A Study to Assess the Relationship of Menstrual Irregularities with Nutritional Status among Adolescent Girls in Selected Urban Schools

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Abstract: *Introduction: Adolescence is a transitional phase between childhood and adulthood. Menstruation is the normal physiological process which occurs during this period. Adolescent girls are particularly at high risk of malnutrition because of growth spurt and increased nutrition and iron demand. Due to shy nature, lack of scientific knowledge, cultural taboos, myths, gender discrimination and restricted practice during menstruation, they are reluctant to discuss this topic with their parents and often hesitate to seek help regarding their menstrual irregularities. More than 90% of menstrual irregularities are preventable which need early detection and prompt treatment. Adolescent girls are the future mothers and their nutritional status significantly contributes to the nutritional status of the community. Objectives: To assess menstrual irregularities, nutritional status and to find association of menstrual irregularities and nutritional status among adolescent girls. Population: Adolescent girls aged 13-19 years studying in selected urban schools. Methods: A cross-sectional descriptive study with non-purposive Convenience sampling technique was used to collect data from 203 samples. The research variables were menstrual irregularities and nutritional status. Based on the objectives a semi-structured questionnaire was prepared to identify sociodemographic variables and menstrual history. Calorie intake was calculated using food frequency questionnaire. The anthropometric assessment ie, height and weight of adolescent girls and calculated BMI were recorded using an observation tool. Haemoglobin level estimated by Sahli's Haemometer and association of variables were calculated with chi square and unpaired t-test. Data was analysed using SPSS 20 at 5% level of significance. Results: It was inferred that among 203 adolescent girls, 56% of adolescent girls had menstrual irregularities, while 80.8% were found to have inadequate calorie intake. Underweight was prevalent among 36.5% and 76.2% of adolescent girls were anaemic. There is significant association between menstrual irregularities with BMI and calorie intake p<0.001 and with mean haemoglobin level at p=0.019. Conclusion: The study depicts alarming results of prevalence of menstrual irregularities, anaemia, underweight and inadequate calorie intake. The associated factors related to these problems needs to be urgently addressed to improve the health status of adolescent girls. In our community Policymakers and media can develop more awareness programmes in the schools' regarding prevention and management of menstrual irregularities by improving nutritional status.*

Keywords: Menstrual Irregularities, Nutritional Status, Anemia, BMI

1. Introduction

Adolescence is a transitional phase between childhood and adulthood characterized by marked acceleration in growth.[1] Adolescence begins with pubescence- the earliest sign of development of secondary sexual characteristics and continues until morphological and psychological changes approximate adult status.[2] Menstrual problems are generally perceived as only minor health concerns and thus considered irrelevant to the public health agenda, particularly women in developing countries who may face life-threatening conditions.[3] Due to changes in lifestyle, habits and dietary pattern, the prevalence of obesity has increased even in developing countries which resulted in attaining menarche at an early age.[4] More than 90% of menstrual problems are diagnosable and treatable even at peripheral health care centres if identified early.[4]

The nutritional status of adolescent girl plays an important role in determining the maturation status.[5] Adolescent girls are particularly at high risk of malnutrition because of gender discrimination in the family. The needs of adolescent girls are often ignored and they remain a largely neglected population in our society.[2] Malnutrition denotes impairment of health arising either from deficiency or excess or imbalance of nutrients in the body. Inadequate nutrition in adolescence can put them at high risk of developing chronic diseases particularly if combined with other adverse lifestyle behaviours.[9] Girls' iron requirements increase dramatically during adolescence as a result of expansion of the lean body mass, total blood volume and onset of menstruation. These changes make adolescent girls more susceptible to anaemia, which in turn has lasting negative consequences in the survival, growth and development of their children later in life.[7]

World Health Organization (WHO) report suggests that in South East Asian Region a large number of adolescents, who constitute 20% of the population suffer from malnutrition and anaemia, which has an adverse impact on their reproductive health.[8] Majority of adolescent girls does not seek health care services in developing countries due to lack of knowledge, education, cultural taboos and male dominance. School absenteeism is found among 75% adolescent girls during menstruation. In the coming 5 to 10 years, the adolescent girls will become mother and will be responsible for the health of the future generation. In view of the high prevalence of moderate to severe anaemia among adolescent girls and the fact that many of them get married early, conceive and face the problems associated with anaemia in pregnancy, it is imperative to screen and treat them early for anaemia.[6]

2. Methods /Approach

A cross sectional survey design was chosen for the study. A semi structured questionnaire was used to assess the menstrual irregularities and a food frequency questionnaire was used to analyse the calorie intake. Anthropometric assessment and Haemoglobin estimation were done during the period of data collection. Each subject was subjected to anthropometric assessment ie height, weight and body mass index was calculated and was categorised based on the findings. The haemoglobin estimation was done using Sahli's haemometer.

Firstly, a total of 286 girls were listed down who attained menarche in three different schools. School -I had 68 girls who attained menarche, School-II had 88 adolescent girls and School-III had 130 adolescent girls. 230 adolescent girls met the inclusion criteria in three different schools ie; School-I had 38 adolescent girls, School-II had 69 and School-III had 123 adolescent girls who met the inclusion criteria. All the adolescent girls were selected from standard VIII to Standard XII. Finally, 203 adolescent girls were subjected for research study ie, from School-I total 30 adolescent girls, 65 adolescent girls were from School-II and 109 adolescent girls were from School-III. A total of 27 girls were absent during the data collection period.

Schools were selected and formal permission was obtained from the school authorities, parents and the adolescent girls for conducting the research study. The investigator has selected one school from Urban Community for conducting the pilot study and for checking the validity of tool and reliability of instruments. For the final study the investigator had taken samples from three different schools at selected urban community.

For non-probability convenience sampling, the sample size required for the descriptive study was calculated according to the following formula:

$$n = \frac{t^2 \times p\,(1-p)}{d^2}$$

Where
n= required sample size
t= confidence level at 95 (standard value of 1.96)
p= estimated prevalence of menstrual irregularities (86%)
d= Permissible error in estimation, assuming 95% confidence coefficient and permissible error of 5% (0.05)

In this study the sample size was calculated considering the prevalence of menstrual irregularities 90%

$$n = \frac{(1.96)^2 \times 0.86\,(1-0.86)}{(0.05)^2}$$

$$n = \frac{3.8416 \times 0.86 \times 0.14}{0.0025}$$

$$n = \frac{0.46252864}{0.0025}$$

$$n = 185.01 \approx 185$$

For attrition or difficulties, the investigator decided to take additional 10% of the calculated sample size ie, 185+18.5=203.5. The investigator had included 203 samples for the present study.

Inclusion criteria: Adolescent girls who have attained menarche 2 or more years prior to the conduction of study and are in the age group of 13-19 years.

A questionnaire was prepared to assess the sociodemographic variables and questions related to menstrual irregularities. The tool was a semi-structured questionnaire. All the questions were structured and were multiple choice types except two which was open ended.

The statistics tests used are chi-square, unpaired t-test.

3. Results

1) Frequency and percentage distribution will be used for analysis of socio-demographic characteristics and menstrual history
2) Chi square will be used for associating menstrual irregularities with BMI, Calorie intake.
3) Unpaired t-test will be used for associating menstrual irregularities with the mean of haemoglobin level among adolescent girls.
4) Association of menstrual irregularities with nutritional status
5) The statistical significance will be tested at 5% level of significance and the data will be analysed using SPSS version 20 software.

Table 1: Distribution of sociodemographic characteristics of adolescent girls, n=203

Attribute	Sociodemographic characteristics	Frequency f	Percentage %
Age (Years)	13-15	28	13.8
	16-19	175	86.2
Family	Nuclear	190	93.6
	Joint	13	6.4
Number of siblings	1	5	2.5
	2	43	21.2
	3	64	31.5
	≥4	91	44.8
Birth order	1	63	31.0
	2	71	35.0
	3	38	18.7
	≥4	31	15.3
(Figures in parenthesis denote percentage)			

Table 1 shows that out of 203 adolescent girls, majority 175(86.2 percent) were in the age group of 16-19 years and 28(13.8percent) were between 13-15years. Most of the adolescent girls 190(93.6 percent) were from Nuclear family and 3(6.4 percent) were from Joint family. It also depicts that 5(2.5 percent) adolescent girls had one sibling, 43(21.2 percent) of them had two siblings, 64(31.5 percent) had three siblings whereas 91(44.8 percent) had four or more siblings. It was evident from this data that majority of the adolescent girls had large family as far as the number of siblings were concerned. Adolescent girls with first in birth order were 63(31 percent), while 71(35 percent) were second in birth order, 38(18.7 percent) were third in birth order and 31(15.3 percent) were fourth or more in birth order.
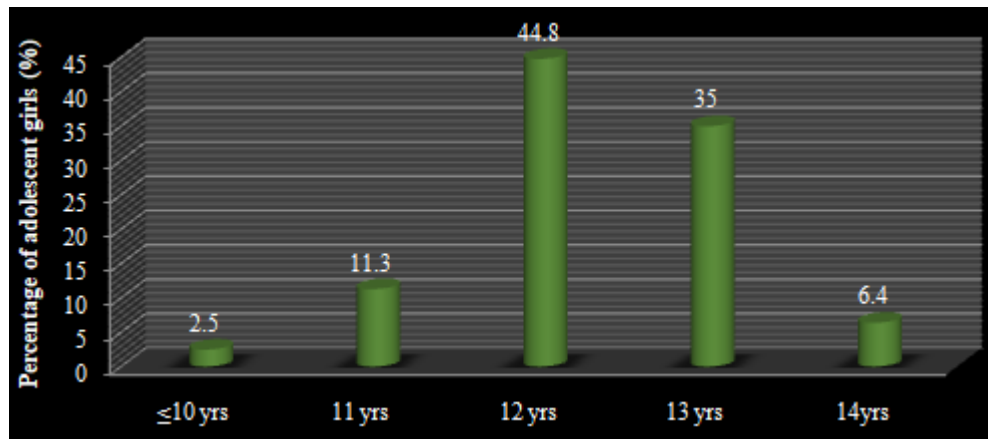
n=203

Figure 1: Distribution of adolescent girls as per age of menarche

The above Fig 1 reveals that out of 203 adolescent girls who gave the history of having attained menarche; 5(2.5percent) attained their menarche at the age of 10 or less than 10 years, 23(11.3percent) attained menarche at the age of 11 years. Most of them, 91(44.8 percent) had attained menarche at the age of 12 years.71(35 percent) attained menarche at the age of 13 years, 13(6.4percent) attained menarche at the age of 14 years. It can be drawn from the findings that most of the adolescent girls attained their menarche at the age of 12 years. Changing trends such as urbanization, lifestyle changes did not have much influence in the present population.

Table 2: Distribution of adolescent girls as per premenstrual symptoms, n=203

Premenstrual symptoms	Frequency (f)	Percentage (%)
Pain abdomen	166	81.8
Giddiness	43	21.2
Vomiting	21	10.3
Abdominal cramps	97	47.8
Headache	52	25.6
Loosemotion	37	18.2
Leg cramps	72	35.5
Mood swings	60	29.6
Anger	74	36.5
Loss of apetite	87	42.9
Sleeplessness	56	27.6
Lack of concentration	12	5.9

(Figures in Parenthesis denote percentage)

The Table 2: highlights the number of adolescent girls suffering from premenstrual symptoms. Majority 166(81.8 percent) complained of pain abdomen, 43(21.2percent) reported of having giddiness. Adolescent girls having complaints of vomiting were reported by 21(10.3percent), while abdominal cramps were reported by 97(47.8 percent) of adolescent girls. Headache was reported among 52(25.6 percent) of adolescent girls, 37 (18.2 percent) reported of having loose motion. Leg cramps were reported by 72 (35.5 percent) adolescent girls, while mood swings were reported among 60(29.6percent) of adolescent girls. Anger was reported among 74(36.5percent) of adolescent girls while loss of appetite was experienced by87(42.9 percent) of adolescent girls. Sleeplessness and lack of concentration were reported by 56(27.6 percent) and 12 (5.9 percent) of adolescent girls respectively.

Table 3: Distribution of type of menstrual irregularities among adolescent girls
n=203

Menstruation	Frequency (f)	Percentage (%)
Normal menstruation	85	42
Hypomenorrhoea	43	21.2
Polymenorrhoea	8	3.9
Oligomenorrhoea	53	26
Metrorrhagia	11	5.4
Menorrhagia	3	1.5

(Figures in Parenthesis denote percentage)

Table3depicts that menstrual irregularities experienced by the adolescent girls were 58% , out of which 21.2% of the adolescent girls suffered from Hypomenorrhoea, 3.9% of the adolescent girls reported of Polymenorrhoea while one fourth (26%) of the adolescent girls reported of Oligomenorrhoea 5.4% and 1.5% of the samples suffered from Metrorrhagia and Menorrhagia respectively.

Table 4: Distribution of adolescent girls as per calorie intake, n=203

Calorie Intake	Frequency (f)	Percentage (%)
Inadequate	164	80.8
Adequate	15	7.4
Extra calorie intake	24	11.8

(Figures in Parenthesis denote percentage)

Table 4 depicts that majority (80.8%) of the adolescent girls had inadequate calories intake ie, ranged from 2310-2490 calories by food frequency questionnaire and only 7.4% of the adolescent girls had adequate calories in their diet while 11.8% of the samples reported of taking extra calories in their diet. It can be inferred from the table that majority of the adolescent girls were not taking adequate diet and many were skipping their breakfast. Hence the dietary pattern was found lacking adequate calorie intake which is especially important during adolescent period to meet the extra demand due to development changes.

Table 5: Distribution of adolescent girls as per BMI, n=203

BMI	Frequency (f)	Percentage (%)
Underweight	74	36.5
Normal	123	60.5
Overweight	5	2.5
Obese	1	0.5

(Figures in Parenthesis denote percentage)

Table 5, depicts that more than half (60.5 percent) of the adolescent girls had normal BMI, while underweight constituted 123(36.5 percent) of adolescent girl and overweight and obese constituted 5(2.5 percent) and 1(0.5percent) respectively.

Table 6: Distribution of adolescent girls as per Grades of Anaemia, n=203

Grades of Anaemia	Frequency (f)	Percentage (%)
Normal Haemoglobin level	28	13.8
Mild anaemia	135	66.5
Moderate anaemia	40	19.7

(Figures in Parenthesis denote percentage)

The above table 6 shows that 175(86.2 percent) of the adolescent girls are anaemic. Out of 203 adolescent girls majority 135(66.5 percent) of the adolescent girls had mild anaemia and 40(19.7percent) had moderate anaemia while only 28(13.8 percent) of the adolescent had normal haemoglobin level. The table depicts that the 86.2 percent of the adolescent girls had anaemia. Hence, the prevalence of anaemia among girls was 86.2 percent.

Table 7: Association of menstrual irregularities with BMI, n=203

BMI	Menstrual Irregularities		Total	p Value	Chi square Value
	Normal f (%)	Irregular f (%)			
Under Weight	0(0)	74(62.71)	74(36.45)	<0.001	86.07
Normal	81(95.29)	42(35.59)	123(60.59)		
Overweight	4(4.71)	1(0.85)	5(2.46)		
Obese	0(0)	1(0.85)	1(0.49)		
Total	85(100)	118(100)	203(100)		

Table value of Chi square 11.34, at p< 0.01, df=3
(Figures in Parenthesis denote percentage)

Data presented in the Table7, depicts that majority of adolescent girls 74(62.71 percent) were underweight and had menstrual irregularities while 42(35.59 percent) of the adolescent girls who had normal BMI also reported of having menstrual irregularities. Overweight were found in 5(2.46 percent) of the adolescent girls out of which 1(0.85 percent) had menstrual irregularities. Only 1(0.49 percent) of the adolescent girls was obese and also had menstrual irregularity during menstruation. Adolescent girls with menstrual irregularities were significantly underweight (62.71%). The computed Chi square value was 86.07 at df= 3, which is more than the Table value ie, 11.34 at p < 0.001, hence there is a significant association observed between menstrual irregularities and BMI of adolescent girls with p value being highly significant at <0.001.

Table 8: Association of menstrual irregularities with Calorie intake among adolescent girls, n=203

Calorie Intake	Menstrual Irregularities		Total	p Value	Chi square Significance
	Normal f (%)	Irregular f (%)			
Inadequate	46(54.12)	118(100)	164(80.79)	0.001	67.02 Significant
Adequate	15(17.64)	0(0)	15(7.39)		
Extra calorie intake	24(28.24)	0(0)	24(11.82)		
Total	85(100)	118(100)	203(100)		

(Figures in Parenthesis denote percentage)

Table value of Chi square is 9.21, at p< 0.01 at df=2

Table 8, clearly depicts that 164(80.79 percent) of adolescent girls had inadequate calorie intake, out of which 118(58.13 percent) adolescent girls had menstrual irregularities. On the other hand, 46(22.66 percent) adolescent girls who gave history of menstrual irregularities had normal menstruation but had inadequate calorie intake. None of the adolescent girls had adequate calorie intake or extra calorie intake having menstrual irregularities. 15(17.65 percent) adolescent girls had adequate calorie intake as well as had normal menstruation. Adolescent girls who were consuming extra calorie in their diet as well as having normal menstruation were 24(28.24percent). There is statistically significant association observed between menstrual irregularities and calorie intake with Pearson Chi square calculated value =67.02, at df=2 and p value <0.001which is more than the table value ie 9.21. Thus, adolescent girls with menstrual irregularities had significant inadequate calorie intake.

Table 9: Association of menstrual irregularities with Grades of Anaemia

Grades of Anaemia	Menstruation		p value	Chi square
	Normal f (%)	Irregular f (%)		
Normal	16 (18.8)	12 (10.2)	0.127 Non-significant	4.135
Mild	56 (65.9)	79 (66.9)		
Moderate	13 (15.3)	27 (22.9)		
Total	85 (100)	118 (100)		

(Figures in Parenthesis denote percentage)

The table 9 depicts, that 79(66.9 percent) of adolescent girls with menstrual irregularities had mild anaemia while 27(22.9percent) had moderate anaemia. Adolescent girls who had normal menstruation with mild anaemia were56(65.9 percent) while normal menstruation with moderate anaemia was found in 13(15.3 percent). Adolescent girls with normal menstruation and normal haemoglobin level were 16(18.8 percent) while, adolescent girls with menstrual irregularities and normal haemoglobin level were 12(10.2 percent). The findings further revealed that there is no statistical significant association observed between menstrual irregularities with grades of anaemia among adolescent girls as the p >0.05. The calculated chi-square value is 4.135 at p<0.127, df=2.

Table 10: Comparison of menstrual irregularities with mean Haemoglobin level, n=203

Menstruation	Mean Hb level	Standard deviation	P value	Unpaired t-test
Normal	10.24	1.20		
Irregular	9.82	0.94	0.019	2.793
				Significant

Unpaired t-test=1.960, p<0.019, at df= 201
(Figures in Parenthesis denote percentage)

The above table 10, shows that the mean haemoglobin level of the adolescent girls having normal menstruation was10.24 with standard deviation of 1.20 while the mean haemoglobin level of the samples having menstrual irregularities was 9.82 with a standard deviation of 0.94. The calculated t value is

2.793 which were more than the table value (1.960) at p<0.019 hence, mean haemoglobin level of the adolescent girls was found to be significantly low in adolescent girls with menstrual irregularities.

4. Conclusion

Statistically significant association was found between menstrual irregularities and nutritional status which constituted anthropometric measurement, calorie intake and haemoglobin level of the individual adolescent girls.It was also found that the mean haemoglobin level was significantly low in adolescent girls and statistical significance observed with menstrual irregularities (9.82±0.94 SD) using unpaired t-test with p= 0.019, while adolescent girls having normal menstruation had a mean haemoglobin level of 10.24±1.20 SD.

Government has launched many nutritional programs to create awareness and help to improve the nutritional status of the community. The present study was conducted to find the association of menstrual irregularities with nutritional status among adolescent girls in selected schools of Kolkata. The findings revealed many significant relations with many variables. Policymakers, media and healthcare professionals can develop more awareness programmes in the schools' regarding the menstrual irregularities and nutritional status. The findings of the study have major implications in the field of medicine, paediatrics, public health administration and in nursing profession.

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