Prevalence and Risk Factors of Anaemia among Adolescent Girls in Selected Schools

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Authors’ contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

ABSTRACT

To assess the prevalence and risk factors which contribute to anemia among adolescent girls in selected

Introduction: ‘Anemia is a disease in which, because of one or more vital nutrient deficiencies, the blood hemoglobin content is lower than average, irrespective of the cause of such deficiency. In Maharashtra, according to District Level Household Survey (DLHS) 2002-2006, the prevalence of moderate anemia in adolescent girls was estimated to be 53%, whereas severe anemia was 29%.

Aims: To assess the Prevalence and risk factors which contribute to anemia among adolescent girls in selected Schools.

Research Methodology: A cross sectional study was carried in 150 adolescent girls age between 10 to 15 years. Quantitative research approach was used. Non-probability convenience sample technique was used.

Results: The data obtained to describe the sample characteristics including demographic variables (age of adolescent girls, education, mother education, type of family, monthly family income and type of diet), prevalence of anemia among adolescent girls, menstrual factors and dietary factors.

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The levels of anemia were seen into 4 categories, normal Hb% level, mild anemia, moderate anemia and severe anemia. In demographic variables, Type of family of adolescent girls (p=0.04) is statistically associated with prevalence of anemia. In menstrual factors, duration of blood flow is found to be statistically associated with menstrual factors of adolescent girls (p=0.0001). In dietary factors, it is interpreted dietary factors of adolescent girls is statistically not associated with their prevalence of anemia.

**Conclusion:** The prevalence of anemia is more in adolescent girls. A statistically significant was found between nuclear family but not with the other socio-demographic factors. No association was found between status of menstrual factors except duration of blood flow.

**Keywords:** Assess; prevalence; risk factors; anemia; adolescent girl; Hb estimation.

### 1. INTRODUCTION

“Anemia is a disease in which, because of one or more vital nutrient deficiencies, the blood haemoglobin content is lower than average, irrespective of the cause of such deficiency.” Anemia, the word anemia, derives from a Greek word that means ‘no blood.’ The term chlorosis a Greek term meaning brown, first described the signs of anemia. Anemia is not disorder, it is a condition that results from for red blood cells, below normal levels of hemoglobin. Earlier reference of anemia can be dated back to 1684 when a study on composition of blood was conducted by Robert Boyle [1].According to the adolescent age group of the WHO, between 10-19 years is described as life span [2] WHO estimates that in the developing world, the prevalence of anaemia among adolescent girls is 27% and 6% in the developed world [3]. In India reported by to National Health and Family Survey(NHFS-3), in adolescent girls aged between 15 and 19 years the prevalence of anemia is 55.8%, including 39.1% with mild anemia, 14.9% with moderate anemia and 1.7% with severe anemia. 45.3% of women aged 15-49 years in India are anaemic, according to NHFS. The incidence rate of anaemia in India embroyonic and non embroyonic mother age between 15 to 49 years is 50.3% and 53.1%. Similarly the incidence rate of anemia in women aged 15-49 years in Maharashtra is 56.2% [4]. In Maharashtra, the incident rate of moderate anemia among adolescent girls was estimated at 53%, according to the 2002-2006 District Level Household Survey (DLHS), while extreme anemia was 29% [5]. A cross sectional study of nutritional anemia epidemiological correlates among 630 adolescent girls in rural Wardha aged 13-19. Results showed that 68.7% of the students were aged between 13 and 16 years. 85.9% the menarche was attended by girls. The incidence rate of anemia was found to be 59.8%. The incidence rate are mild is 38.4%, moderate is 20.8% and severe is 0.6% respectively. With more than 50 percent girls completing secondary education, 0.9 percent of girls were analphabets. Most of girls were members of grade III income-class families. 6.6% girls had severe menstrual bleeding background, 90% girls had daily iron intake of less than 20 mg, 58.6% girls were non-vegetarians. In 10.3 percent of girls there was worm infestation. Significant anemia association with socio-economic status, iron intake, vegetarian diet, excessive menstrual bleeding and worm infestation has been observed [6]. Adolescent girls not focus on health as well as their food pattern and other health habits and parents also ignored on health of adolescent girls. investigator realised that their food habits and other health practices make them anaemic. So the researcher thought to take the task for assessing the prevalence and risk factors which contributed to anemia among adolescent girls in selected school.

### 2. MATERIALS AND METHODS

A cross sectional study was carried from 21st August to 20th September 2019. The study population were all adolescent girls age between 10 to 15 years residing in Adhiwashi Ashram school Jungad, tal. Kelzal, dist. Wardha. Sample size: Using the formula for sample size, \( n = \frac{2a^2}{P(1-P)d^2} \), the sample size was 150. Research approach: quantitative research approach was used. Sample Technique: Non-probability convenience sample technique was used. Data collection: The investigator visited to the selected school and obtained the necessary permission from the concerned authorities. The investigator approached the adolescent girls from age 10-15 years in selected school and explained the purpose of the study and explain how it will be beneficial for them. The investigator
personally visited each adolescent girls, and oriented to the study and administered structured questionnaire to them. On the first day, each participant was given a questionnaire. The questionnaire were collected soon after it was filled up. On the same day the 3 ml of venous blood was collected in EDTA bulb and send for Hb estimation by CBC counter machine in central laboratory of our hospital, Sawangi (M) Wardha. The criteria for detecting anemia was diagnosed as per WHO cut off values, Normal value of Hb = >12 gm/dl, Mild anemia = > 11gm/dl to <11.9 gm/dl, Moderate anemia = >9gm/dl to <10.9 gm/dl, Severe anemia = < 8 gm/dl.

Any adolescent girls found to be anemic was referred to the nearest peripheral health centre for management according to the grade of anemic.

2.1 Statistical Method
Statistical analysis was done by ANOVA and unpaired “t” test was used to calculate statistical significance.

3. RESULTS
3.1 Section I
- Table 1 refer that frequency and percentage wise distribution of adolescent girls was according to the age of adolescent girls, girl’s education, mother’s education, type of family, monthly family income and type of diet respectively

Majority 55(36.7%) subjects were 10-11 years of age group, 46(30.70%) subjects were 12-13 years of age group, and 49(32.70%) subjects were 14-15 years of age group. Only 11(7.30%) subjects were educated up to primary standard, Majority of subjects 118(78.70%) were educated up to middle school and 21(14%) subjects were educated up to secondary standard. Only 17(11.30%) of the mother’s of adolescent girls were illiterate, 89(59.30%) of them were educated up to primary standard, 37(24.70%) of them were educated up to SSC, 7(4.70%) of them were educated up to HSC standard and no one were educated upto undergraduate and graduate. 104(60.30%) subjects were residing in nuclear families, 29(19.30%) in joint and only 17(11.30%) of them were residing in extended families. 89(59.30%) of subjects had monthly family income of Rs.9001-10000, 15(10%) of them had between Rs.11001-12000, 22(14.70%) of them had income more than Rs.12000. Majority subjects 82(54.70%) were consuming vegetarian diet and 68(45.30%) of them were consuming non-vegetarian diet.

3.2 Section II
- The Table 2 refer the frequency and percentage of wise distribution of adolescent girls based on prevalence anemia

Out of 150 adolescent girls, were found 35(23.33%) subjects had normal Hb level, 53(35.33%) had mild anemia, 59(39.33%) were moderate anemia and only 3(2%) were severely anemia.

3.3 Section III
- Table 3 refer percentage wise distribution of adolescent girls according to their menstrual factors

Out of the 150 adolescent girls, 85(56.67%) subjects not attended menarche, 32.67(75.38%) subjects had 10-12 years as a age at menarche and only 16(24.62%) of them had 13-15 years. Majority 29(44.62%) subjects were duration of blood flow 1-3 days, 33(50.77%) had 4-6 days and only 3(4.62%) subjects were duration of blood flow more than 6 days. Only 3(4.62%) subjects were uses one pad per day, 18(27.69%) uses two pad per day and most of 44(67.69%) adolescent girls uses three sanitary pads per day. 34(52.31%) subjects were dysmenorrhea and 31(47.69%) of them not have dysmenorrhea. Majority subjects 64(98.46%) were regular pattern of menstrual cycle, and Only 1(1.54%) of them irregular of menstrual cycle, and duration of menses is 2 month interval.

- Table 4 refer percentage wise distribution of adolescent girls according to their dietary factors

High majority 145(96.67%) were not taking junk foods and only 5(3.33%) were taking daily junk food. High majority 142(94.67%) were not taking milk and only 8(5.33%) of them were taking milk daily. Only 3(2%) were taking meal one time in a day, majority 87(58%) of them were taking two times meal, 60(40%) of them were taking three times meal and no one taking meal in more than three time. High majority 112(74.70%) were taking breakfast daily and 38(25.30%) of them...
were not taking daily breakfast. Only 10(6.70%) were daily consuming fruits and 140(93.30%) of them were not consuming fruits daily. Higher majority 141(94%) were not doing fasting, only 9(6%) of them were doing fasting of 2 days in a week and no one of them not doing fasting of 4 days in a week and no one of them not doing fasting more than 4 days in a week. only 9(6%) of the adolescent girls were taking fast food in between fast. 103(68.67%) were taking tea/coffee daily, whereas only 47(31.33%) were not taking tea/coffee.

3.4 Section IV

• Table 5 refer the association of socio-demographic factors with prevalence of anemia of adolescent girls

The association between the prevalence of anemia of adolescent girls with type of family were significant i.e. \( P = 0.04 \). Therefore it is shows the significant association between these variable. In these the alternative hypothesis was accepted and the null hypothesis was rejected.

• Table 6 refer the association of menstrual factors with prevalence of anemia of adolescent girls

The association between prevalence of anemia with menstrual factors of adolescent girls. The tabulated ‘\( x^2 \)’ values were much higher than the calculated ‘\( x^2 \)’ values at 5% level of significance for all demographic variables. As well as the calculated \( P \)-value which were much higher than the acceptable level of significance i.e. \( P = 0.05 \). Duration of blood flow is found to be statistically associated with menstrual factors of adolescent girls \( (P = 0.0001) \). Hence it is interpreted menstrual factors of adolescent girls is statistically not associated with their prevalence of anemia, except the duration of blood flow.

• Table 7 refer association of dietary factors with prevalence of anemia of adolescent girls

The association of prevalence of anemia with dietary factors of adolescent girls. The tabulated ‘\( x^2 \)’ values was much higher than the calculated ‘\( x^2 \)’ values at 5% level of significance for all demographic characteristics. Also the calculated \( P \)-value that was significantly higher than the acceptable level of significance i.e. \( P = 0.05 \). Therefore it is shows the dietary factors of adolescent girls is statistically not associated with their prevalence of anemia.

4. DISCUSSION

Present study reported the prevalence of anemia among 150 adolescent girls age between 10-15 years in selected school. In this study cross sectional survey design adopted. Hb estimation done by CBC counter machine and interpretation done on WHO cut off value. Mild anemia >11 gm/dl to <11.9 gm/dl, moderate anemia >8 gm/dl to <10.9 gm/dl and severe anemia < 8 gm/dl. Out of 150 adolescent girls, were found 23.33% had normal Hb level, 35.33% had mild anemia, majority of the adolescent girls 39.33% had moderate anemia and only 2% adolescent girls were sever anemia. A related cross sectional research was conducted by Chandrakumari, Ablish Sasidharan nair among 255 adolescent girls which was in age group of 10 to 19 years to determine the prevalence of anemia in Tamil Nadu, India's rural area. The prevalence rate of mild anaemia was high in this study (48.39 percent) compared to the prevalence of moderate and severe anaemia, which were found to be 33.87% and 10.48%, respectively [7]. Another similar research carried out by Dr. Meenal Vinay Kulkarni et al. to assess the incident rate of anemia in 272 adolescent girls in urban slum at Jaitala, Nagpur age between 10 to 19 years. Out of 272 adolescent girls, 90.1% girls were found to be anemic. Majority of the girls 88.6% were having mild to moderate anemia and only 1.5 % girls severely anemic. Overall mean haemoglobin level was 10.33±1.34 [8]. Another similar project carried out by Rajaratnam to estimate the prevalence of mild anemia is 36.5%, moderate anemia is 6.3% and severe anemia is 2%, in adolescent girls in rural Tamil Nadu [9]. Another study conducted by Bulliy G et al. among anemic adolescent girls in Orissa showed that 45.2% had mild anemia, moderate anemia was 46.9% and severe anemia is 4.4%, respectively [10]. One of the research was carried out by Aggarwal et al. in North East Delhi among adolescent girls was showed prevalence of anemia. 45% [11]. A cross-sectional studies done by Toteja and Gawarika in adolescent girls in different rural districts of India. In this study was found the prevalence rate of 90.1% and 96.5%, respectively; our study findings showed lower prevalence rate when compared with these studies [12,13].

4.1 Prevalence of Anemia Associate with Nuclear Family

Present study the association between the prevalence of anemia in adolescent girls with
type of family were significant i.e. $p = 0.04$. Therefore, it is described that there was significant association with in nuclear family, so the high prevalence shown in nuclear families. A similar cross-sectional studies conducted by Premalatha T et al. assess the incident rate of anemia and its related factors in adolescent school girls in Chennai, Tamil Nadu, has a significant relationship with anemia that explains its higher prevalence, i.e. 85.3 percent from nuclear families [14]. Another similar finding showed that quite contradictory to the reported by Rawat et al. which suggests the high incident rate in joint families and interestingly to both of the above-mention study carried out in 2010 in Cuddalore reported that there's no influence of the family type [15]. There centre search is in line with the Gupta et al. report showing a high prevalence of 78% in nuclear families. Responsibilities are shared which gives the family economic and social security [16].

Table 1. Percentage wise distribution of adolescent girls according to their demographic characteristics; n=150

| Demographic Variables      | Frequency | Percentage |
|---------------------------|-----------|------------|
| Age in years              |           |            |
| 10-11 years               | 55        | 36.7       |
| 12-13 years               | 46        | 30.7       |
| 14-15 years               | 49        | 32.7       |
| Girls Education           |           |            |
| Primary                   | 11        | 7.3        |
| Middle School             | 118       | 78.7       |
| Secondary                 | 21        | 14.0       |
| Mother's Education        |           |            |
| Illiterate                | 17        | 11.3       |
| Primary                   | 89        | 59.3       |
| SSC                       | 37        | 24.7       |
| HSC                       | 7         | 4.7        |
| Undergraduate             | 0         | 0          |
| Graduate                  | 0         | 0          |
| Type of family            |           |            |
| Nuclear                   | 104       | 69.3       |
| Joint                     | 29        | 19.3       |
| Extended                  | 17        | 11.3       |
| Monthly family income     |           |            |
| Rs. 9000-10000            | 89        | 59.3       |
| Rs. 10001-11000           | 15        | 10.0       |
| Rs 11001-12000            | 24        | 16.0       |
| Rs 12001 and above        | 22        | 14.7       |
| Type of diet              |           |            |
| Vegetarian                | 82        | 54.7       |
| Non Vegetarian            | 68        | 45.3       |

Table 2. Assessment of prevalence of anemia; n=150

| Score Range             | Frequency | Prevalence of anemia |
|-------------------------|-----------|----------------------|
| Normal Hb level         | 35        | 23.33                |
| Mild anemia             | 53        | 35.33                |
| Moderate anemia         | 59        | 39.33                |
| Severe anemia           | 3         | 2                    |
| Total                   | 150       | 100                  |
### Table 3. Percentage wise distribution of adolescent girls according to their menstrual factors; n=150

| Menstrual Factors                  | Frequency | Percentage |
|-----------------------------------|-----------|------------|
| Age of menarche                   |           |            |
| Not Attended                      | 85        | 56.67      |
| 10-12 years                       | 49        | 32.67      |
| 13-15 years                       | 16        | 10.67      |
| Duration of blood flow            |           |            |
| 1-3 days                          | 29        | 44.62      |
| 4-6 days                          | 33        | 50.77      |
| ≥7 days                           | 3         | 4.62       |
| Number of sanitary pad used per day |       |            |
| One                               | 3         | 4.62       |
| Two                               | 18        | 27.69      |
| Three or more                     | 44        | 67.69      |
| Dysmenorrhea                      |           |            |
| Yes                               | 34        | 52.31      |
| No                                | 31        | 47.69      |
| Pattern of menstrual cycle        |           |            |
| Regular                           | 64        | 98.46      |
| Irregular                         | 1         | 1.54       |
| If, Irregular duration            |           |            |
| 2 months                          | 1         | 1.54       |

### Table 4. Percentage wise distribution of adolescent girls according to their dietary factors; n=150

| Dietary Factors                  | Frequency | Percentage |
|----------------------------------|-----------|------------|
| Frequency of taking junk food    |           |            |
| Nil                              | 145       | 96.67      |
| Daily                            | 5         | 3.33       |
| Frequency of taking milk         |           |            |
| Nil                              | 142       | 94.67      |
| Daily                            | 8         | 5.33       |
| Frequency of taking meal         |           |            |
| One Time                         | 3         | 2          |
| Two Time                         | 87        | 58         |
| Three Time                       | 60        | 40         |
| More than three times            | 0         | 0          |
| Daily Breakfast                  |           |            |
| Yes                              | 112       | 74.7       |
| No                               | 38        | 25.3       |
| Daily Fruits                     |           |            |
| Yes                              | 10        | 6.7        |
| No                               | 140       | 93.3       |
| Fasting                          |           |            |
| Never                            | 141       | 94         |
| 2 days in a week                 | 9         | 6          |
| 4 days in a week                 | 0         | 0          |
| More than 4 days                 | 0         | 0          |
| Do you take fast food in between |           |            |
| Yes                              | 9         | 6          |
| No                               | 141       | 94         |
| Frequency of tea/coffee          |           |            |
| Nil                              | 47        | 31.33      |
| Daily                            | 103       | 68.67      |
Table 5. Association of socio-demographic factors with prevalence of anemia of adolescent girls; n=150

| Demographic Variables | Frequency | Normal Anemia | Mild Anemia | Moderate Anemia | Severe Anemia | χ²-value | Df | χ²-tab val | p-value |
|-----------------------|-----------|---------------|-------------|-----------------|---------------|-----------|----|-----------|---------|
| Age in years          |           |               |             |                 |               |           |    |           |         |
| 10-11 years           | 55        | 10            | 19          | 25              | 1             | 4.47      | 6  | 12.59     | 0.61,NS |
| 12-13 years           | 46        | 13            | 18          | 15              | 0             |           |    |           |         |
| 14-15 years           | 49        | 12            | 16          | 19              | 2             |           |    |           |         |
| Girls Education       |           |               |             |                 |               |           |    |           |         |
| Primary               | 11        | 4             | 4           | 3               | 0             | 2.46      | 6  | 12.59     | 0.87,NS |
| Middle School         | 118       | 26            | 42          | 48              | 2             |           |    |           |         |
| Secondary             | 21        | 5             | 7           | 8               | 1             |           |    |           |         |
| Mother’s Education    |           |               |             |                 |               |           |    |           |         |
| Illiterate            | 17        | 3             | 6           | 8               | 0             | 4.36      | 9  | 16.91     | 0.88,NS |
| Primary               | 89        | 23            | 29          | 35              | 2             |           |    |           |         |
| SSC                   | 37        | 9             | 14          | 13              | 1             |           |    |           |         |
| HSC                   | 7         | 0             | 4           | 3               | 0             |           |    |           |         |
| Undergraduate         | 0         | 0             | 0           | 0               | 0             |           |    |           |         |
| Graduate              | 0         | 0             | 0           | 0               | 0             |           |    |           |         |
| Type of family        |           |               |             |                 |               |           |    |           |         |
| Nuclear               | 104       | 30            | 36          | 36              | 2             | 12.73     | 6  | 12.59     | 0.04,S  |
| Joint                 | 29        | 5             | 12          | 11              | 1             |           |    |           |         |
| Extended              | 17        | 0             | 5           | 12              | 0             |           |    |           |         |
| Monthly family income |           |               |             |                 |               |           |    |           |         |
| Rs. 9000-10000        | 89        | 23            | 33          | 32              | 1             | 8.11      | 9  | 16.91     | 0.52,NS |
| Rs. 10001-11000       | 15        | 5             | 4           | 5               | 1             |           |    |           |         |
| Rs 11001-12000        | 24        | 3             | 10          | 10              | 1             |           |    |           |         |
| Rs 12001 and above    | 22        | 4             | 6           | 12              | 0             |           |    |           |         |
| Type of diet          |           |               |             |                 |               |           |    |           |         |
| Vegetarian            | 82        | 19            | 32          | 28              | 3             | 4.42      | 3  | 9.83      | 0.21,NS |
| Non Vegetarian        | 68        | 16            | 21          | 31              | 0             |           |    |           |         |
Table 6. Association of menstrual factors with prevalence of anemia of adolescent girls; n= 65

| Menstrual Factors                          | Frequency | Normal Anemia | Mild Anemia | Moderate Anemia | Severe Anemia | χ²-value | df | χ²-tab val | p-value |
|-------------------------------------------|-----------|---------------|-------------|-----------------|---------------|----------|----|------------|---------|
| **Age at menarche**                       |           |               |             |                 |               |          |    |            |         |
| 10-12 years                               | 49        | 12            | 18          | 17              | 2             | 3.26     | 3  | 7.81       | 0.25,NS |
| 13-15 years                               | 16        | 4             | 3           | 9               | 0             |          |    |            |         |
| **Duration of blood flow**                |           |               |             |                 |               |          |    |            |         |
| 1-3 days                                  | 29        | 4             | 12          | 13              | 0             | 19.82    | 6  | 12.59      | 0.0001,S|
| 4-6 days                                  | 33        | 12            | 9           | 11              | 1             |          |    |            |         |
| ≥7 days                                   | 3         | 0             | 0           | 2               | 1             |          |    |            |         |
| **Number of sanitary pad used per day**   |           |               |             |                 |               |          |    |            |         |
| One                                       | 3         | 1             | 0           | 2               | 0             | 11.45    | 6  | 12.59      | 0.07,NS |
| Two                                       | 18        | 1             | 5           | 12              | 0             |          |    |            |         |
| Three or more                             | 44        | 14            | 16          | 12              | 2             |          |    |            |         |
| **Dysmenorrhea**                          |           |               |             |                 |               |          |    |            |         |
| Yes                                       | 34        | 9             | 12          | 12              | 1             | 0.69     | 3  | 7.81       | 0.87,NS |
| No                                        | 31        | 7             | 9           | 14              | 1             |          |    |            |         |
| **Pattern of menstrual cycle**            |           |               |             |                 |               |          |    |            |         |
| Regular                                   | 64        | 15            | 21          | 26              | 2             | 3.11     | 3  | 7.81       | 0.37,NS |
| Irregular                                 | 1         | 1             | 0           | 0               | 0             |          |    |            |         |

Table 7. Association of dietary factors with prevalence of anemia of adolescent girls; n=150

| Dietary Factors                           | Frequency | Normal Anemia | Mild Anemia | Moderate Anemia | Severe Anemia | χ²-value | df | χ²-tab val | p-value |
|-------------------------------------------|-----------|---------------|-------------|-----------------|---------------|----------|----|------------|---------|
| **Frequency of taking junk food**         |           |               |             |                 |               |          |    |            |         |
| Nil                                       | 145       | 35            | 50          | 57              | 3             | 2.10     | 3  | 7.81       | 0.55,NS |
| Daily                                     | 5         | 0             | 3           | 2               | 0             |          |    |            |         |
| **Frequency of taking milk**              |           |               |             |                 |               |          |    |            |         |
| Nil                                       | 142       | 32            | 51          | 56              | 3             | 1.15     | 3  | 7.81       | 0.76,NS |
| Daily                                     | 8         | 3             | 2           | 3               | 0             |          |    |            |         |
| **Frequency of taking meal**              |           |               |             |                 |               |          |    |            |         |
| One Time                                  | 3         | 1             | 1           | 1               | 0             | 3.34     | 6  | 12.59      | 0.76,NS |

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| Dietary Factors                | Frequency | Normal Anemia | Mild Anemia | Moderate Anemia | Severe Anemia | $\chi^2$-value | df | $\chi^2$-tab val | p-value |
|-------------------------------|-----------|---------------|-------------|-----------------|---------------|----------------|----|----------------|---------|
| Two Time                      | 87        | 21            | 32          | 31              | 3             | 3.19           | 3  | 7.81           | 0.36,NS |
| Three Time                    | 60        | 13            | 20          | 27              | 0             | 0              |    |                 |         |
| More than three times         | 0         | 0             | 0           | 0               | 0             | 0              |    |                 |         |
| **Daily Breakfast**           |           |               |             |                 |               |                |    |                 |         |
| Yes                           | 112       | 27            | 42          | 40              | 3             | 3.19           | 3  | 7.81           | 0.36,NS |
| No                            | 38        | 8             | 11          | 19              | 0             | 0              |    |                 |         |
| **Daily Fruits**              |           |               |             |                 |               |                |    |                 |         |
| Yes                           | 10        | 4             | 3           | 3               | 0             | 1.81           | 3  | 7.81           | 0.61,NS |
| No                            | 140       | 31            | 50          | 56              | 3             | 0              |    |                 |         |
| **Fasting**                   |           |               |             |                 |               |                |    |                 |         |
| Never                         | 141       | 33            | 50          | 55              | 3             | 0.27           | 3  | 7.81           | 0.96,NS |
| 2 days in a week              | 9         | 2             | 3           | 4               | 0             | 0              |    |                 |         |
| 4 days in a week              | 0         | 0             | 0           | 0               | 0             | 0              |    |                 |         |
| More than 4 days              | 0         | 0             | 0           | 0               | 0             | 0              |    |                 |         |
| **During fasting do you take fast food in between** | | | | | | | | | |
| Yes                           | 9         | 2             | 4           | 3               | 0             | 0.50           | 3  | 7.81           | 0.91,NS |
| No                            | 141       | 33            | 49          | 56              | 3             | 0              |    |                 |         |
| **Frequency of tea/coffee**   |           |               |             |                 |               |                |    |                 |         |
| Nil                           | 47        | 9             | 15          | 23              | 0             | 3.71           | 3  | 7.81           | 0.29,NS |
| Daily                         | 103       | 26            | 38          | 36              | 3             | 0              |    |                 |         |
4.2 Prevalence of Anemia Associate with Duration of Blood Flow

Present study the duration of blood flow is found to be statistically associated with menstrual factors of adolescent girls (p=0.0001). Hence it is interpreted menstrual factors of adolescent girls is statistically not associated with their prevalence of anemia, except the duration of blood flow. A similar cross sectional research was reported by Pattnaik S. et al, to assess the incident rate of anemia among 151 adolescent girls in community rural areas of Odisha. Anemia was reported to be significantly association between the adolescent girls with heavy menstrual flow (p= 0.001) [17]. Another similar cross-sectional research was reported by P. M. Siva et al. to assess the incident rate of anaemia and its related risk factors in 257 adolescent girls in the community practice setting of Government Medical College, Kottayam Central Kerala. In this research incident rate of anaemia was highest in those adolescent girls used more number of sanitary pads. Indirectly, it suggests a substantial increase in blood loss during menstruation (p= 0.001) [18].

5. CONCLUSION

Anemia is common condition in adolescent girls. The prevalence rate of anemia is more in adolescent girls. Out of 150 adolescent girls, 35(23.33%) subjects had normal Hb level, 53(35.33%) had mild anemia, 59(39.33%) were moderate anemia and only 3(2%) were severely anemia. A statistically significant was found between nuclear family i.e. p = 0.04. The duration of blood flow is found to be statistically associated with menstrual factors of adolescent girls. There is need to yearly camp should be conducted in school to increase awareness and prevention of anemia in adolescent girls to prevent the further complication.

CONSENT

Oral and written consent was taken from local guardian for individual adolescent girls for this study,

ETHICAL APPROVAL

The study proposal was approved by Institutional Ethical Committee of the college IEC-2018-19, Referral no: 7756.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Ramakrishnan U. Nutritional anemias. CRC Series in modern Nutrition, 2000; 280.
2. Kotecha PV, Nirupam S, Karkar PD. Adolescent girls’ anaemia control programme, Gujarat, India. Indian J Med Res. 2009;130(5):584-9.
3. World Health Organization. Strategic directions for improving adolescent health in South-East Asia Region. WHO Regional Office for South-East Asia; 2011.
4. Chapparbandi SR, Nigudgi SR. A cross sectional study on menstrual hygiene of adolescent girls in rural field practice area of Kalaburagi, Kamataka, India. International Journal Of Community Medicine And Public Health. 2017;3(8): 2233-6.
5. Bhalla GS, Grover N, Singh G, Sarao MS, Mishra D. Antimicrobial susceptibility profile of surgical site infection isolates from a tertiary care center in West India. Journal of Marine Medical Society. 2019 Jan 1;21(1):69.
6. Kaur S, Deshmukh PR, Garg BS. Epidemiological correlates of nutritional anemia in adolescent girls of rural Wardha. Indian J Community Med. 2006;31(4):255-8.
7. Chandrakumari AS, Sinha P, Singaravelu S, Jaikumar S. Prevalence of anemia among adolescent girls in a rural area of Tamil Nadu, India. Journal of Family Medicine and Primary Care. 2019; 8(4):1414.
8. Kulkarni MV, Durge PM, Kasturwar NB. Prevalence of anemia among adolescent girls in an urban slum. Natl J Community Med. 2012;3(1):108-1.
9. Jolly R, Rajarathnam A, Asokan JS, Jonathan P. Prevalence of anemia among adolescent girls of rural Tamilnadu. Indian pediatrics. 2000;37(5):532-6.
10. Bulliyy G, Mallick G, Sethy GS, Kar SK. Hemoglobin status of non-school going adolescent girls in three districts of Orissa, India. International Journal of Adolescent Medicine and Health. 2007;19(4):395-406.
11. Aggarwal KN. Assessment of prevalence of anemia and iron stores in response to daily/weekly iron folate supplements in adolescent girls (10-18) from urban slums of East Delhi. UNICEF Contract. 1998; 95/0075.
12. Toteja GS, Singh P, Dhillon BS, Saxena BN, Ahmed FU, Singh RP, et al. Prevalence of anemia among pregnant women and adolescent girls in 16 districts of India. Food and Nutrition Bulletin. 2006; 27(4):311-5.
13. Gawarika R, Gawarika S, Mishra AK. Prevalence of anaemia in adolescent girls belonging to different economic group. Indian Journal of Community Medicine. 2006; 31(4):287.
14. Premalatha T, Valarmathi S, Srijayanth P, Sundar JS, Kalpana S. Prevalence of anemia and its associated factors among adolescent school girls in Chennai, Tamil Nadu, India. Epidemiol an Open Access Journal. 2012;2(1).
15. Rawat CM, Garg SK, Singh JV, Bhatnagar M, Chopra H, Bajpai SK. Socio demographic correlates of anaemia among adolescent girls in rural area of district Meerut (UP). Indian Journal of Community Medicine. 2001;26(4):173.
16. Gupta N, Kochar G. Pervasiveness of anaemia in adolescent girls of the lower socio-economic groups of the district of Kurukshetra (Haryana). The Internet Journal of Nutrition and Wellness. 2009; 7(1):1-5.
17. Pattnaik S, Patnaik L, Kumar A, Sahu T. Prevalence of anemia among adolescent girls in a rural area of Odisha and its epidemiological correlates. Indian Journal of Maternal and Child Health. 2013; 15(1):5.
18. Siva PM, Sobha A, Manjula VD. Prevalence of anaemia and its associated risk factors among adolescent girls of central Kerala. Journal of clinical and diagnostic research: JCDR. 2016; 10(11):LC19.