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The Severity of Dysmenorrhea and its Relationship with Body Mass Index among Female Adolescents in Hamadan, Iran

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ABSTRACT

Background & aim: Primary dysmenorrhea is a common problem among women, resulting in a decline in their performance level and quality of life. Previous studies have not indicated a definite relationship between body mass index (BMI) and dysmenorrhea. Therefore, this study aimed to determine the severity of dysmenorrhea and investigate its relationship with BMI among female adolescents in Hamadan, Iran.

Methods: This cross-sectional study was conducted on 579 single, female adolescents in schools of Hamadan, Iran in 2011. Students with primary dysmenorrhea (without any other conditions) were selected, using random cluster sampling. Demographic characteristics and menstrual cycle information were collected, using two separate questionnaires. BMI was recorded in all participants and visual analogue scale was applied for pain assessment. Chi-square, t-test, Fisher's exact test and logistic regression were used to examine the relationship between variables. Data were analyzed, using SPSS version 16. P-value less than 0.05 was considered statistically significant.

Results: The mean age, BMI and age at menarche in participants were 15.94±1.17 years, 21.16±3.36 kg/m^2 and 12.92± 1.05 years, respectively. The frequency of dysmenorrhea was estimated to be 85.31%. The frequency and severity of dysmenorrhea was higher in the normal-weight group than other subjects. No relationship was seen between the severity and duration of dysmenorrhea with BMI. But dysmenorrhea had a significant relationship with age at menarche and premenstrual syndrome (P<0.05).

Conclusion: In this study, dysmenorrhea was highly prevalent among female adolescents. However, there was no significant association between BMI and dysmenorrhea. We recommend that future studies consider the confounding factors. Also, further research is required to find the relationship between the amount of body fat and dysmenorrhea.

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Introduction

Menstruation is a natural phenomenon in women after puberty and is often associated with dysmenorrhea. Primary dysmenorrhea is defined as painful menstrual cramps in the absence of any visible pelvic pathology. This symptom usually appears within one to two

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years after menarche simultaneously with the stabilization of menstrual cycle (1). Pain begins a few hours before or immediately after menstruation and continues for 12 to 72 hours. Dysmenorrhea might be also accompanied by nausea, malaise, low back pain or flank pain.

About 29-90% of women are affected by dysmenorrhea, worldwide (2). Also, as statistics have indicated, 10-12% of women suffer from severe dysmenorrhea (3-5). Primary dysmenorrhea is a common problem among females and young women, and its monthly recurrence reduces their performance level and quality of life. Dysmenorrhea leads to absence from work in about 34-50% of women; also, 40% of absences from school are caused by this problem (6). According to annual reports in the United States, dysmenorrhea leads to the loss of about 600 million working hours or two million dollars annually and reduces women's performance quality (7).

One of the factors associated with dysmenorrhea is obesity in female adolescents. The prevalence of obesity in Iran has been estimated at 22-40% (8). Physiological prostaglandin production by the endometrium is increased in primary dysmenorrhea. In fact, increased prostaglandin leads to uterine contractions, which ultimately cause primary dysmenorrhea. Overweight and obesity have been hypothesized to be involved in dysmenorrhea through increased prostaglandin production (6).

Overweight and obesity may contribute to the etiology of menstrual problems such as primary dysmenorrhea (9). There are various reports regarding the impact of body mass index (BMI) on dysmenorrhea (10-11). As several studies have indicated, various physiological, cultural and psychological factors are involved in dysmenorrhea. In addition, inappropriate nutritional diet, lower age, obesity, family history and reduced frequency of breakfast meals per week are factors affecting the frequency of this problem (12, 13).

Although some studies have demonstrated an association between BMI and the incidence and severity of dysmenorrhea (14, 15), this relationship is still controversial (16, 17). In fact, some studies have not introduced obesity as a risk factor for dysmenorrhea (18). Considering the inconsistency in previous studies and lack of adequate research in this area, we aimed to investigate the severity of dysmenorrhea among female adolescents and determine its relationship with BMI.

Materials and Methods

This cross-sectional study was performed on female adolescents in Hamadan, Iran in 2011. In total, 579 students were selected via multi-stage sampling. The inclusion criteria were as follows: 1) being single, 2) menstruation for at least 1-2 years, and 3) primary dysmenorrhea. Volunteers with any systemic, chronic or gynecological diseases were excluded from the study. The presence of these conditions was confirmed by inquiring the students.

Sampling was carried out by considering the educational districts of Hamadan (two districts). From each region, four schools were selected via cluster sampling. Students at each school were randomly selected from high-school grades 1 to 4. Overall, 160, 141, 181 and 94 students were selected from grade 1, grade 2, grade 3 and pre-university level, respectively. Finally, at each school, 40, 35, 45 and 26 students were selected from grade 1, grade 2, grade 3 and pre-university level, respectively.

Demographic characteristics and menstrual cycle information were collected using two separate questionnaires, which were completed by students and the researcher. Demographic information included subjects' age, educational level, number of breakfast meals per week, height, weight and BMI.

Menstrual information included menstrual regularity, pain duration and premenstrual syndrome (PMS). The severity of dysmenorrhea was assessed by Visual Analogue Scale (VAS), which is a standard pain assessment tool (18). In this scale, zero indicates "no feeling of pain" and 10 denotes "severe pain" (15). Reliability and validity of VAS have been demonstrated in several studies (18).

Students' weight was measured by a digital scale with an accuracy of 1.0 g, and their *height was measured, using a wall meter with* an accuracy of 1 cm. BMI was calculated as kilograms divided by height in meters squared. According to the obtained BMI values, participants were classified as underweight

Table 1. Comparison of demographic characteristics between female adolescents with and without primary dysmenorrhea

Variables	With dysmenorrhea (n = 494)	Without dysmenorrhea (n = 85)	P-value
Qualitative variables			
High-school grade	N (%)	N (%)	
Grade one	130 (81.19)	30 (19.81)	0.010
Grade two	130 (92.41)	11 (7.59)	
Grade three	157 (86.69)	24 (13.31)	
Pre-university level	77 (78.71)	20 (21.19)	
Total	494 (85.32)	85 (14.68)	
Field of study			
Physics/mathematics	70 (83.31)	14 (16.69)	0.371
Experimental sciences	171 (86.39)	27 (13.61)	
Humanities	123 (89.81)	14 (10.19)	
Total	364(86.18)	55(13.11)	
Father's educational level			
Illiterate/elementary level	156 (83.39)	31 (16.61)	0.655
Secondary school/ high-school diploma	266 (85.80)	44 (14.19)	
University education	69 (87.31)	10 (12.69)	
Total	491(85.29)	85(14.71)	
Mother's educational level			
Illiterate/elementary	222 (83.10)	44 (16.88)	0.122
Secondary school/ high-school diploma	240 (88.59)	30 (11.40)	
University education	32 (80.01)	8 (20.01)	
Total	494(85.80)	82(14.19)	
Frequency of breakfasts per week			
< 3 days	180 (87.39)	26 (12.59)	0.287
3-7 days	312 (84.10)	59 (15.90)	
Total	492(85.31)	85(14.71)	

(BMI≤ 18.5 kg/m^2), normal weight (BMI: 18.5-25 kg/m^2) and overweight/obese (BMI ≥ 25.0 kg/m^2) groups (19). All measurements were performed by three trained interviewers.

Statistical analysis was performed, using SPSS version 16.0 (SPSS Inc., Chicago, Illinois). Statistical tests including Chi-square, Fisher's exact test, t-test and logistic regression were applied. P-value less than 0.05 was considered statistically significant.

This study was approved by the Ethics Committee of Hamadan University of Medical Sciences, and written informed consents were obtained from the participants. Students were assured about the confidentiality of their personal information and they voluntarily participated in the study.

Results

Data were gathered from 579 students. Demographic characteristics including mean age, educational level, educational field, parental education were identical among groups with and without primary dysmenorrhea. The frequency of primary dysmenorrhea in this study was estimated at 85.31%. The obtained results showed that age at menarche was correlated with BMI (P<0.001).

In this study, the mean age, BMI, height and weight were 15.94±1.17 years, 21.16±3.36 kg/m^2, 160.47±5.45 cm and 53.54±9.24 kg, respectively. Also, 84.10% of students who had breakfast 3-7 days a week suffered from primary dysmenorrhea (Table 1). Overall, no significant difference was found between subjects with and without primary dysmenorrhea in terms of weight, height or BMI.

The frequency of primary dysmenorrhea in underweight, normal-weight and overweight groups was 20.3%, 66.73% and 12.93%, respectively; the frequency of primary dysmenorrhea was higher in normal-weight students. No significant difference was found in menstrual duration and regularity between subjects with and without primary dysmenorrhea (P>0.05). However, the relationship between

Table 2. Comparison between subjects with and without dysmenorrhea regarding menstrual cycle characteristics

Variables	With dysmenorrhea (n = 494)	Without dysmenorrhea (n = 85)	P-value
Menstrual period	N (%)	N (%)	
1–3 days	20 (76.89)	6 (23.10)	0.155
4–7 days	381 (86.40)	60 (13.59)	
8–10 days	88(84.61)	16 (15.41)	
> 10 days	5 (62.49)	3 (37.49)	
Total	494(85.31)	85(14.71)	
Regularity of menstrual cycle			
Regular	334 (86.30)	53 (13.69)	0.342
Irregular	160 (83.31)	32 (16.71)	
Total	494(85.29)	85(14.70)	
Premenstrual syndrome			
Yes	439 (90.10)	48 (9.79)	P<0.001
No	1 (2.61)	37 (97.41)	
Total	440(83.81)	85(16.20)	

primary dysmenorrhea and PMS was statistically significant (P<0.001) (Table 2).

In this study, 19.49%, 65.90% and 14.60% of subjects in underweight, normal-weight and overweight groups suffered from severe primary dysmenorrhea (VAS score> 7), respectively. The severity and duration of dysmenorrhea were not significantly associated with BMI, whereas BMI and PMS were significantly correlated (P=0.006) (Table 3). Also, according to logistic regression test results, BMI and primary dysmenorrhea had no significant relationship (Table 4).

Discussion

Dysmenorrhea is one of the most common and serious problems in the reproductive period (18, 19). This common problem reduces females' quality of life and daily activities (20). Based on our findings, the frequency of dysmenorrhea was estimated at 85.31% among female adolescents. In previous research, the frequency of pain during menstruation was 82.2% among Indian secondary school adolescents (21) and 85.5% among Omani female adolescents (22); these findings were in consistence with the results reported in our study.

In our study, the frequency of dysmenorrhea in the normal-weight group was higher than others. In a study by Chung et al. on Taiwanese nurses, nurses with a lower BMI suffered from dysmenorrhea more than other participants (23). Similarly, in a study by Hirata, the frequency of dysmenorrhea was the highest in the underweight group (24). These findings were not consistent with our study results, which may be due to differences in BMI grading. However, in another study, the frequency of dysmenorrhea in the obese group was higher than that of the underweight group (25).

In our study, the mean age at menarche was 12.92±1.05 years. The reported age at menarche

Table 3. Comparison of menstrual characteristics among BMI groups with dysmenorrhea

Variables	Underweight (n = 99)	Normal weight (n = 325)	Overweight/obese (n = 63)	P-value
Pain severity	N (%)	N (%)	N (%)	
≤ 3	30 (24.80)	77 (63.61)	14 (11.61)	0.650
4–7	45 (18.51)	167 (68.70)	31 (12.79)	
> 7	24 (19.49)	81 (65.90)	18 (14.60)	
Total	99 (20.33)	325(66.69)	63(12.94)	
Pain duration				
< 1 day	42 (23.20)	115 (63.51)	24 (13.29)	0.458
1–3 days	50 (19.89)	171 (68.09)	30 (11.94)	
> 3 days	7 (14.92)	31 (65.93)	9 (19.11)	
Total	99(20.49)	325(68.49)	63(12.95)	
Regularity of menstrual cycle				
Regular	68 (20.09)	216 (66)	46 (13.18)	0.581
Irregular	31 (19.61)	109 (69.40)	17 (10.98)	
Total	99 (20.29)	325 (66.69)	63 (12.99)	
Premenstrual syndrome				
Yes	18 (23.10)	40 (51.30)	20 (25.59)	0.006
No	81(18.95)	285(69.91)	43(10.98)	
Total	99 (20.28)	325 (66.70)	63 (12.98)	

Table 4. The odds ratios (ORs) of the effect of BMI on primary dysmenorrhea with regard to the duration of menstruation, menstrual regularity and frequency of breakfast meals per week

		B	S.E.	P-value	OR
BMI	<= 18.5 (ref)		--	--	1
	18.5-25	.525	.271	.053	1.691
	>=25	.630	.441	.153	1.878
Duration of menstruation	1-3 (ref)	--	--	--	1
	4-7	.574	.527	.276	1.776
	8-10	.509	.583	.383	1.664
	>10	-.619	.911	.497	.539
Menstrual regularity	Irregular (ref)	--	--	--	1
	Regular	.173	.255	.497	1.189
Frequency of breakfasts per week	<3 (ref)	--	--	--	1
	3-7	.292	.266	.272	1.339

in the present study appears to be lower than previous reports in Hamadan. In fact, in a study in Hamadan in 2007, the average age of menarche was 13.7 years (26); this discrepancy may be due to lifestyle changes in female adolescents. In our study, mean BMI was 21.16±3.36 kg/m^2, and there was a significant relationship between age at menarche and BMI .In other words, low age at menarche was associated with increased BMI.

In this study, BMI was not significantly associated with menstrual regularity or the frequency, severity or duration of dysmenorrhea. Severe dysmenorrhea in normal-weight students was more prevalent than others. Singh et al. showed that the frequency of dysmenorrhea was higher in the overweight/obese group, compared to the underweight group. However, no significant relationship was found between BMI and the frequency or severity of dysmenorrhea (27).

On the other hand, Jalili et al. in their study reported a significant relationship between BMI and dysmenorrhea**.** However, dysmenorrhea was not significantly associated with height, weight, age at menarche, menstrual regularity or severity of bleeding during each menstrual period (28). Moreover, Fujiwara showed that pain intensity was higher in those with lower weight, compared to others (29).

Additionally, Tangchai and colleagues found that low BMI was significantly associated with dysmenorrhea (30). However, in a study by Harlow et al., overweight was regarded as an important risk factor for dysmenorrhea (31). Additionally, Montero et al. showed that attempts to lose weight were significantly associated with dysmenorrhea, whereas dysmenorrhea was not significantly correlated with BMI (32).

In our study, there was no significant association between eating breakfast and dysmenorrhea. However, the frequency of dysmenorrhea was low in students who had breakfast 3-7 times in a week . The results of our study were similar to the findings reported in the study by Fujiwara (33). Golmakani and colleagues showed that attention to nutrition during adolescence plays an important role in changing lifestyle at this stage (34). Therefore, nutritional education is advised for female adolescents.

The strength of this study was the adequate sample size and its limitation was the impossibility to estimate students' size and fat mass.

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Conflict of Interest

The authors declare no conflicts of interest.

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