8% were under Mild adolescent group which contrary to our findings.<sup>11</sup>

In this study, prevalence of anemia in adolescent girls was found to be 44.4%. In contrast, a study conducted in urban slum of Nagpur by Kulkarni et al., conducted on adolescent girls reported a high prevalence of anemia (90.1%). Majority (88.6%) were mild to moderate anemia and only 1.5% were severely anemic, whereas, in this study, most 35.2% were mild anemic followed by 8.9% include moderate anemic.<sup>1</sup> Similarly, Devi S et al., conducted a school based study among adolescent girls in Haryana reported that prevalence of anemia was 73%, in which nearly half (54%) were mild anemic and 1% were severely anemic.<sup>9</sup> The prevalence was less in our study may be due to study subjects from urban area and well educated families which is needed to be assessed. In a study conducted in rural Wardha among adolescent girls showed a prevalence of 59.8% which was apparently near to our study findings.<sup>12</sup> Tesfaye et al, conducted a study in southwest Ethiopia, among adolescents, reported very less prevalence of anemia (15.2%). Of which, prevalence among females was high (19.3%) compared to males (9.4%). As far as overall prevalence concerned, it was reported as 11% Iron deficient Anemia and 4.2% non-

iron deficient anemia.<sup>4</sup> Our study did not make an attempt to undergo peripheral smear test to find type of anemia.

In the present study, findings showed that nearly three-fourth of population were practicing mixed diet habits and remaining were vegetarians. In particular among anemic girls, we found that majority (72.2%) were on mixed diet. Abhishek et al, conducted a study in Mandya district of Karnataka, among high school going adolescent females revealed that 55 were non-vegetarians. Among the non-vegetarians, 9.9% and 7.27% were diagnosed mild and moderate anemia respectively. Out of 45 vegetarians, 33.3% were mild anemic and 8.8% were found severely anemic.<sup>5</sup>

In our study, we found that majority of the participants were Hindus (92.2%) followed by Muslims (5.2%), Christians (1.2%), Jains (0.9%) and Sikhs (0.5%). No past study had reported the religion of study participants. We also found that majority of study participants belonged to nuclear family occupying 88.5% followed by 10.9% Joint family and 0.2% extended family. No past study had reported about type of family to which study participants belonged.

In the current study, 6.5% of anemic adolescent girls had reported the history of worm infestation. Whereas, a study conducted in rural Wardha on adolescent girls to know the epidemiological correlates of nutritional anemia reported that 10.3% had history of worm infestation among which 87% were anemic.<sup>12</sup> Varma et al, reported that 65.9% vegetarians were anemic compared to non-vegetarians.<sup>13</sup>

In this study, among 154 anemic girls, majority of the study participants 85.0% were healthy, 11.1% were under mild thinness and 3.9% were under overweight category. In a study conducted in Eastern Ethiopia showed similar findings that majority of adolescent girls were normal (72.6%) followed by mild thinness (15.0%), severe thinness (6.6%), overweight (4.8%) and obese (1.1%).<sup>14</sup>

Among all the study participants, 72.9% girls had attained their menarche. Majority (79.8%) of anemic girls had attained menarche, whereas, among non-anemic girls (whose Hb >12 g%) 67.3% had attained menarche. Apparently, this indicates that more girls in the anemic group had attained menarche compared to girls in non-anemic group. In a study carried out in Western Ethiopia among school adolescents also reported similar findings that majority (63%) of anemic girls had attained menarche and comparatively less proportion (42.2%) of non-anemic girls had attained their menarche.<sup>4</sup> In contrary, Kaur et al, conducted a study among adolescent girls in rural Wardha stated that nearly same proportion of study participants had attained menarche in anemic (86.7%) and non-anemic groups (84.6%).<sup>12</sup>

## CONCLUSION

Prevalence of anemia among school adolescent girls was found to be less. Among anemic girls, majority were showing mild anemia.

### Strengths

This study gives an information regarding prevalence of anemia among school adolescent population which was rarely evaluated in India. BMI was determined based on Z-score recommended by WHO, especially for Adolescents.

### Limitations

This study population was limited to only one school in the Belgaum. Assessment of energy, protein and other macro or micro nutrient intakes was not done because of limited resource available. Our sample size is very less to find a significant association between cause and effect. Peripheral smear test was not conducted to differentiate type of anemia.

### Recommendations

A good cause-effect relation can be drawn by including all school adolescent in Belgaum to implement an effective intervention against preventable anemia in adolescent girls. In this study, Anemia prevalence was found less, might be due to educated family to which study participants belong. This can be assessed in further studies, as this study did not consider father's and mother's educational level.

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