



### Original Research Article

## Prevalence of anaemia and its self reported symptoms among schools going adolescents of Gwalior Township

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### Abstract

**Background:** According to latest WHO report Iron deficiency anaemia (IDA) prevalence in India reported to vary from 56% - 90.1% in adolescent girls. 67.8 – 98.5 million adolescent girls are anaemic. Anemia in the adolescence causes stunted growth, poor school performance, decrease memory, diminished concentration in work, School dropout, decrease immunity, susceptibility to infection and also poses a major threat to future safe motherhood in girls.

**Aims and Objectives:** To find out prevalence of anaemia, To assess self reported symptoms of anaemia among school adolescents of Gwalior township.

**Methods:** It was a cross-sectional study, conducted among 400 school adolescents in Gwalior Township, of Madhya Pradesh, from January 2016 to December 2016. It was a questionnaire based study. Hemoglobin estimation was done by finger prick method.

**Results:** The anemia was present in 60% girls & 38% boys. 62% adolescents felt anemia symptoms in their life (62% female and 61% male). breathlessness, anorexia, tiredness, weakness, lack of concentration, giddiness, are symptoms most commonly felt.

**Conclusion:** Among adolescents prevalence of anaemia is very high, Hence hemoglobin concentration should be examined periodically and should be recorded in progress report for early recognition of anaemia. Iron rich food intake should be increased.

**Keywords:** Adolescent, Anaemia, Prevalence.

### Background

WHO has defined adolescents as person in the 10-19 year age group.<sup>1</sup> According to latest WHO report Iron deficiency anaemia (IDA) prevalence in India reported to vary from 56% - 90.1% in

adolescent girls. 67.8 – 98.5 million adolescent girls are anaemic.<sup>2</sup> The Growth spurt that occur in adolescents place a great demand on their nutritional requirements and make them more vulnerable to anemia. Anemia in the adolescence

causes stunted growth, poor school performance, decrease memory, diminished concentration in work, School dropout, decrease immunity, susceptibility to infection and also poses a major threat to future safe motherhood in girls. The nutritional anaemia in adolescent girls attributes to the high maternal mortality rate, the high incidence of low birth weight babies, high prenatal mortality and the consequent high fertility rates.<sup>3</sup> This phase of life is also important due to the ever-increasing evidence that the control of anaemia in pregnant women can be more easily achieved if a satisfactory iron status can be ensured during adolescence.<sup>4</sup>

Integrating the WIFS programme for adolescents, in school and out of school, in the health and education system and country policy for taking it to scale, is essential for preventing anaemia, improving school performance building pre-pregnancy iron stores and for achieving the MDG of reducing MMR of 230 in 2008 to 109 by 2015 (World Health Statistics, 2011).<sup>2</sup>

#### **What are the negative effects of anemia for adolescents**

Much emphasis has been placed on the negative and irreversible developmental effects of iron deficiency during infancy and childhood. However, the negative effects of iron deficiency on cognitive performance may not be limited to just younger ages, but continue through adolescence.<sup>5</sup>

Iron status at the beginning of adolescence may be important for ensuring adequate growth during this period, because iron deficiency can decrease appetite, and thus food and energy intake.<sup>6</sup> Studies in which iron supplements were given to anemic adolescent children, showed an increase in weight and height gain among supplemented children, particularly during the earlier part of adolescence (10-14 years) in comparison to those children not receiving iron supplements.<sup>6,7</sup> Urban adolescents may have poor eating habits favoring high-calorie but nutrient-poor “junk” foods or fast foods which are more available in urban environments.<sup>5</sup> Iron-rich foods include those

naturally rich in bioavailable iron (e.g. a source of heme-iron, such as that found in red meat) as well as iron-fortified foods (i.e. food to which additional iron is added).<sup>5</sup> Fortifying staple foods with iron will provide a source of iron for vulnerable groups across the lifespan. For adolescent girls, and all women of reproductive age, promoting consumption of an iron-fortified staple food is a way to build their iron stores before and after pregnancy. Investing in iron-fortification of staple-foods was ranked as the third best “world investment” in 2008 by the Copenhagen Consensus.<sup>8</sup>

#### **Why risk of anaemia for adolescents**

- Increased physiological demand due to growth spurt associated with poor dietary intake of iron rich food.
- Worm infestation due to unhygienic dietary habits and poor hand hygiene practices.
- In urban adolescents due to increasing junk food and fast food culture (less iron containing food) in such conditions anaemia accompanied by obesity.
- Among adolescents, girls are more vulnerable because in certain families especially in lower socioeconomic class girls are more likely to be neglected along with menstrual blood loss causes susceptibility of girls for anaemia.
- Urban school going girls due to fear of gaining weight, along with poor iron rich food consumption are susceptible for anaemia.

In present study we want to explore the relationship between self reported symptoms of anaemia and various factor like age, type of diet, BMI, dietary habits. Every physician encounter these symptoms frequently and these are widely prevalent. There are very few study based on self reported symptoms of anaemia.

#### **Aims and Objectives**

To find out prevalence of anaemia, To assess self reported symptoms of anaemia among school

adolescents of Gwalior township, To assess the associated factor, To give recommendations on the basis of key findings.

### Materials & Methods

Present study is cross sectional observational study conducted among adolescents of schools of Gwalior Township from 1<sup>st</sup> Jan. 2016 to 31<sup>st</sup> Dec. 2016, including 400 adolescents (299 Male and 101 Female), To find out prevalence of anaemia, To assess self reported symptoms of anaemia among school adolescents of Gwalior township.

**Study settings:** Gwalior is located at 26.22°N 78.18°E. in northern Madhya Pradesh 300 km (186 miles) from Delhi. It has an average elevation of 197 meters (646 feet). Most part of it comes under Bundelkhand area. As of 2011's India census, Gwalior has a population of 19,53,505. Males constitute 53% of the population and females 47%. Gwalior has an average literacy rate of 87.20%, higher than the national average of 74%: male literacy is 90.85%, and female literacy is 78.82%. In Gwalior, 13% of the population is under 6 years of age<sup>9</sup>

**Study Design** - Cross sectional study

**Study Period**-One years (01.01.2016 to 31<sup>st</sup> Dec. 2016)

**Study population**- Adolescents of Gwalior township.

**Sampling Method**- Simple random sampling

### Sampling

For the study purpose the whole Gwalior township was divided into three zones namely Lashkar, Gwalior and Morar. From each zone – two schools was selected randomly. From each school study participants (i.e. adolescents) was selected randomly.

### Sampling frame

1. Adolescents from two schools (one private and one government school) from zone Lashkar.
2. Adolescents from two schools (one private and one government school) from zone Morar.

3. Adolescents from two schools (one private and one government school) from zone Gwalior.

**Sample Size**- 400 adolescents of Gwalior township.

### Sample Size Calculation<sup>-10</sup>

To calculate the sample size (95% confidence level) we can use the following formula:

$$nr = 4pq/d^2$$

Where nr = required sample size, p = proportion of the population having the characteristic, q = 1-p and d = the degree of precision. The proportion of the population (p) may be known from prior research or other sources; if it is unknown use p = 0.5 which assumes maximum heterogeneity (i.e. a 50/50 split). The degree of precision (d) is the margin of error that is acceptable. Setting d = 0.02, for example, would give a margin of error of plus or minus 2%.

We take the worst case scenario and set p = 0.5 (and therefore q = 1-0.5 = 0.5). we are prepared to accept a margin of error of ± 5% so we set d = 0.05. To determine the minimum sample size we then apply the formula: So our minimum sample size would be 400.

$$nr = 4pq/d^2$$

$$nr = 4 \times 0.5 \times (1-0.5) / (.05)^2$$

$$nr = 400$$

### Criteria for Selection

#### Inclusion Criteria

- Adolescent at the age of 10-19
- Adolescent who give consent for their blood testing

#### Exclusion Criteria

- Adolescent who were under treatment of anemia
- Adolescent who were terminally ill
- Adolescent who did not give consent.

### Ethical Consideration

- Ethical Approval for the study was taken from the Ethical Committee of G.R. Medical College, Gwalior before beginning the study (Annexure I).
- The study does not require any invasive or non-invasive diagnostic procedure.

- The study does not require withholding of any drug prescribed by treating doctor or starting any new drug.
- The study doesn't interfere with any diagnostic or treatment procedure adopted by treating physician.
- The study does not involve any investigative procedure nor was the subject exposed to any hazardous investigation during the course of the study.

- (A) General Information
- (B) Anthropometric Measurements
- (C) Personal History
- (D) Substance Abuse
- (E) Life Style Profile
- (F) Reproductive Health Problems
- (G) STI/HIV/AIDS Awareness and Symptoms
- (H) Psychological Problems
- (I) Behavioural Problems
- (J) Health Risk Behaviour
- (K) Nutritional Problems

### Methodology

The present study was a cross sectional study carried out among the adolescents of schools of Gwalior Township. First of all list of various government and private (non government) schools of Gwalior was taken from district education office. 6 schools, three governments and three private from the list were selected randomly than 67 adolescents from each school were selected randomly. Verbal consent from the Head/ Principle of the respective school was taken after explaining the type and purpose of the study. The inform consent from each of the participant was taken before asking the questions of the questionnaire and performing necessary measurements. They were assured that in the confidentiality of the study participants and concerned school would be strictly maintained. It was a questionnaire based study. The questionnaire was filled by the students themselves to find out the symptoms suggestive of anemia. Hemoglobin estimation was done by finger prick method. The severity of anemia is classified on the basis on WHO i.e. Hb < 7gm%: Severe anaemia, Hb 7-10 gm%: Moderate anaemia, Hb 10-12 gm%: Mild anaemia and Hb >12 gm%: Non- anaemic (World Health Organization, 2011).

**Data Collection:** Data was collected by using predesigned, pretested structured schedule (questionnaire) from study participants. The questionnaire which was used for interview was divided into

- (A) General Information about Name, Age, Gender, Marital Status, Address, Religion, Education status, Occupation, Income, Type of Family, Family members, Socio-economic-class have been taken.
- (B) Operational definitions of various variables used in study

**Vegetarian diet:** Exclusively take Vegetarian diet do not take non vegetarian diet.

**Non vegetarian diet:** Consider non-vegetarian if at least once in a month consume non- vegetarian diet.

**Eggitarian:** Person who take eggs in diet.

**Junk food:** Energy dense food with high sugar/fat/salt content and low nutrient value in terms of protein, fibers, vitamins and mineral content.

**Anaemia symptoms and signs:** Symptoms like tiredness, decreased work capacity, *chakkar*, *ghabrahat*, headache, paleness of face and palm are considered as symptoms and signs of anaemia in present study.

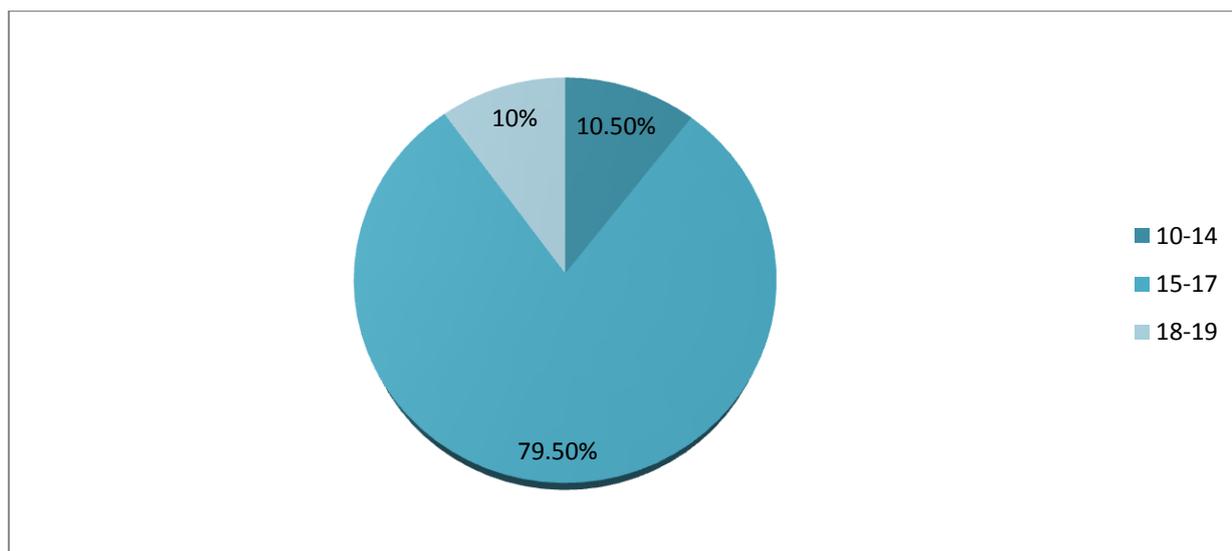
**Results and Observation**

General Information about the adolescents

**Table-1:** Distribution of respondents according to various stages of adolescents

S.No	Stages of Adolescents*(years)	Male (%)	Female (%)	Total (%)
1.	Early adolescents (10-14)	39	3.0	42 (10.50)
2.	Middle adolescents (15-17)	227	91	318 (79.50)
3.	Late Adolescents (18-19)	33	7.0	40 (10.00)
	Total	299	101	400 (100.00)

Above table is showing that, 79.50% adolescents belong to middle adolescents age group, 10.5% early adolescents and 10% belong to late adolescents age group.



**Diagram-1:** Distribution of respondents according to various stages of adolescents:

\*UNFPA for UN system in India; Adolescents in India – A Profile.Sept.2000 –Lodi Estate; New Delhi, India.

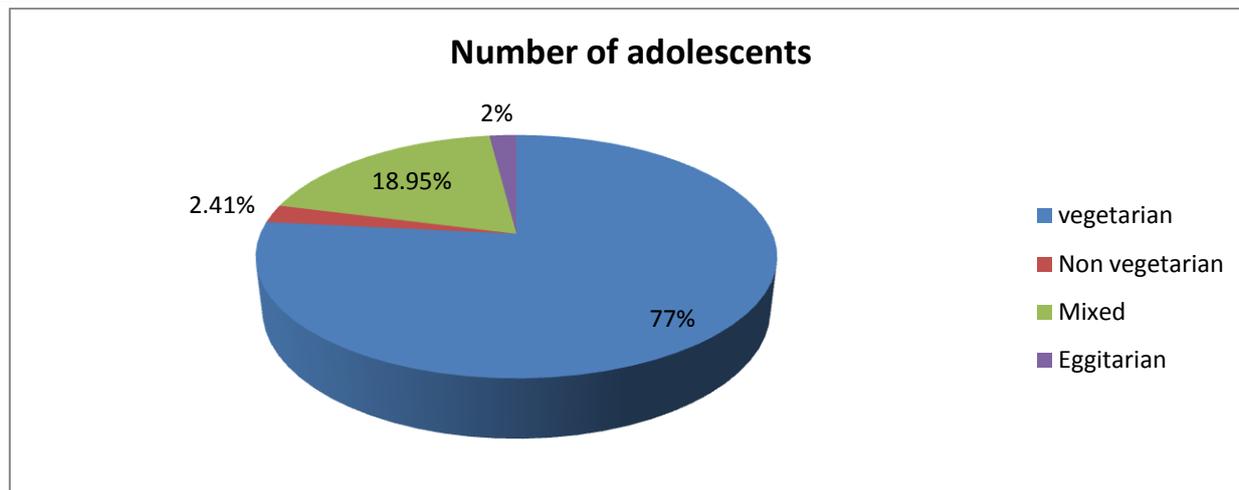
**Table-2:** Distribution of respondents according to self reported anaemia symptoms in various stages of adolescents

S.No	Stages of Adolescents(years)	Male(%) n=186	Female (%) n=62	Total (%) n=248
1.	Early adolescents (10-14)	28 (15.05)	2(3.22)	30 (12.09)
2.	Middle adolescents (15-17)	141 (75.80)	56(90.32)	197 (79.43)
3.	Late Adolescents (18-19)	17(9.13)	4(6.45)	21 (8.46)
	Total	186(100)	62(100)	248(100.00)

Above table showing out of 400 hundred adolescents 248 (62%) reported symptoms of anaemia , male and female adolescents have almost equal percentage of anaemia symptoms (male 62.2% and female 61.38%).197 (79.43%) middle adolescents age group reported anaemia symptoms.

**Table-3:** Distribution of adolescents according to Type of diet and reported anaemia symptoms

S.No.	Type of Diet	Number of adolescents (n=248)	Percentage
1.	Vegetarian	190	76.61
2.	Non vegetarian	6	2.41
3.	Mixed	47	18.95
4.	Eggitarian	5	2.01
	Total	248	100.00



**Diagram-2:** distribution of adolescents according to Type of diet.

Above table showing most adolescents reporting anaemia symptoms are vegetarian (77%) and 19% were taking mixed diet.

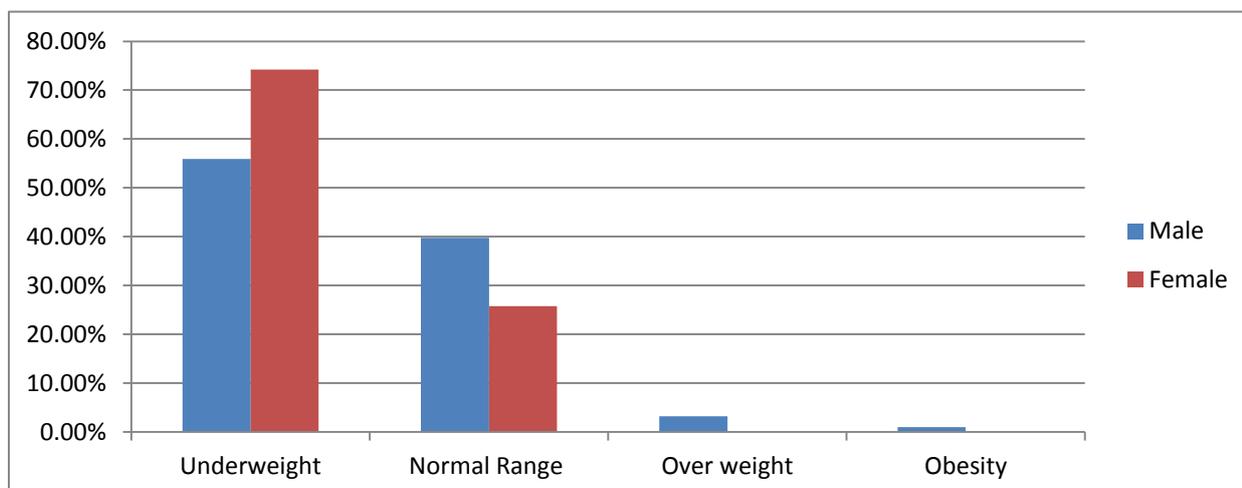
**Table 4:** Association between self reported anaemia symptoms and BMI

S.No.	Classification*	BMI	Male (%) n=186	Female (%) n=62	Total (%) n=248
1.	Underweight	<18.50	104(55.91)	46(74.19)	150 (60.48)
2.	Normal Range	18.50-24.99	74(39.78)	16(25.80)	90(36.29)
3.	Overweight (Pre-obese)	25-29.99	6(3.22)	0.00	6.00 (2.41)
4.	Obesity	>30	2 (1.00)	0.00	2.00 (0.80)
Total			186	62	248

$\chi^2 : 7.74$   
 DF : 3  
 p-value : 0.051

Above table showing 60.48% adolescents who are reporting symptoms of anaemia are underweight (BMI <18.50), 74.19% female adolescents and 55.91% male adolescents are underweight.36.29% adolescents have BMI within normal range. 3.22% male adolescents are overweight and 1%

male adolescents are obese. In present study no female adolescents are found overweight and obese. above results indicate that majority of adolescents reporting symptoms of anaemia are underweight and anaemia affect weight gain and nutrition status of school going adolescents.



**Diagram-3:** Distribution of adolescents according to BMI

\*WHO classification of BMI (Source: WHO (2003),Tech.Rep.Ser.No.916.)

**Table-5:** Association between self reported anaemia symptoms and consumption of junk food, awareness about balance diet and abnormal appetite pattern

Variable Name	No. and(%) of Respondent reported symptoms anaemia and responded (n=248)		No. and(%) of Respondent not reported symptoms anaemia and responded (n=152)	
	Yes	No	Yes	NO
<b>Consumption of Junk food</b>	217 (87.5%)	31 (12.5%)	130 (85.52%)	22 (14.47%)
<b>Awareness about balance diet</b>	227 (91.53%)	21 (8.46%)	139 (91.44%)	13 (8.55%)
<b>Abnormal appetite</b>	164 (66.12%)	84 (33.87%)	28 (18.42%)	124(81.57%)

$\chi^2$  : 282.11

DF : 6

p-value:0.000002

Above table showing out of 248 adolescents who reported anaemia symptoms 91.53% adolescents have awareness about balance diet and know the ingredients of balance diet, 87.5% adolescents consume junk food and 66% adolescents have

abnormal appetite(either loss of appetite or increased appetite).Junk food consumption and abnormal appetite pattern have been associated with presence of anaemia symptoms.

**Table 6:** Distribution of respondents according to anaemic status

Hb(gm%)*	Male(n=299) N(%)	Female (n=101) N(%)	Total (n=400) N(%)
<12 (anaemic)	113 (37.79)	61(60.39)	174 (43.5)
>12 (not anaemic)	186 (62.20)	40 (39.60)	226 (56.5)

\*WHO 2011 (reference 11)

Above table showing 43.5% of adolescents are anaemic, 60.39% girls and 37.79% boys are anaemic.

**Table 7:** Distribution of Respondents according to prevalence of self reported symptoms of anaemia

self reported anaemia symptoms	Male(n=299) N(%)	Female(n=101) N(%)
Tiredness	51(17.05)	7(6.93)
Lack of concentration	18(6.02)	5(4.95)
Decreased work capacity	40(13.37)	8(7.92)
Chakkar (giddiness/vertigo)	8(2.67)	4(3.96)
Ghabrahat	6(2.00)	4(3.96)
Paleness/palor	8(2.67)	12(11.88)
Multiple symptoms (more than one of above symptoms)	55(18.39)	22(21.78)
Total	186(62.20)	62(61.38)

18.39 males and 21.78 female adolescents have multiple symptoms, tiredness (17.05) is most common among males and paleness (11.88) is most common symptoms among females Followed by decreased work capacity both among males and females.

### Discussion

Present study is cross sectional observational study conducted in adolescents of schools of Gwalior Township from 01.01.2016 to 31.12.2016. It included 299 male adolescents and 101 female adolescents. It is conducted To find

out prevalence of anaemia, To assess self reported symptoms of anaemia among school adolescents of Gwalior township.

In present study 79.50% adolescents belong to middle adolescents (15-17yrs) age group, 10.5% early adolescents and 10% belong to late adolescents age group. Shanti Devi et al.<sup>3</sup> reported majority of subjects belonged to 14-15 years (51%) age group and followed by 16-17 years (45%). Only 3 cases were found in >17 years age group.These findings are in accordance with present study.

Above table showing most adolescents reporting anaemia symptoms are vegetarian (77%) and 19% were taking mixed diet. Suchitra A Rathi et al<sup>12</sup> reported that 87.5% of the adolescents girls belongs to vegetarian diet and remaining 12.5% were belongs to non vegetarian diet.

Above table showing 60.48% adolescents who are reporting symptoms of anaemia are underweight (BMI <18.50), 74.19% female adolescents and 55.91% male adolescents are underweight.36.29% adolescents have BMI within normal range. 3.22% male adolescents are overweight and 1% male adolescents are obese. In present study no female adolescents are found overweight and obese.

NFHS-3 data shows, in the age group 15–19 y, 47% girls and 58% boys were thin, 56% girls and 30% boys were anemic.<sup>13</sup>

In present study 43.5% of adolescents are anaemic, 60.39% girls and 37.79% boys are anaemic. The earlier study from western India reports that in the low income group 80-90% had haemoglobin less than 12%.<sup>14</sup> The study from Ranga Reddy district of Andhra Pradesh reports anaemia prevalence in girls 13-15 years to be 83% .<sup>15</sup> Whereas undernutrition is reported (stunting) in one-third of adolescent population, prevalence of anaemia is almost universal.<sup>16</sup> The present study findings are in accordance with these( previous) studies done.

It was reported by Parasuraman et al<sup>17</sup> in India which was a national level study that 56% of women and 25% of men were anemic. Rao et al<sup>18</sup> In adolescent boys and girls with anemia prevalence rate was 82.3%.

Regarding symptoms of anaemia 62% adolescents felt anemia symptoms .Male and female adolescents have almost equal percentage of anemia symptoms (Male 62.2% and Female 61.38%).

Breaking the Inter-Generational Cycle of Under nutrition in India with a focus on Adolescent Girls. The Government of India and state governments with technical support by UNICEF and partners have been implementing for over a

decade the Adolescent Girls Anemia Control Programme.

### Conclusion

In present study 62% adolescents felt anemia symptoms. Male and female adolescents have almost equal percentage of anemia symptoms. Most adolescents have multiple symptoms of anaemia. When Hemoglobin estimation was done 43.5% of adolescents were found anaemic, 60.39% girls and 37.79% boys were found anaemic. More than half (60%) of adolescents who had symptoms of anaemia were underweight. Junk food consumption and abnormal appetite have been associated with reporting of anaemia symptoms. Period of adolescents is followed by reproductive life so prevalence of anaemia among adolescents is a matter of great concern, there are very few studies in adolescents regarding prevalence of anaemia and perception of its symptoms. There are variation in perception of anaemia symptoms among adolescents and majority of them ignore the symptoms and doesn't seek health care for their symptoms.

### Recommendations

- Consumption of healthy iron rich food.
- Biannual deworming.
- Menstrual hygiene and treatment of abnormal bleeding condition.
- Proper hand washing and sanitation.
- IFA supplementation.
- Periodic health examination camps at school level.
- Awareness about the healthy diet.
- Alternatively, creating local demand (for example, through social marketing techniques) for “attractive” iron supplements supplied through the private sector,

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