The Effect of Psychological Stress on the Menstrual Cycle in Medical Students

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Abstract

Background: medical students suffer from stress during academic performance, and since stress negatively impacts various characteristics of the menstrual cycle, and reproductive health is an important indicator of a woman's overall health, assessing such a phenomenon was of the utmost importance to carry out this study.

Objectives: To assess the prevalence of menstrual abnormalities among medical students. Assess the prevalence of stress among medical students and the association between stress levels and the occurrence of menstrual abnormalities. An online questionnaire composed of questions assessing stress using the PSS10 scale and questions assessing menstrual abnormalities was distributed through e-mail to medical students in Baghdad.

Results: around 397 students were included in the study. The mean age of the students was 20.84 years old, with a range of 17 to 24 years. The mean age of menarche was 12.65 years and the mean PSS score was 22.71. The BMI mean was 22.71 6.369. Dysmenorrhea was seen among 92.9%, while premenstrual symptoms were noticed among 98.5%. Dysmenorrhea and heavy bleeding were significantly associated with stress.

Within this sample quartile of students, most students reported high levels of stress. Most students had premenstrual symptoms, heavy bleeding, and dysmenorrhea. There was a significant association between stress and dysmenorrhea and menorrhea.

Keywords: Stress; Menstrual Abnormalities; Medical Students

Background

In recent years, the field of education has witnessed cut-throat competition across all disciplines as the quality of educational opportunities has failed to cater to the increasing number of students every year. Concerns and uncertainties about the future create high academic pressure even on excellent performers, leading to stress among college students. Stress can be eustress, which is "good stress" acting as a motivation for an individual to complete a particular work or distress, "bad stress" with which one finds it difficult to cope and that leads to conditions like depression, anxiety, or other personality disorders. Though college life is an enjoyable phase, it also imposes inevitable stress due to academic demands, competitions, family expectations and responsibilities. Medical students, in particular, are known to suffer from greater levels of stress due to their heavier academic burdens. In addition, females have been shown to experience more stress than males and consistently report more physical as well as somatoform symptoms [1].

Menstruation is a normal physiological phenomenon in a woman, indicating her capability for procreation. However, this normal phenomenon is not an easy one and is often associated with some degree of suffering and embarrassment. Almost every woman experiences one or another type of menstrual problem in her lifetime. Disorders that are usually linked with menstruation are increasingly becoming one of the major reasons for gynecological visits. Menstrual irregularity is associated with prolonged menstrual bleeding and usually occurs right after the age of menarche as a result of nonovulatory cycles. Instability in the endometrial lining that arises as a result of the uncontrolled production of unopposed estrogen causes the breakdown in vasoconstriction and myocardial contractility. During the ovulatory cycle, the production of prostaglandins in excess is thought to be the cause of the pain in dysmenorrhea. The presence of the prostaglandins causes the contraction of the myometrium and vasoconstriction locally. Dysmenorrhea is pain perceived before or during menstruation, confined to the lower abdomen, back, and thighs, and of varying severity, ranging from mild to moderate to severe. Regular menstrual cycles occur every 28–35 days, with 5 days in which the menstrual flow lasts for 3–5 days with an average loss of 30–80 ml of blood. An irregular menstrual cycle is any deviation from the normal duration [2].

Among the student population, disturbances arising from menstruation could contribute to absenteeism, exemption from physical exercise, and social and emotional distress. Premenstrual syndrome greatly affects the student population and causes a considerable amount of anxiety. Dysmenorrhea and menstrual irregularities are also reportedly prevalent among the student population, and these also affect these young women's social lives and class attendance. On the whole, students who are victims of menstrual disturbances also experience an impact on their social and physical health. Apart from the pathological factors that disrupt women's cycles, certain environmental factors and dietary or lifestyle trends have also been reported to influence the menstrual pattern, like depression, changes in body weight, and stress [3].

Stress in medical students is high for various reasons, such as high parental expectations, frequency of examinations, vastness of the academic curriculum, sleeping difficulties, worrying about the future and performance in periodic examinations [4].

Objectives

- Assess the prevalence of menstrual abnormalities
- among medical students.
- Assess the prevalence of stress among medical students.
- Assess the association between stress levels and the occurrence of menstrual abnormalities among medical students.

Methodology

A cross-sectional study was conducted among undergraduate female medical students aged 17-24 in Baghdad during the period from May 18th to May 28th, 2021.

Data collection was done using an online questionnaire distributed to medical college students through email explaining the purpose of the study and information about the study questionnaire, which was composed of 3 domains: anthropometric data, menstrual history, and psychosocial stress. All the students agreed to participate in the study. Students with any chronic health condition, psychiatric condition, or current use of oral contraceptives or exogenous hormones were excluded from the study.

Demographic data, including age and living conditions, while anthropometric data included weight and height, body mass index (BMI) was calculated as the subject's weight in kilograms divided by the square of their height in meters (kg/m^2). Menstrual data is included. average length of the menstrual cycle, which was defined as the period between the first day of menstrual flow and the day immediately prior to the next menstrual flow. duration of menstrual flow, any passage of clots during periods,

Heavy menstrual flow, which was defined as bleeding for 7 days and/or passage of clots during the period, and the occurrence of dysmenorrhea, which was defined as acute spasmodic pain experienced in the lower abdomen that appeared on the first day of menses and rarely lasted for more than 2 days, was severe enough to miss classes or any need to take medications such as analgesics, and any perception of premenstrual symptoms. which were defined as a constellation of physical, emotional, and behavioral symptoms that occurred before the menstrual cycle and remitted after the onset of bleeding. Physical symptoms included abdominal pain, headache, nausea, increased frequency of stool, skin disorders, abdominal bloating, painful breasts, and swelling of extremities. Emotional symptoms include irritability, anger, depression, and tension. Behavioral symptoms included increased or decreased food intake, hypersomnia, lethargy, and a marked lack of energy.

Irregular menstrual cycles, which were defined as a past history of irregular cycles experienced by the students within 6 months prior to the study,

The student's psychosocial stress level was measured using the PSS10 scale, which comprises of 10 questions with responses varying from 0 to 4 for each item and ranging from: never, almost never, sometimes, fairly often, and very often, respectively, on the basis of their occurrence during the 1 month prior to the survey. PSS scores were obtained by reversing responses (e.g., 0 = 4, 1 = 3, 2 = 2, 3 = 1 and 4 = 0) to the four positively stated items (items 4, 5, 7, and 8); and for the remaining questions (items 1, 2, 3, 6, 9 and 10), the scoring was given as (0 = 0, 1 = 1, 2 = 2, 3 = 3 and 4 = 4) and then summed across all scale items. The scores ranged from 0 to 40 [4].

To maintain anonymity, the student's identity was not revealed.

Statistical Analysis

Data analysis was done using IBM SPSS version 25. Data was presented in counts and percentages using suitable tables and graphs. The mean and standard deviation were calculated. The students were classified as having low and high stress based on their PSS scores (high stress 27 PSS; low stress 27). The association of various characteristics and the distribution of stress among the students was analyzed using the 2-*test*. A p value of 0.05 was considered to be statistically significant.

Table 1. Characteristics of study participants ($n = 397$)

Characteristics	(mean ± SD)
Age (years)	20.84 ± 1.621
BMI	22.71 ± 6.369
Age of menarche (years)	12.65 ± 1.399
PSS score	22.71 ± 6.016

The mean age of the students was 20.84 years with range 17 to 24 years. The mean age of menarche was 12.65 years and the mean PSS score was 22.71, BMI mean was 22.71 ± 6.369

Table 2: Prevalence of menstrual abnormalities in medical students ($n = 397$)

Menstrual Abnormality		Frequency	%
Dysmenorrhea	Yes	369	92.9
	No	28	7.1
Irregular cycle	Yes	152	38.3
	No	245	61.7
Heavy bleeding	Yes	217	54.7
	No	180	45.3
Prolonged cycles	Yes	4	1.0
	No	393	99.0
Premenstrual symptoms	Yes	391	98.5
	No	6	1.5
Dysmenorrhea severe enough for medication	Yes	283	71.3
	No	114	28.7
Dysmenorrhea severe enough to miss classes	Yes	85	21.4
	No	312	78.6

Table 2: shows prevalence of menstrual abnormalities among the participants in which the majority of the students reported premenstrual symptoms (98.5%) and dysmenorrhea (92.9%). A total of (38.3%) of them experienced irregular cycles and 54.7% of them reported heavy bleeding flow. Prolonged cycles were seen only in (1.0%) Out of the 369 students who had dysmenorrhea, 85 (21.4 %) missed classes because of dysmenorrhea and 283 (71.3%) of them had to take medication such as analgesics.

Table 3. The association of demographic and menstrual factors with perceived stress (n = 397)

| Characteristic		High stress		Low stress		p value
		Count	%	Count	%	
Age	≤20 years	47	30.9	105	69.1	0.075
	>20 years	56	22.9	189	77.1	
Body Mass Index (BMI)	Underweight	14	33.3	28	66.7	0.543
	Normal weight	68	25.3	201	74.7	
	Overweight	18	23.1	60	76.9	
	Obese	3	37.5	5	62.5	
Living condition	With family	95	27.1	256	72.9	0.318
	Dormitories	3	13.6	19	86.4	
	With friends	5	20.8	19	79.2	
Irregular cycle	Yes	45	29.6	107	70.4	0.190
	No	58	23.7	187	76.3	
Heavy bleeding	Yes	70	32.3	147	67.7	**0.002**
	No	33	18.3	147	81.7	
Dysmenorrhea	Yes	96	26	273	74	0.906
	No	7	25.0	21	75.0	
Dysmenorrhea severe enough for medication	Yes	76	26.9	207	73.1	0.514
	No	27	23.7	87	76.3	
Dysmenorrhea severe enough to miss classes	Yes	29	34.1	56	65.9	**0.027**
	No	70	22.4	242	77.6	

Results

Out of the 428 students who volunteered to participate in the study, 31 were excluded, as 13 of them were already diagnosed with polycystic ovarian syndrome, one had hypothyroidism on treatment, and 17 others were taking hormonal therapy. The data for the remaining 397 students was analyzed Figure 1.
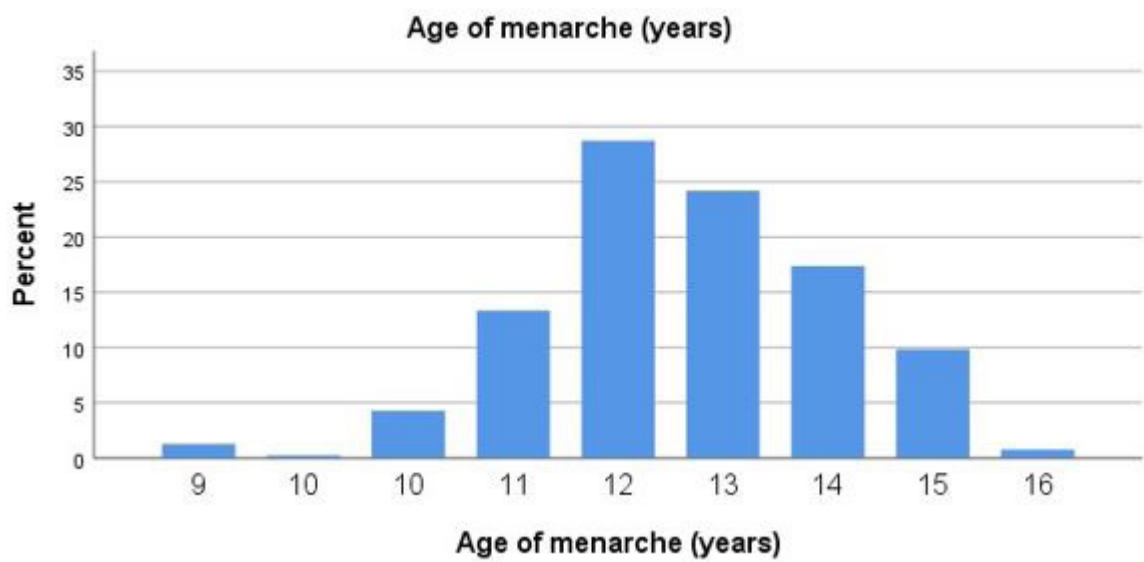
Figure 1: Showing the distribution of age of menarche among medical students with mean age of menarche 12.65 years and the distribution of age of menarche among participants (n = 397)

Figure 2 Shows the distribution of stress scores and the proportion of students who perceived physical, behavioral and emotional (psychological) premenstrual symptoms. The higher a student's stress score became, the more likely it was that the student had these symptoms. Some 53% of students with high stress scores reported behavioral symptoms, and 73% of them reported emotional (psychological) premenstrual symptoms, while there was a weak association between perceived stress and the physical premenstrual symptoms in which the occurrence of these symptoms is approximately the same in all students.
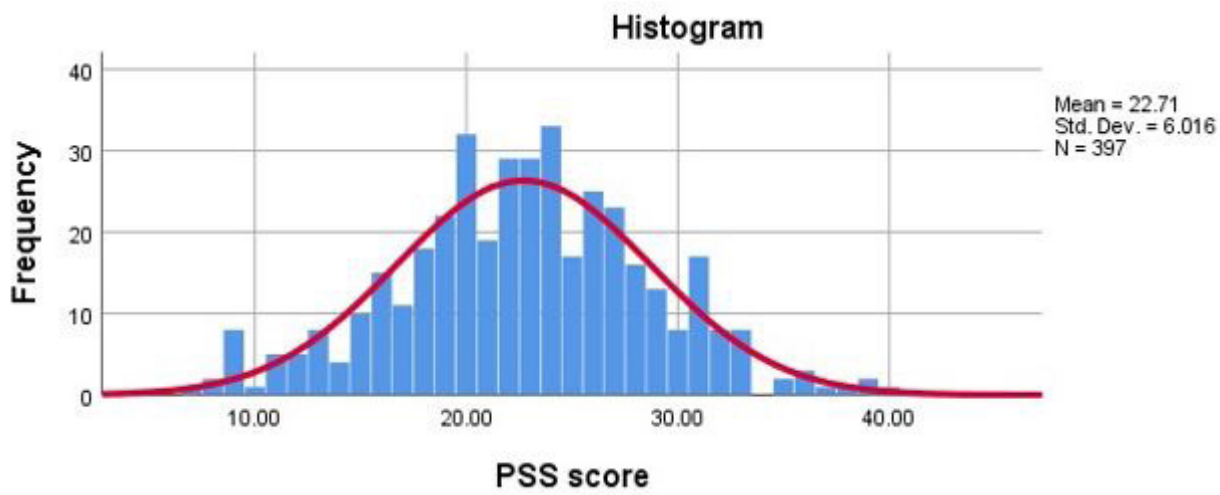
Figure 2: Shows the PSS score of the students with the mean score was 22.71 and the distribution of PSS score among participants (n = 397)

One hundred and fifty-two students who are 20 years old had 30.9% of them in high stress and 69.1% in low stress, while 245 students who are > 20 years old had 22.9% in high stress and 77.1% in low stress (p = 0.075), which indicates a weak association between age and perceived stress.

Forty-two students who are underweight 33.3% of them are under high stress and 66.7% are under low stress. 269 students who are normal weight show that 25.3% of them are under high stress and 74.7% are under low stress. Of the 78 students who are overweight, 23.1% of them are in high stress and 76.9% are in low stress, and only eight students in an obese state show that 37.5% of them are in high stress and 62.5% in low stress (p = 0.543), which indicates a weak association between BMI and perceived stress.

Three hundred and fifty-one students who live at home with their families show 27.1% of high stress and 72.9% of low stress. 22 of the students who stay in dormitories have 13.6% of them in high stress and 86.4% in low stress, while the 24 students who live with their friends have 20.8% of them in high stress and 79.2% in low stress (p = 0.318), which indicates a weak association between residence and perceived stress.

One hundred and fifty-two students who have irregular cycles show that 29.6% of them are under high stress and 70.4% are under low stress, while 245 students who have regular cycles show that 23.7% are under high stress and 76.3% are under low stress (p = 0.190), which indicates a weak association between irregular cycles and perceived stress.

Two hundred and seventeen students who have heavy bleeding show about 32.3% in high stress and 67.7% in low stress, while 180 students who have normal bleeding show only 18.3% in high stress and 81.7% in low stress (p = **0.002**), which indicates a strong significant association between heavy bleeding flow and perceived stress (Figure 3a).

Students with physical premenstrual symptoms

Students with emotional premenstrual symptoms
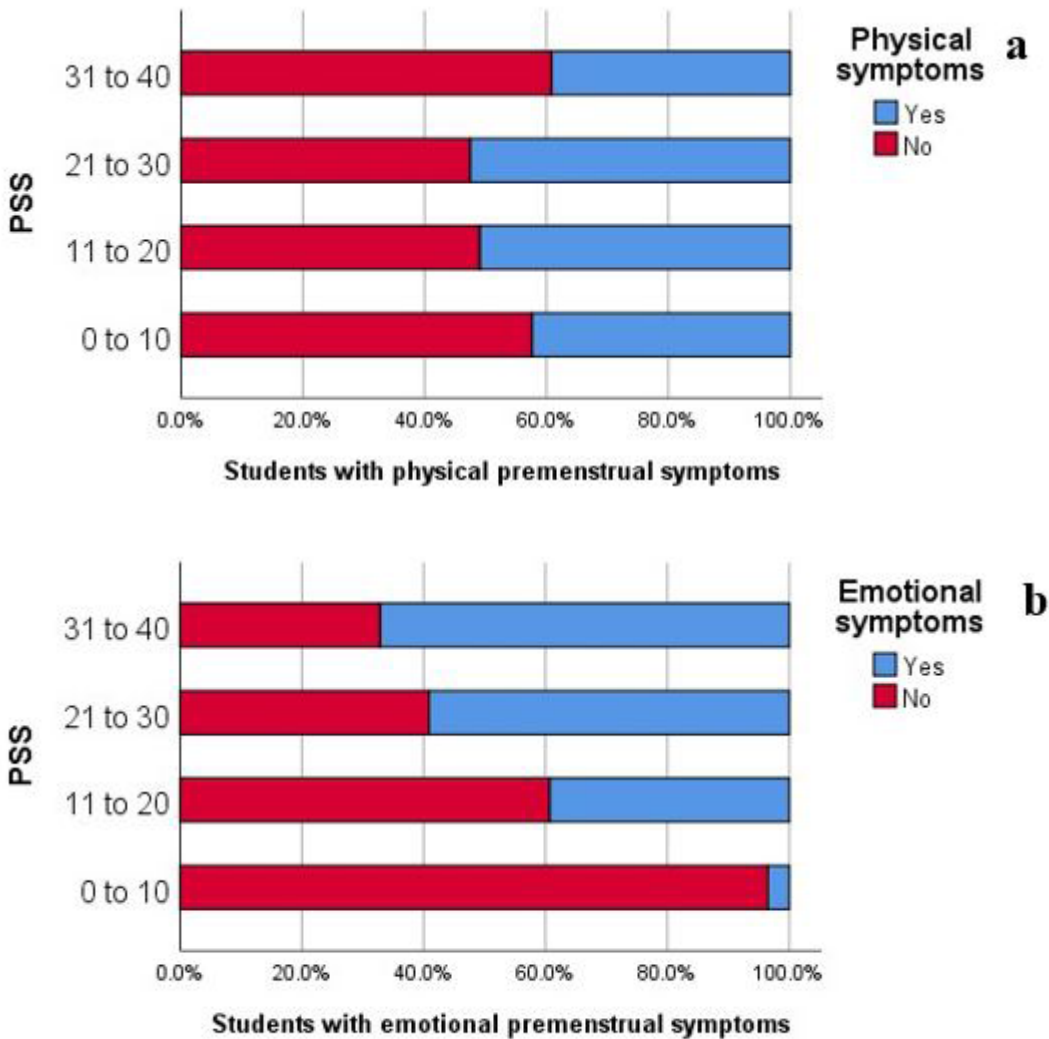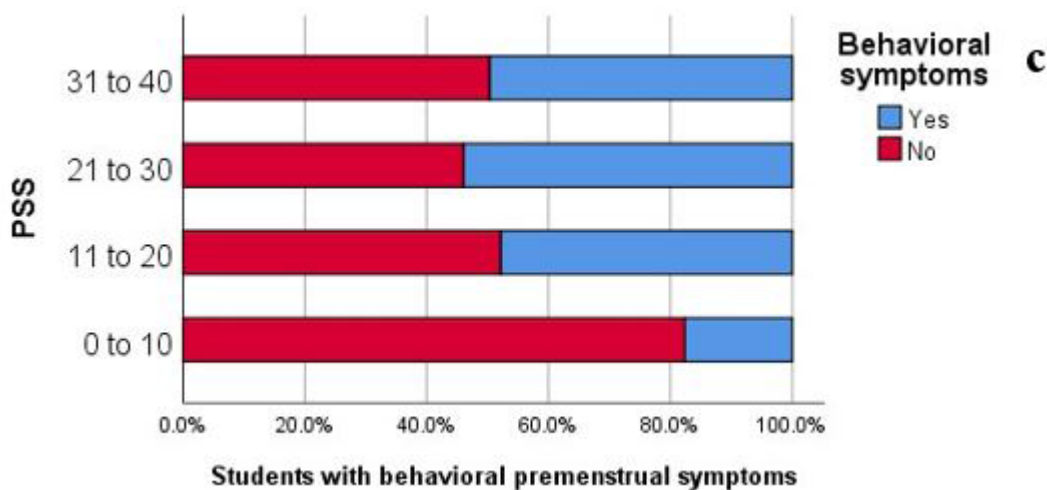
Figure 3: distribution of PSS Score and proportion of students with premenstrual symptoms. (a) Physical premenstrual symptoms, (b) Emotional premenstrual symptoms, (c) Behavioral premenstrual symptoms

Three hundred and sixty-nine students who have dysmenorrhea show that about 26% of them are under high stress and 74% are under low stress, while 28 students who do not have dysmenorrhea show that about 25% of them are under high stress and 75% are under low stress ($p = 0.906$), which indicates a weak association between dysmenorrhea and perceived stress. Two hundred and eighty-three students who have dysmenorrhea severe enough for medication show that about 26.9% of them are under high stress and 73.1% are under low stress, while 114 students who do not have dysmenorrhea severe enough for medication show that about 23.7% are under high stress and 76.3% are under low stress, ($p = 0.514$), which indicates a weak association.

Eighty-five percent of students with dysmenorrhea severe enough to miss classes have 34.1% high stress and 65.9% low stress, while 312 students with dysmenorrhea severe enough to miss classes have 22.4% high stress and 77.6% low stress (p = 0.027), indicating a significant association between dysmenorrhea severe enough to miss classes and perceived stress.

Discussion

As medical education is perceived as being stressful as it is characterized by many psychological changes in students, our study aimed to determine the prevalence of menstrual abnormalities among female undergraduate medical students and examined the association between psychosocial stress and menstrual-associated health problems such as premenstrual symptoms, dysmenorrhea, heavy bleeding flow, and irregular menstrual cycle. While much data concerning menstrual

problems is available in other countries [5-7], very scant such data among medical students is available in Iraq.

In our study, most of our respondents started their menarche at a normal age range of 9–16 years, with a mean age of 12.65 years, which is comparable with other reports in Khartoum school girls in Sudan [8], and 13.85 years in Egypt [9]. Also, we observed that premenstrual symptoms (98.5%) and dysmenorrhea (92.9%) were the most common menstrual abnormalities reported by the students, similar to the studies done by Sharma et al. (2008) and Singh et al. (2008). The prevalence of dysmenorrhea was relatively high (92.9%) in our respondents; this finding is in line and fits within the published reported values from other studies in Nigeria, Egypt, Saudi, and Oman nursing students, which is about 94.0% [10-14]. However, it is relatively higher than found in the studies in India, Kassal, Eastern Sudan, Palestine, Ethiopia, Australia, and Nigeria that reached 87.87%, 85.1%, 80%, and 76%, respectively [15-18].

A study conducted at the University of Dammam, Saudi Arabia reported that 18.3% of the students perceived severe stress levels during their medical schooling, which was approximately similar to our finding. Multiple factors, such as variations in the curricula and/or evaluation (examination) system, may affect the amount and severity of stress experienced by medical students and limit comparability among these studies [19].

Of the students who reported dysmenorrhea in our study, 21.4% were severe enough to miss classes, and 71.3% were using medications to control it. A study done in India found that only 37.5% were using medications among medical students [4]. The

proportion of students using medications in our study was high when compared with those missing classes. This could be due to NSAIDs being an OTC drug. Students have a proclivity for self-medication [20].

We chose the perceived stress scale to measure psychosocial stress since this instrument has been documented for its reliability and validity. In our study, stress levels were measured by means of PSS 22.71 and it was demonstrated that the mean PSS score was associated with premenstrual symptoms. Our results agree with other studies showing that psychosocial stress in daily life influences the occurrence of heavy bleeding and dysmenorrhea severe enough to miss classes [4].

A study done by Wang et al. (2011) suggested that perceived stress was associated with dysmenorrhea, but in our study, although mean PSS was higher in those having dysmenorrhea, the difference was not statistically significant. But the students who had dysmenorrhea severe enough to miss classes had a significantly higher mean PSS score . Concerning reasons for absenteeism from the study, (24.4%) of the respondents confirmed having a very painful period, hindering them from attending class. Such findings were parallel to those of another previous study among adolescent females in Baghdad, in which absenteeism due to dysmenorrhea was seen among 23.6% of girls [21].

Our finding is also supported by the literature that shows that evident painful menses is an important health problem in university female students and has a negative effect on their attendance [22].

Conclusion

• Most students suffer from premenstrual symptoms, heavy bleeding, and dysmenorrhea, which are severe enough to require analgesics.

• Within our sample quartile, high levels of stress were reported by students.

• There was a significant relationship between high stress levels and the occurrence of menstrual abnormalities like premenstrual symptoms, heavy bleeding flow, and dysmenorrhea, which were severe enough to miss classes (absenteeism)

Conflicts of Interest

None

Consent

Verbal consents were obtained from all the medical students precipitant

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