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ORIGINAL ARTICLE

Relation Between Dysmenorrhea and Body Mass Index in Adolescents with Rural Versus Urban Variation

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Abstract
Objectives To find out the relation between the frequency of dysmenorrhea and body mass index in adolescents and to assess the impact of socio-demographic factors, especially rural/urban variation in the frequency of dysmenorrhea.
Methods Cross-sectional study of 200 urban and 200 rural school going adolescent girls at Udaipur and Bedla Districts, Rajasthan.
Results Of the 400 girls, the prevalence of dysmenorrhea was found to be very high (81.5 % rural and 76 % urban). In the rural setup, of the total girls with mild dysmenorrhea, 71.84 % had BMI < 16.5, with 27.18 % underweight. All girls with moderate and severe dysmenorrhea had BMI < 16.5. In the urban setup, of all girls with mild dysmenorrhea, 38.05 % had BMI < 16.5 and 54.86 % were underweight. All girls with severe and 80 % with moderate dysmenorrhea had BMI < 16.5. All girls with no dysmenorrhea had normal BMI. There was significant rural versus urban variation.
Conclusions Relation between dysmenorrhea and BMI was found to be significant ($p < 0.01$) with increased prevalence in the low BMI group. Hence, improving the nutritional status of adolescent girls may reduce dysmenorrhea.

Keywords Dysmenorrhea · Body mass index · Adolescents

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Introduction

Dysmenorrhea refers to a cyclical lower abdominal or pelvic pain which may radiate to the back or to the thighs, occurring during menstruation. The actual word dysmenorrhea is derived from the Greek words, "dys" meaning difficult, "meno" meaning month, and "rrhea" meaning flow.

It is divided into primary dysmenorrhea and secondary dysmenorrhea. Primary dysmenorrhea is defined as cramping pain in the lower abdomen occurring at the onset of menstruation in the absence of any identifiable pelvic disease. It is differentiated from secondary dysmenorrhea, which refers to painful menses resulting from an identifiable pelvic pathology like fibroid, adenomyosis, pelvic inflammatory disease etc.

The etiology of primary dysmenorrhea is not precisely understood, but most symptoms can be explained by the action of prostaglandins, particularly PGF2alpha which is released during endometrial sloughing. As menstruation begins, PGF2alpha stimulates myometrial contractions, ischemia, and sensitization of nerve endings. The clinical evidence of this theory is quite strong. Women with more severe dysmenorrhea have higher levels of PGF2alpha in

their menstrual fluid. In addition, several studies have demonstrated the impressive efficacy of NSAIDS, which act through prostaglandins synthetase inhibition. Some studies have also implicated increased levels of leukotrienes and vasopressin, but these connections are not well established [1–6].

Primary dysmenorrhea usually presents during adolescence within 3 years of menarche. It is unusual for symptoms to start within the first 6 months after menarche. A focused history and physical examination is usually sufficient to make the diagnosis of primary dysmenorrhea. History reveals the typical cramping pain and physical examination is completely normal.

Body mass index or quetelet index is a statistical measure which compares a person's height and weight. Due to its ease of calculation, BMI is the most widely used diagnostic tool to identify obesity problems within a population. BMI is defined as the individual's bodyweight divided by the square of his height.

BMI does not take into account many factors like frame size, muscularity, fat, bone, cartilage, water weight etc. Despite this, BMI can be calculated quickly and without expensive instruments. Hence, it has been used by the WHO as the standard for recording obesity statistics since 1980s. The WHO considers BMI < 18.5 as underweight and may indicate malnutrition, an eating disorder, or other health problems while a BMI > 25 is considered overweight. Normal BMI ranges from 18.5 to 25. Severely underweight (starvation) is BMI < 16.5. Obese Class 1 is BMI between 30 and 35, Obese Class 2 is BMI between 35 and 40, and Obese Class 3 is BMI > 40.

Primary dysmenorrhea is by far the most common gynecological problem in menstruating women. It is so common that many fail to report it, even when their daily activities become restricted because they consider pain to be a normal part of the menstrual cycle. The consequences of untreated dysmenorrhea range from loss of work and school absenteeism to family and personal disruption. In a study done, dysmenorrhea accounted for 600 million work hours lost and $2 billion lost in productivity annually [7, 8]. Therefore, dysmenorrhea affects not only the untreated person, but also their family, social, and national economics. Hence, it is necessary to clarify what factors are associated with menstrual pain in adolescents to assist in improving their quality of life.

Our work aims to study the prevalence of dysmenorrhea and the influence of BMI and socio-demographic factors like rural and urban variation in relation to it.

Methods

Our study was conducted in adolescent girls, in Udaipur and Bedla districts of Rajasthan from March 2008 to December 2008. The study population was a cross-sectional sample of 400 school-going girls, with 200 rural and 200 urban girls, in the age group 12–18 years. The rural study was conducted at Rajkiya Balika Uchh Prathmik Vidyalaya, Bedla and the urban study at Rajkiya Janjati Kasturba Balika Vidyalaya, Madhuban, Udaipur. The cases studied fulfilled the following criteria: (A) adolescent girls in the age group 12–18 years. (B) Have attained menarche at least 6 months back.

A detailed history was taken in the form of a self-administered questionnaire, regarding socio-demographic factors, dietary history, menstrual history, past history, and family history. Intensity of pain was assessed by the Multidimensional Scoring System of Andersch and Milsom [9] (1982) which defines pain as follows:

(A) Mild dysmenorrhea is defined as painful menstruation with no limitation of normal activity, with infrequent requirement of analgesics and no systemic complaints.
(B) Moderate dysmenorrhea is defined as menstrual pain affecting daily activities, with requirement of analgesics for pain relief and few systemic complaints.
(C) Severe dysmenorrhea is defined as menstrual pain with severe limitation of daily activities, poor response to analgesics, and apparent systemic complaints like vomiting, fainting etc.

General physical examination was performed to exclude pallor, nipple discharge, or abnormal body hair distribution. Height was recorded by the stadiometer in centimeters (converted to meters) as per ICMR guidelines 1957, maintaining an accuracy of 0.5 cm. The weight was measured using a balanced beam scale, wearing light clothes and no shoes, up to the nearest 100 gm.

Body mass index was calculated as weight in kilograms/height in square meters.

Results

Of the total 200 girls in the rural setup (Table 1), 52 % had mild, 26.5 % had moderate, and 3 % had severe dysmenorrhea. Similarly, in the urban setup, of the total 200 girls, mild dysmenorrhea was present in 56.5 %, while 12.5 % had moderate and 7 % had severe dysmenorrhea. Although

Table 1 Prevalence of dysmenorrhea (rural vs urban variation)

	Dysmenorrhea			
	No	Mild	Moderate	Severe
Rural ($n = 200$) (%)	37 (18.5)	104 (52)	53 (26.5)	6 (3)
Urban ($n = 200$) (%)	48 (24)	113 (56.5)	25 (12.5)	14 (7)

Table 2 BMI distribution in adolescents (rural vs urban variation)

BMI	Rural ($n = 200$) (%)	Urban ($n = 200$) (%)
<16.5	133 (66.5)	77 (38.5)
16.5–18.5	29 (14.5)	67 (33.5)
18.5–25	38 (19)	56 (28)
>25	0 (0)	0 (0)

these values were not significant, and no significant rural versus urban variation was found, yet the prevalence of dysmenorrhea was found to be very high with 81.5 % in the rural setup and 76 % in the urban setup suffering from it.

In our study (Table 2), majority of the rural girls were underweight with 66.5 % having BMI < 16.5(starvation), 14.5 % underweight, and just 19 % having normal BMI. Of the total urban girls, 38.5 % had BMI < 16.5, 33.5 % were underweight, and 28 % had normal BMI. This indicates the poor nutritional status of Indian adolescent girls, particularly in the rural setup.

According to our study (Table 3), of the total school going rural girls, 15 % miss school due to moderate dysmenorrhea and 3 % due to severe dysmenorrhea. Also, 21 % were unable to pursue their hobbies due to moderate and 3 % due to severe dysmenorrhea. Of the total school going urban girls, 8.5 % were absent from school due to moderate and 7 % due to severe dysmenorrhea. Also, 11.5 % were unable to pursue their hobbies due to mild, 1 % due to moderate, and 7 % due to severe dysmenorrhea. Although these values were not significant, yet it proves that dysmenorrhea has its impact on daily activities, with many girls being forced to skip school or abandon their hobbies consequently.

Among the rural girls (Table 4), of the total girls having mild dysmenorrhea, majority (71.84 %) had BMI < 16.5 whereas 27.18 % were underweight and just 0.97 % had normal BMI. All girls with moderate and severe dysmenorrhea had BMI < 16.5. All girls with no dysmenorrhea had normal BMI. These values were found to be highly significant ($p < 0.001$).

Table 4 Relation between dysmenorrhea and BMI in rural population

BMI	Dysmenorrhea			
	No (%)	Mild (%)	Moderate (%)	Severe (%)
<16.5	0 (0)	74 (71.84)	53 (100)	6 (100)
16.5–18.5	0 (0)	28 (27.18)	0 (0)	0 (0)
18.5–25	38 (100)	1 (0.97)	0 (0)	0 (0)
>25	0 (0)	0 (0)	0 (0)	0 (0)
Total ($n = 200$)	38	103	53	6

$p < 0.001$

Table 5 Relation between dysmenorrhea and BMI in urban population

BMI	Dysmenorrhea			
	No (%)	Mild (%)	Moderate (%)	Severe (%)
<16.5	0 (0)	43 (38.05)	20 (80)	14 (100)
16.5–18.5	0 (0)	62 (54.86)	5 (20)	0 (0)
18.5–25	48 (100)	8 (7.07)	0 (0)	0 (0)
>25	0 (0)	0 (0)	0 (0)	0 (0)
Total ($n = 200$)	48	113	25	14

$p < 0.001$

In the urban setting (Table 5), of the total girls with mild dysmenorrhea, 38.05 % had BMI < 16.5, whereas 54.86 % were underweight and just 7.07 % had normal BMI. Of the total girls with moderate dysmenorrhea, majority (80 %) had BMI < 16.5 and 20 % were underweight. All girls with severe dysmenorrhea had BMI < 16.5 and all girls with no dysmenorrhea had normal BMI. These values were highly significant ($p < 0.001$).

Hence in our study, the relation between dysmenorrhea and BMI was found to be highly significant with increased prevalence of dysmenorrhea in the low BMI group. Significant rural versus urban variation was found in girls with mild and moderate dysmenorrhea, with increased prevalence of low BMI being found in rural adolescents indicating their poor nutritional status.

Table 3 Relation between dysmenorrhea and its impact on daily activities (rural vs urban variation)

Dysmenorrhea	Rural				Urban			
	School absenteeism		Pursue hobbies		School absenteeism		Pursue hobbies	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
No	0 (0)	37 (18.5)	37 (18.5)	0 (0)	0 (0)	48 (24)	48 (24)	0 (0)
Mild	0 (0)	104 (52)	103 (51.5)	1 (0.5)	1 (0.5)	96 (48)	113 (56.5)	23 (11.5)
Moderate	30 (15)	23 (11.5)	11 (5.5)	42 (21)	17 (8.5)	24 (12)	0 (0)	2 (1)
Severe	6 (3)	0 (0)	0 (0)	6 (3)	14 (7)	0 (0)	0 (0)	14 (7)

Discussion

Our study aims to establish the relationship between dysmenorrhea and BMI. The prevalence of dysmenorrhea in our study was found to be very high with 81.5 % rural girls and 76 % urban girls suffering from it. Our findings are similar to the study by Singh et al. [10] where the prevalence of dysmenorrhea was 73.83 %, with mild dysmenorrhea in 63.29 %, with moderate dysmenorrhea in 30.37 %, and with severe dysmenorrhea in 6.32 % girls. In the study by Nagata et al. [11], the prevalence of dysmenorrhea was found to be 83.3 %, with 40.2 % mild, with 34.4 % moderate, and with 8.76 % severe dysmenorrhea cases. Dysmenorrhea was absent in 16.7 % cases.

Majority of the girls in our study were found to have low BMI indicating the poor nutritional status among our adolescents, particularly in the rural setup. Our findings support the study by Chaturvedi et al. [12], where the prevalence of chronic energy deficiency (CED) among adolescent girls was found to be very high, with 78.8 % having BMI < 16.5 and 14.3 % underweight.

We observed that dysmenorrhea had its impact on the daily activities of girls leading to school absenteeism and inability to pursue routine activities and hobbies, though our values were not statistically significant. Our study corroborates the study of Svanberg and Ulmstem [13], who observed that 9 % miss school and 25 % limit normal activities due to dysmenorrhea.

In our study, the relation between dysmenorrhea and BMI was found to be highly significant ($p < 0.001$) with increased prevalence of dysmenorrhea in the low BMI group. Our results are supported by the study of Hirata et al. [14], who found the frequency of dysmenorrhea to be greatest in the underweight group. Similarly, the study by Tangchai et al. [15] found low BMI to be significantly associated with dysmenorrhea. But in the study by Harlow et al. [16], being overweight was an important factor for dysmenorrhea and doubled the odds of having a long pain episode. Montero et al. [17] found that attempting to lose weight was significantly associated with dysmenorrhea, but their findings were independent of BMI.

Conclusion

The prevalence of dysmenorrhea in adolescent girls is very high, resulting in disruption of their social and personal activities. Also, Indian adolescents have a very poor nutritional status, as reflected by their low BMI. Our study establishes a positive correlation between dysmenorrhea in adolescents and low BMI reflecting their poor dietary intake. Hence, improvement of their BMI by ensuring intake of a healthy and balanced diet may go a long way in relieving our young adolescent girls of dysmenorrhea and enable them to mature into more socially and economically productive members of the society.

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