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Comparative study on prevalence of anemia and menstrual health problems among urban and rural adolescent girls

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Abstract

Aim & Objective: This study was undertaken to know the prevalence of anemia and menstrual health problems in both urban and rural areas of Siddipet District.

Methodology: It is comparative cross sectional study

Results: In the present study, total mean hemoglobin of students is 10.95 ± 4.43 . In rural area, mean hemoglobin is 10.49 ± 1.71 which is low compared to the mean hemoglobin levels of students in urban area 11.42 ± 5.99 . The contributing factors of anemia seen in this study are: low socioeconomic status, onset of menarche, nuclear families, vegetarian diet, religion and caste, birth order, body mass index, deworming, age of menarche and menstrual cycle length. Some students experienced symptoms like lack of concentration, headache, tiredness, lack of interest in studies, leg cramps, dizziness, shortness of breath and rapid heartbeat due to anemia. On examining the students, most of them were having palmar pallor, tongue pallor, nail pallor and conjunctival pallor. The adolescent girls are facing various menstrual health problems like abdominal pain, menorrhagia, polymenorrhoea etc. In this study, students who have heavy menstrual flow were prone to anemia. Knowledge and practices of students of urban area like frequency of changing pads and disposal of sanitary pads in dustbins were better than the students in rural area. While students in rural area were using sanitary pads more than the students in urban area

Conclusion: The findings of the study can be used for planning programs, making new policies for improving the level of information especially, for rural adolescent girls. So, students should be educated regarding improvement of their nutrition, diet and exercise, hand washing, health seeking behavior and life style habits in order to build healthy nation.

Keywords: Comparative, prevalence, anemia and rural adolescent girls

Introduction

Anemia is the most prevalent nutritional problem worldwide and it is mainly caused due to iron deficiency. Its prevalence is highest among young children and women of childbearing age; particularly in pregnant women^[1]. The prevalence of anemia is disproportionately high in the developing countries, due to poverty, inadequate diet, worm infestations, pregnancy/lactation and poor access to the health services^[2].

Adolescent girls are at a high risk for anemia and malnutrition. Inadequate nutrition during adolescence can have serious consequences throughout the reproductive years of life and beyond^[3]. Very often, in India, girls get married and pregnant even before the growth period is over, thus doubling the risk for anemia^[4].

Menstruation" is a physiological process that occurs throughout the reproductive years of every woman^[5, 6]. In many instances, this phenomenon is associated with various mental as well as physical morbidities like premenstrual syndrome. Menstruation can also predispose women to life threatening RTI (Reproductive Tract Infection), if hygiene is not maintained throughout menstruation. Especially in Indian scenario where joint families are common in the society, the issues of menstrual hygiene practices are needed to be tackled at early age, as adolescence. The knowledge, attitudes and practices regarding menstrual hygiene, which establish at this age, are usually followed by them throughout life and also passed on to the next generation. Therefore faulty practices pertaining to menstruation will affect health of large number of women in reproductive age group.

Most girls are unaware about proper menstrual practices at the age of menarche.

Use of unhygienic cloths may lead to development of infection of reproductive tract which may seriously hamper the reproductive capacity or even life of female. So, this study was undertaken to know the prevalence of anemia and menstrual health problems in both urban and rural areas of Siddipet District.

Hence the present studies emphasize to know and compare the prevalence of anemia and menstrual health problems in both urban and rural areas of Siddipet District.

Materials and Methods

A study entitled "Comparative Study on Prevalence of Anemia and Menstrual Health Problems among Urban and Rural Adolescent Girls in Siddipet District" was under taken from July 2018 to August 2019.

Study design

A cross sectional comparative study.

Study subjects

School girls aged between 10-19yrs.

Sample size

It is calculated by using formula $(4pq/l^2)$ with 10% allowable error. As the prevalence rate of Anemia in 10-19years adolescent girls is 69% in Andhra Pradesh according to DLHS-4 [7].

p = Prevalence of anemia among adolescent girls in India-69%

q = $100 - p = 100 - 69 = 31$

l = 10% of prevalence = $10/100 \times 69 = 6.9$

$n = 4 \times 69 \times 31 / 6.9 \times 6.9 = 180$

180 girls from urban and 180 girls from rural areas are taken into study.

Data collection

A list of schools in Guntur district and prior permission was obtained from District Educational Officer, Siddipet. Prior Permission from Heads of Institutions and informed consent from study subjects was taken. Data was collected by using semistructured questionnaire.

Study method

Current cross sectional study was conducted in Siddipet District of Andhra Pradesh state, India. The sampling was done using multistage random sampling technique.

First Stage: Siddipet District is divided into 4 different field areas

Second Stage

Random selection of single mandal from each revenue division was done. From each selected mandal, one govt school from the urban area and one Govt School from the rural area were taken into study.

Third Stage: Random selection of 45 girl students from secondary and higher secondary classes of the selected schools was done and were taken into study, there by obtaining the total sample size to be 360.

Study setting

Government schools in Urban and Rural areas of Siddipet

District.

Study period

July 2018 to August 2019.

Test used

Hemoglobin levels are estimated by using Cyanmethaemoglobin method. Blood samples were collected with the help of a lab technician and sent to the pathologist for evaluation. 2ml of venous blood was collected in a test tube with EDTA for haemoglobin estimation.

Materials

Semi structured questionnaire, measuring tape, marking pencil, weighing machine, plastic ruler.

Weight

Weight recording of every subject was done with help of a Standardized weighing machine.

Height

Height was measured by using a non -stretchable measuring tape.

Body Mass Index (BMI):-BMI was calculated by dividing weight in kilograms and the square of height in meters [Quetelet's Index].

$BMI = \text{Weight (kg)} / \text{Height (m)}^2$

WHO Classification of BMI [8]

| | | |
|--------------|---|-------------|
| Under Weight | - | <18.50 |
| Normal range | - | 18.50-24.99 |
| Overweight | - | 25-29.99 |
| Obese | - | ≥ 30 |

Hemoglobin estimation

Cyanmethemoglobin method

Data analysis

The data was analyzed using SPSS (Statistical package for Social Sciences) Version 23. Descriptive results were expressed in terms of percentage, means, proportions and relevant tests of significance like Standard error of difference between proportions, Chi-square test were applied and $p < 0.05$ was considered as statistically significant.

Ethical clearance

Was taken from Ethical committee of Surabhi Institute of Medical Sciences, Siddipet.

Inclusion criteria: All adolescent girls of age between 10 to 19 years who are willing to participate, who gave consent and who were present in the school on the day of study.

Exclusion criteria

1. Girls who are not willing to participate.
2. Girls who did not obtained menarche.
3. Absentees and dropouts from schools during the day of visit.

Results

Table 1: Hemoglobin Levels of Students in Urban & Rural Areas

| Area | Non-Anemic | % | Anemic | % | Total |
|-------|------------|--------|--------|--------|-------|
| Rural | 22 | 12.22% | 158 | 87.78% | 180 |
| Urban | 58 | 32.22% | 122 | 67.78% | 180 |
| Total | 80 | 22.22% | 280 | 77.78% | 360 |

In this study, out of 80 students who were having normal levels of hemoglobin, 22 students were from the rural areas and 58 students were from the urban areas. While out of 280 students who were anemic, 158 students were in the rural areas and 122 students were in the urban areas. The analysis of chi-square test suggests that the Proportion of Anemia is significantly higher in the rural area as compared to the Urban area (P<0.001). Normal levels of Hemoglobin were seen in 58 students (32.22%) belonging to the urban areas and only in 22 students (12.22%) of the rural areas. Mild anemia was seen in 73 students (40.56%) belonging to

the urban areas while higher rates were seen in 99students (55%) belonging to the rural areas. Moderate anemia was seen in 45students (25%) belonging to urban areas and 54(30%) students belonging to rural areas. Severe anemia was seen in 4 students (2.22%) belonging to urban areas and 5(2.78%) students belonging to rural areas. There was significant association between Anemia and Place of stay. (P<0.0001*S).

Sociodemographic factors in relation to anemia in students

Table 2: Age Wise Distribution of the Study Population

| AGE | Non-Anemic | | | | Anemic | | | | Total |
|----------------------------|------------|-------|-------|--------|---|--------|-------|--------|-------|
| | Rural | % | Urban | % | Rural | % | Urban | % | |
| 10-14 | 22 | 6.73% | 54 | 16.51% | 150 | 45.87% | 101 | 30.89% | 327 |
| 15-19 | 0 | 0 | 4 | 12.12% | 8 | 24.24% | 21 | 63.64% | 33 |
| Total | 22 | 6.11% | 58 | 16.11% | 158 | 43.89% | 122 | 33.89% | 360 |
| Fisher Exact Test: 0.57;NS | | | | | Chi-square test: 10.95; P value:<0.0009*S | | | | |

In the present study, majority 327 (90.83%) of adolescent girls were in 10-14 years age group followed by 33(9.17%) in 15-19 years age group. Students in rural areas having the age group between 10-14 years have anemia of 45.87% while students in urban area belonging to the same age

group have anemia of 24.24%. Higher levels of anemia was seen in students of urban areas (63.64%) aged between 15-19 years. There was significant association between Age, Place of stay and Anemia (P<0.0001*S).

Table 3: Distribution of students by their Education

| Class | Non-Anemic | | | | Anemic | | | | Total |
|-------------------------------------|------------|--------|-------|--------|-------------------------------------|--------|-------|--------|-------|
| | Rural | % | Urban | % | Rural | % | Urban | % | |
| 7 | 4 | 8.00% | 0 | 0.00% | 46 | 92.00% | 0 | 0.00% | 50 |
| 8 | 6 | 15.00% | 1 | 2.50% | 33 | 82.50% | 0 | 0.00% | 40 |
| 9 | 7 | 5.38% | 34 | 26.15% | 44 | 33.85% | 45 | 34.62% | 130 |
| 10 | 5 | 3.57% | 23 | 16.43% | 35 | 25.00% | 77 | 55.00% | 140 |
| Total | 22 | 6.11% | 58 | 16.11% | 158 | 43.89% | 122 | 33.89% | 360 |
| Chi-square:25.99; P value:<0.0001*S | | | | | Chi-square: 91.65 P value:<0.0001*S | | | | |

In this study, Students in rural area studying 7th class (92%) have high levels of anemia and later decreasing with increase in education. While in contrast, anemia tends to

increase with increase in education in urban areas (55%), there by showing statistical significance (P<0.0001*S) between place of stay, education and anemia.

Table 4: Descriptive Statistics for Hb % (Overall Sample)

| Class | N | Mean | SD | SEM | 95% CI | | Min | Max |
|-------|-----|-------|------|------|-------------|-------------|-----|------|
| | | | | | Lower Bound | Upper Bound | | |
| 7 | 50 | 10.45 | 1.74 | 0.25 | 9.96 | 10.94 | 6 | 15.1 |
| 8 | 40 | 10.50 | 1.87 | 0.30 | 9.90 | 11.09 | 6.2 | 15 |
| 9 | 130 | 11.21 | 1.76 | 0.15 | 10.90 | 11.51 | 5.5 | 16.6 |
| 10 | 140 | 11.03 | 6.74 | 0.57 | 9.90 | 12.15 | 5.7 | 87 |
| Total | 360 | 10.95 | 4.43 | 0.23 | 10.49 | 11.41 | 5.5 | 87 |

In this study, for overall sample 50 students are studying 7th class having mean hemoglobin as 10.45±1.74, and 40 students are studying 8th class having mean hemoglobin as 10.50±1.87, and 130 students are studying 9th class having

mean hemoglobin as 11.21±1.76, and 140 students are studying 10th class having mean hemoglobin as 11.03±6.74. While all the 360 students are having mean hemoglobin as 10.95±4.43.

Table 5: Descriptive Statistics for Hb % (Rural Area)

| Class | N | Mean | SD | SEM | 95% CI | | Min | Max |
|-------|-----|-------|------|------|-------------|-------------|-----|------|
| | | | | | Lower Bound | Upper Bound | | |
| 7 | 50 | 10.45 | 1.74 | 0.25 | 9.96 | 10.94 | 6 | 15.1 |
| 8 | 39 | 10.40 | 1.79 | 0.29 | 9.82 | 10.98 | 6.2 | 15 |
| 9 | 51 | 10.59 | 1.56 | 0.22 | 10.16 | 11.03 | 5.5 | 15.6 |
| 10 | 40 | 10.48 | 1.84 | 0.29 | 9.90 | 11.07 | 5.7 | 15 |
| Total | 180 | 10.49 | 1.71 | 0.13 | 10.24 | 10.74 | 5.5 | 15.6 |

In this study, for rural area 50 students are studying 7th class having mean hemoglobin as 10.45±1.74, and 39 students are studying 8th class having mean hemoglobin as 10.40±1.79, and 51 students are studying 9th class having mean

hemoglobin as 10.59±1.56, and 40 students are studying 10th class having mean hemoglobin as 10.48±1.84. While all the 180 students in the rural area are having mean hemoglobin as 10.49±1.71.

Table 6: Descriptive Statistics for Hb % (Urban Area)

| Class | N | Mean | SD | SEM | 95% CI | | Min | Max |
|-------|-----|-------|------|------|-------------|-------------|------|------|
| | | | | | Lower Bound | Upper Bound | | |
| 8 | 1 | 14.30 | --- | --- | --- | --- | 14.3 | 14.3 |
| 9 | 79 | 11.60 | 1.78 | 0.20 | 11.20 | 12.00 | 6.6 | 16.6 |
| 10 | 100 | 11.24 | 7.90 | 0.79 | 9.68 | 12.81 | 6.1 | 87 |
| Total | 180 | 11.42 | 5.99 | 0.45 | 10.53 | 12.30 | 6.1 | 87 |

In this study, from urban area, 1 student studying 8th class having mean hemoglobin as 14.30. Students studying 9th class (79) were having mean hemoglobin as 11.60±1.78. Students studying 10th class (100) were having mean hemoglobin as

11.24±7.90. While all the 180 students in the urban area were having mean hemoglobin as 11.42±5.99.

Anemia with relation to Nutrition

Table 7: Distribution of students based on Body Mass index

| BMI | Non-Anemic | | | | Anemic | | | | Total |
|----------------------------------|------------|-------|-------|--------|------------------------------------|--------|-------|--------|-------|
| | Rural | % | Urban | % | Rural | % | Urban | % | |
| Under Weight | 16 | 6.56% | 33 | 13.52% | 123 | 50.41% | 72 | 29.51% | 244 |
| Normal | 6 | 6.19% | 18 | 18.56% | 31 | 31.96% | 42 | 43.30% | 97 |
| Overweight | 0 | 0.00% | 4 | 33.33% | 4 | 33.33% | 4 | 33.33% | 12 |
| obese | 0 | 0.00% | 3 | 42.86% | 0 | 0.00% | 4 | 57.14% | 7 |
| Total | 22 | 6.11% | 58 | 16.11% | 158 | 43.89% | 122 | 33.89% | 360 |
| Chi-square: 3.38 P value:0.33;NS | | | | | Chi-square: 14.61 P value:<0.002*S | | | | |

In this study, most of the students were underweight 244(67.78%) followed by normal weight 97(26.94%), overweight 12(3.33%) and obese 7(1.94%). In this study, students belonging to rural areas and underweight

have 50.41% of anemia, while in contrast students belonging to urban area and obese (57.14%) were having higher rates of anemia. Statistical significance was seen between Body mass Index, Area and Anemia.

Table 8: Distribution based on intake of Iron containing foods

| IRON FOODS | Non-Anemic | | | | Anemic | | | | Total |
|---------------------------|------------|--------|-------|--------|----------------------------------|--------|-------|--------|-------|
| | Rural | % | Urban | % | Rural | % | Urban | % | |
| NO | 7 | 12.07% | 10 | 17.24% | 26 | 44.83% | 15 | 25.86% | 58 |
| YES | 15 | 4.97% | 48 | 15.89% | 132 | 43.71% | 107 | 35.43% | 302 |
| Total | 22 | 6.11% | 58 | 16.11% | 158 | 43.89% | 122 | 33.89% | 360 |
| Fischer Exact Test:0.2;NS | | | | | Chi-square: 0.95 P value:0.32;NS | | | | |

In this study, 302 (83.89%) students were taking iron containing foods regularly, while 58(16.11%) students were not taking any iron containing foods. Most of the students were

anemic in rural (132) even after taking of iron rich foods regularly compared to students in urban area (107).

Table 9: Associated Symptoms in study subjects

| Symptoms | Rural | | Urban | | Total | | p-value |
|---------------------|-------|--------|-------|--------|-------|--------|----------|
| | n | % | n | % | n | % | |
| Concentration | 90 | 50.00% | 36 | 20.00% | 126 | 35.00% | <.001** |
| Tiredness | 82 | 45.56% | 34 | 18.89% | 116 | 32.22% | <.001** |
| Headache | 51 | 28.33% | 55 | 30.56% | 106 | 29.44% | .447, NS |
| Lack Of Interest | 50 | 27.78% | 35 | 19.44% | 85 | 23.61% | <.001** |
| Leg Cramps | 29 | 16.11% | 52 | 28.89% | 81 | 22.50% | <.001** |
| Soreness Of Mouth | 39 | 21.67% | 35 | 19.44% | 74 | 20.56% | .432, NS |
| Worms In Stools | 20 | 11.11% | 23 | 12.78% | 43 | 11.94% | .489, NS |
| Dizziness | 23 | 12.78% | 8 | 4.44% | 31 | 8.61% | <.001** |
| Shortness Of Breath | 17 | 9.44% | 10 | 5.56% | 27 | 7.50% | 0.022* |
| Rapid Heart Beat | 13 | 7.22% | 9 | 5.00% | 22 | 6.11% | 0.024* |
| Odema | 3 | 1.67% | 2 | 1.11% | 5 | 1.39% | 0.544,NS |

** : Sig. at 1% level, * : Sig. at 5% level, NS: Not Sig.

In this study, Out of 126 (35.00%) students who complained of lack of concentration, 90 (50%) students in rural area were having it, while it is in 36 (20.00%) students in urban area, which is statistically significant (<0.001). Similarly, out of 116 (32.22%) students who complained of tiredness, 82 (45.56%) in rural were having it, while it was in 34 (18.89%) students in urban area, which is statistically significant (<0.001).

Out of 85(23.61%) students, who have lack of interest in studies, 50 (27.78%) students were in rural area and 35 (19.44%) students were in urban area, which is statistically

significant (<0.001).

Out of 81(22.50%) students, who complained of leg cramps, 29 (16.11%) students in rural were complaining of it, while it is seen in 52 (28.89%) students in urban area, which is statistically significant (<0.001). Similarly, out of 31 (8.61%) students complained of dizziness, 23 (12.78%) were from rural and 8 (4.44%) students were from urban area.

Anemia in relation to Menstrual Factors

Table 10: Anemia in Relation with Age of Menarche

| Age Of Menarche | Non-Anemic | | | | Anemic | | | | Total |
|---------------------------------|------------|--------|-------|--------|------------------------------------|--------|-------|--------|-------|
| | Rural | % | Urban | % | Rural | % | Urban | % | |
| 11 | 2 | 7.41% | 5 | 18.52% | 7 | 25.93% | 13 | 48.15% | 27 |
| 12 | 9 | 6.77% | 16 | 12.03% | 81 | 60.90% | 27 | 20.30% | 133 |
| 13 | 8 | 5.71% | 23 | 16.43% | 58 | 41.43% | 51 | 36.43% | 140 |
| 14 | 2 | 3.92% | 13 | 25.49% | 9 | 17.65% | 27 | 52.94% | 51 |
| 15 | 1 | 11.11% | 1 | 11.11% | 3 | 33.33% | 4 | 44.44% | 9 |
| TOTAL | 22 | 6.11% | 58 | 16.11% | 158 | 43.89% | 122 | 33.89% | 360 |
| Chi-square: 2.97 P value:0.5;NS | | | | | Chi-square: 34.33 P value:<0.001*S | | | | |

In this study, 27 (7.5%) students attained menarche at 11yrs, 133 (36.94%) students at 12 years, 140 (38.89%) students at 13 years, 51 (14.17%) students at 14 years and 9 (2.5%) students at 15 years of age.

In this study, students who attained menarche at an earlier

age were having anemia compared to the students who attained menarche at a later age. There was statistical significance between age of menarche, Area & Hb%. The mean age of menarche in both urban and rural areas was 12.5 years.

Table 11: Anemia with Relation to Menstrual Regularity

| Menstrual Regularity | Non-Anemic | | | | Anemic | | | | Total |
|---------------------------|------------|-------|-------|--------|----------------------------------|--------|-------|--------|-------|
| | Rural | % | Urban | % | Rural | % | Urban | % | |
| Irregular | 4 | 7.02% | 4 | 7.02% | 27 | 47.37% | 22 | 38.60% | 57 |
| Regular | 18 | 5.94% | 54 | 17.82% | 131 | 43.23% | 100 | 33.00% | 303 |
| Total | 22 | 6.11% | 58 | 16.11% | 158 | 43.89% | 122 | 33.89% | 360 |
| Fischer Exact Test:0.2;NS | | | | | Chi-square: 0.04 P value:0.83;NS | | | | |

In this study, 303(84.17%) students were having regular menstrual cycle, 57(15.83%) students were having irregular menstrual cycle. Irregular menstrual cycles were seen most

in students who were anemic and living in (27) rural area compared to (22) urban area.

Table 12: Anemia in relation to menstrual cycle length

| Cycle Length | Non-Anemic | | | | Anemic | | | | Total |
|--------------------------------|------------|-------|-------|--------|----------------------------------|--------|-------|--------|-------|
| | Rural | % | Urban | % | Rural | % | Urban | % | |
| <21 | 4 | 7.41% | 8 | 14.81% | 26 | 48.15% | 16 | 29.63% | 54 |
| 21-35 | 16 | 5.65% | 46 | 16.25% | 127 | 44.88% | 94 | 33.22% | 283 |
| >35 | 2 | 8.70% | 4 | 17.39% | 5 | 21.74% | 12 | 52.17% | 23 |
| Total | 22 | 6.11% | 58 | 16.11% | 158 | 43.89% | 122 | 33.89% | 360 |
| Chi-square:0.40 P value:0.8;NS | | | | | Chi-square: 5.66 P value:0.059;S | | | | |

In this study, 54(15%) students were having menstrual cycle length <21 days, 283(78.61%) students between 21-35 days, while 23(6.39%) students were having the cycle length of

>35 days. In this study, anemia was high in students, who were having cycle length more than 35 days in urban areas.

Table 13: Distribution based on No. of days of flow

| No. Of Days of Flow | Non-Anemic | | | | Anemic | | | | Total |
|----------------------------------|------------|-------|-------|--------|---------------------------------|--------|-------|--------|-------|
| | Rural | % | Urban | % | Rural | % | Urban | % | |
| <4 | 13 | 8.67% | 25 | 16.67% | 60 | 40.00% | 52 | 34.67% | 150 |
| 4 - 6 | 8 | 4.47% | 31 | 17.32% | 83 | 46.37% | 57 | 31.84% | 179 |
| >6 | 1 | 3.23% | 2 | 6.45% | 15 | 48.39% | 13 | 41.94% | 31 |
| Total | 22 | 6.11% | 58 | 16.11% | 158 | 43.89% | 122 | 33.89% | 360 |
| Chi-square: 1.86 P value:0.39;NS | | | | | Chi-square: 0.93 P value:0.6;NS | | | | |

In this study, 179 (49.72%) students were having 4-6 days of flow, 150 (41.67%) students were having <4 days of flow and 31 (8.615) students were having flow of >6 days. In this

study, higher rates of anemia were seen in students who have flow more than 6 days in rural areas.

Table 14: Distribution of students having Menstrual Problems

| Menstrual Problems | variable | Non-Anemic | | Anemic | | Total |
|-----------------------------------|----------|------------|-------|--------|-------|-------|
| | | Rural | Urban | Rural | Urban | |
| Bleeding B/W Periods | No | 19 | 57 | 149 | 114 | 339 |
| | Yes | 3 | 1 | 9 | 8 | 21 |
| Menstrual Disorder | No | 22 | 56 | 150 | 118 | 346 |
| | Yes | 0 | 2 | 8 | 4 | 14 |
| Clots during menstruation | No | 16 | 53 | 117 | 114 | 300 |
| | Yes | 6 | 5 | 41 | 8 | 60 |
| Pain during Menstruation | No | 10 | 16 | 82 | 32 | 140 |
| | Yes | 12 | 42 | 76 | 90 | 220 |
| Symptoms of Premenstrual syndrome | No | 4 | 34 | 47 | 72 | 157 |
| | Yes | 18 | 24 | 111 | 50 | 203 |

Most of the students had menstrual problems like pain during menstruation and symptoms of premenstrual syndrome in both rural and urban areas. In rural areas those who were anemic, 76 students were having pain during menstruation, while in urban area, relatively higher number

of students (90) were complaining. Similarly, in rural areas those who were anemic, 111 students were having symptoms of premenstrual syndrome, while in urban area, relatively less number of students (90) were complaining.

Table 15: Healthy Habits during Menstruation

| Knowledge and Practices | variable | Non-Anemic | | Anemic | | Total |
|---------------------------------|------------------|------------|-------|--------|-------|-------|
| | | Rural | Urban | Rural | Urban | |
| Using | Sanitary Napkins | 20 | 55 | 153 | 114 | 342 |
| | Old cloth Pieces | 2 | 3 | 5 | 8 | 18 |
| Reusing old cloth pieces | No | 22 | 56 | 156 | 118 | 352 |
| | Yes | 0 | 2 | 2 | 4 | 8 |
| Frequency of changing pads/ day | 1 | 0 | 0 | 4 | 2 | 6 |
| | 2 | 11 | 31 | 64 | 71 | 177 |
| | 3 | 11 | 27 | 80 | 45 | 163 |
| | >3 | 0 | 0 | 10 | 4 | 14 |
| Availability Of water & Toilets | No | 0 | 0 | 6 | 0 | 6 |
| | Yes | 22 | 58 | 152 | 122 | 354 |
| Attending School | No | 0 | 0 | 10 | 1 | 11 |
| | Yes | 22 | 58 | 148 | 121 | 349 |
| Disposal | Dustbins | 19 | 58 | 124 | 122 | 323 |
| | Throwing | 2 | 0 | 25 | 0 | 27 |
| | Toilets | 1 | 0 | 9 | 0 | 10 |

In this study, most of the students were using sanitary napkins while few (18) students were using and reusing (8) old cloth pieces during menstruation. Most of the students were changing pads twice daily in urban areas (102) compared to rural areas (75). Most of the students were attending school during menstruation and are having toilets and water facilities in the schools. Most of them were disposing sanitary pads in dustbins.

Discussion

Haemoglobin levels of all students

In this study, out of 80 (22.22%) students who were having normal hemoglobin, 22 (27.50%) students in rural area and 58 (72.50%) students in urban area were having normal levels of Hemoglobin. While out of 280 (77.78%) students who were anemic, 158 (56.43%) in rural area and 122 students (43.57%) in urban area were having anemia.

In this study, overall prevalence of anemia is 77.78%. While Prevalence of anemia in different settings among adolescent girls in India was follows

| | Age Group | n | (%) |
|---|------------------|----------|------------|
| Rural | | | |
| Rajasthan ^[9] | 10-18 | 941 | 73.7 |
| Tamil Nadu ^[10] | 13-19 | 281 | 44.8% |
| Haryana (School going) ^[11] | 13-17 | 218 | 80.8% |
| Haryana (Non-school going) ^[11] | 13-17 | 206 | 90.3% |
| Rajasthan ^[12] | 11-18 | 185 | 85.4%. |
| Setting | Age Group | n | (%) |
| Urban | | | |
| Delhi (high socio economic) ^[13] | 11-18 | 251 | 46.6% |

| | | | |
|---|-------|------|-------|
| Delhi (low socio economic) ^[13] | 11-18 | 195 | 56% |
| Slums of Vadodara, Baroda ^[14] | 10-18 | 203 | 81% |
| Schools of Vadodara, Baroda ^[14] | 10-19 | 2090 | 75% |
| Delhi ^[12] | 11-18 | 520 | 61.9% |
| Slums Hyderabad ^[15] | 10-19 | 2500 | 88% |

In this study, Out of 360 students, 280 were found anemic. Majority of girls 172(47.78%) were having mild anemia, 99 (27.50%) students were having moderate anemia and only 9(2.5%) students have severe anemia. Overall mean Hemoglobin level was 11 which have similar findings from the study conducted in urban slum by Meenal Vinay Kulkarni *et al.* ^[16]. Out of 272 adolescent girls in the study population, 245 (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 were severely anemic. Overall mean hemoglobin level was 10.33 ± 1.34 .

Age

In the present study, majority 327 (90.83%) of adolescent girls were in 10-14 years age group followed by 33(9.17%) in 15-19 years age group. Mean age in our study population was 14.05 ± 1.19 yrs. In this study, students of rural areas in the age group 10-14 years have anemia of 45.87% while students of urban area in the same age group was 24.24%. Higher levels of anemia was seen in students of urban areas (63.64%) aged between 15-19 years. There was significant association between age, place of stay and anemia ($P < 0.0001 * S$). Similar findings were seen in study conducted in urban area by Premalatha *et al.* ^[17], while this denies the report of studies done in rural area by Rajani *et al.* ^[18].

Education

In this study, Students in rural area studying 7th class (92%) have high levels of anemia and later decreasing with increase in education. There was a statistical significance ($P < 0.0001 * S$) between place of stay, education and anemia. In this study, an inverse relation between education of girl and anemia was observed in the students of rural area while contrast findings were seen in studies done by Kaur ^[2] and Gautham *et al.* ^[19] done in rural area.

Body mass index

In this study, most of the students are underweight 244(67.78%), followed by normal weight 97(26.94%), overweight 12(3.33%) and obese 7(1.94%). Choudhary *et al.* (2003) ^[20] reported that 68.2% of adolescence had BMI of less than 18.5.

Type of diet

In this study, vegetarians were more anemic than non-vegetarian students which have similar findings to the study conducted by Verma *et al.* ^[21].

Iron containing foods

In this study, 302 (83.89%) students are taking iron containing foods, while 58(16.11%) students are not taking any iron containing foods. In the study conducted by Baliga *et al.* ^[22], the average intake of iron was 11%.

Menstrual cycle length

In this study, 54(15%) students were having menstrual cycle length <21 days, 283(78.61%) students between 21-35 days,

while 23(6.39%) students are having the cycle length of >35 days. Similar findings were seen in study conducted in the rural area by Rana *et al.* ^[23].

No. Of Days of Flow

In this study, 179 (49.72%) students are having 4-6 days of flow, 150 (41.67%) students are having <4 days of flow and 31 (8.6%) students having flow of >6 days. In the study done in rural area by Wasnik VR *et al.* ^[24], the duration of blood flow was within 5 days in 75.8% of adolescent girls with 24.2% having prolonged menses.

Type of flow

In this study, students having heavy flow, 59 (81.94%) students were having anemia. In students who were having moderate flow, 194 (78.22%) students were having anemia. In students who were having scanty flow, 27 (67.50%) students were having anemia.

In this study, students who were having heavy flow in rural area (50%) were more anemic compared to other students, which was similar with studies conducted in the rural area by Jagannath *et al.* ^[25].

Usage of sanitary pads

In this study, most of the students were using sanitary pads (95%), which is similar to study conducted in Lebanon ^[26] and slightly less in the study conducted by Tarhane *et al.* ^[27].

Conclusion

The present study revealed a comprehensive picture of socio demographic factors and menstrual factors which influenced the prevalence and severity of anemia. Students in rural area are more anemic than the students of urban Area. Most of them are mild anemic followed by moderate and severe anemic.

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Conflict of Interest

None

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