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.

Original Research Article

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.

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 anaemia 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 21[th]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 = $2\alpha 2/2 \cdot P \cdot (1-P)/d2$, 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 = >8gm/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.10001-11000, 24(16%)

had between Rs.11001-12000 and 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 weeks and no one of them not doing fasting of 4 days in a weeks and no one of them not doing fasting more than 4 days in a weeks. 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 of 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 '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, Abilash 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 Bulliyy G et al. among anemic adolescent girls in Orissa showed that 45.2% had mild anemia, moderate anemiaia 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 anemiai.e 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	Prevalence of anemia	
	Frequency	Percentage
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 oftaking 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	א2-value	Df	א2-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	x^2-value	df	x^2-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	x^2-value	df	x^2-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

Dietary Factors	Frequency	Normal Anemia	Mild Anemia	Moderate Anemia	Severe Anemia	x^2-value	df	x^2-tab val	p-value
Two Time	87	21	32	31	3				
Three Time	60	13	20	27	0				
More than three times	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				
Daily Fruits									
Yes	10	4	3	3	0	1.81	3	7.81	0.61,NS
No	140	31	50	56	3				
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				
4 days in a week	0	0	0	0	0				
More than 4 days	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				
Frequency of tea/coffee									
Nil	47	9	15	23	0	3.71	3	7.81	0.29,NS
Daily	103	26	38	36	3				

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, 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. 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.

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