Ministry of Higher Education and Scientific Research

Mustansiriyah University College of Medicine – Department of Family and Community Medicine

The Effect of Psychological Stress on Menstrual Cycle among Medical Students

Done by Group 6 Subgroup 1
Fourth Grade

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Introduction

In recent years, the field of education has witnessed cut throat competition, across all disciplines, as the quality educational opportunities have failed to cater the increasing number of students every year. Concerns and uncertainties for future create a high academic pressure even in excellent performers leading to stress among college students. Stress can be a eustress which is a 'good stress' acting as a motivation for an individual for completion of a particular work or distress, the 'bad stress' with which one finds difficult to cope and leads to conditions like depression, anxiety or other personality disorders. Though college life is an enjoyable phase, it also imposes inevitable stresses 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 burden. In addition, females have 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 does experience one or the other 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 the 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 lower abdomen, back and thighs, and of varying severity, ranging from mild, moderate to severe. Regular menstrual cycle occurs every 28-35 days ± 5 days in which the menstrual flow lasts for 3-5 days with an average loss of 30-80 ml of blood. Irregular menstrual cycle is any deviation from normal duration [2].

Among the student population, disturbances arising from menstruation could contribute to absenteeism, exemption from physical exercises and social and emotional distress. Premenstrual syndrome greatly affects the student population

and causes a considerable amount of anxiety. Dysmenorrhea and menstrual irregularity are also reportedly prevalent among the student population and these also affect these young women's social life 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 owing to various reasons such as high parental expectations frequency of examinations vastness of 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 relationship 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 year old, in medical colleges of Baghdad Iraq, during the period from 18^{th} to 28^{th} of May 2021. A sample of students were briefed on the purpose of the study and given information on the questionnaire. They were invited to answer the questionnaire by E-mail, which dealt with anthropometric data, menstrual history and psychosocial stress (see Appendix, below). All the 428 students agreed to participate in the study. Students with any chronic health condition, psychiatric condition and current use of oral contraceptives or exogenous hormones were excluded from the study.

Anthropometric data included: age, weight and height, marital status, and the residence. 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 included: age of menarche; average length of menstrual cycle; duration of menstrual flow; any passage of clots during periods, and the occurrence of dysmenorrhea and if present is it severe enough to miss classes or any need to take medications such as analgesics, and any perception of premenstrual symptoms.

Questions relating to psychosocial stress were asked according to the PSS10 scale. To maintain anonymity, student identity was not revealed.

For the purpose of this study, we decided upon the following definitions of menstrual abnormalities. The duration of menstrual cycle was defined as the period between the first day of menstrual flow and the day immediately prior to the next menstrual flow. Irregular menstrual cycles was defined as past history of irregular cycles experienced by the students within 6 months prior to the study. Heavy menstrual flow was defined as bleeding for 7 days and/or passage of clots during the period. Dysmenorrhea was defined as acute spasmodic pain experienced in the lower abdomen which appeared on the first day of menses and rarely lasted for more than 2 days. Premenstrual symptoms (PMS) were defined as a constellation of physical, emotional and behavioral symptoms which occurred premenstrualy and remitted after the onset of bleeding. Physical symptoms included abdominal pain, headache, nausea, increase frequency of stool, skin disorders, abdominal bloating, painful breast and swelling of extremities. Emotional symptoms included irritability, anger, depression and tension. Behavioral symptoms included increased or decreased food intake, hypersomnia, lethargy and marked lack of energy. All these symptoms were enlisted in the questionnaire and students were asked whether they experienced any discomfort, before menses, which remits after the onset of menses and if so, they were asked to mark which kind of discomfort they experienced.

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 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 summing across all scale items. Scores ranged from 0 to 40[4].

Statistical Analysis

Data analysis was done using IBM SPSS version 25. A p value < 0.05 was considered to be statistically significant. The students were classified as having low and high stress based on their PSS scores (high stress ≥ 27 PSS; low stress $<$

27). Association of various characteristics and distribution of stress among the students was analyzed using the χ^2 - *test*.

Table I. 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

Results

Out of the 428 students who volunteered to participate in the study, 31 were excluded, as 13 of them were already diagnosed to have polycystic ovarian syndrome and one was hypothyroidism on treatment and 17 others were taking hormonal therapy. Data for the remaining 397 students were analyzed. Demographics and other characteristics have been summarized in Tables I, II, III and IV. The mean age of the students was 20.84 years between 17 to 24 years. The mean age of menarche was 12.65 years (Figure II.) and the mean PSS score was 22.71 (Figure III.). Medical universities that participated summarized in figure I. students of Mustansiriyah University was the most then Baghdad University, Al-kindy, Iraqia, Ibn sina, Nahrain Universities and some others in Iraq (Figure I.).

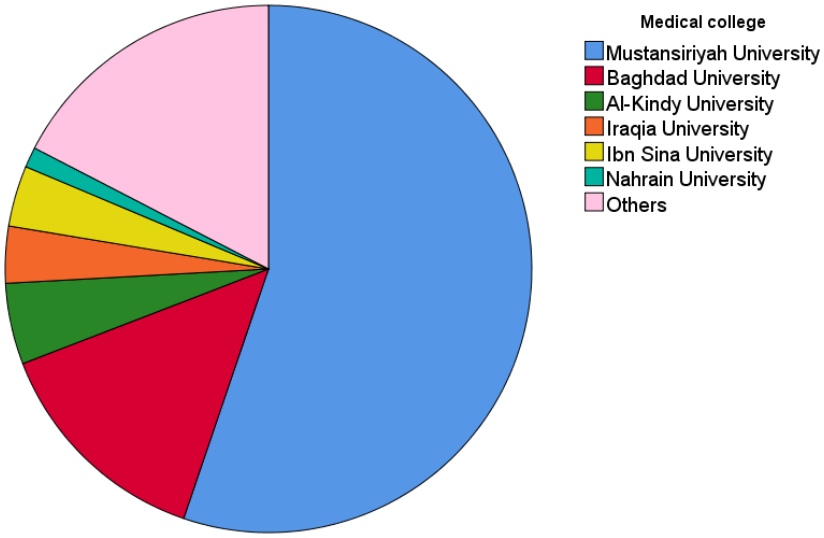


Figure I. Shows Distribution of universities that participated in the study.

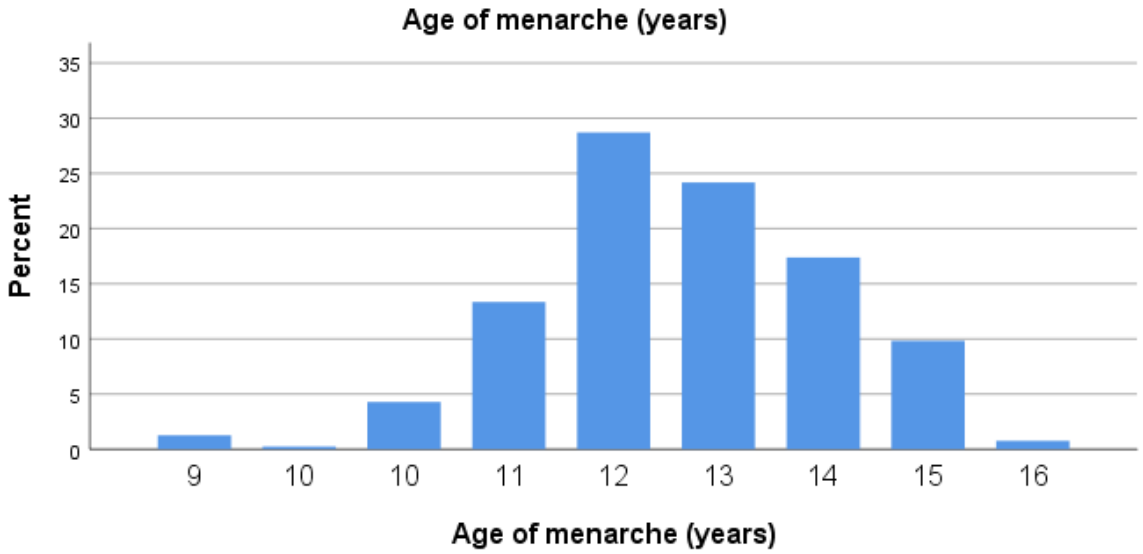


Figure II. Shows the age of menarche distribution, the mean age of menarche was 12.65 years.

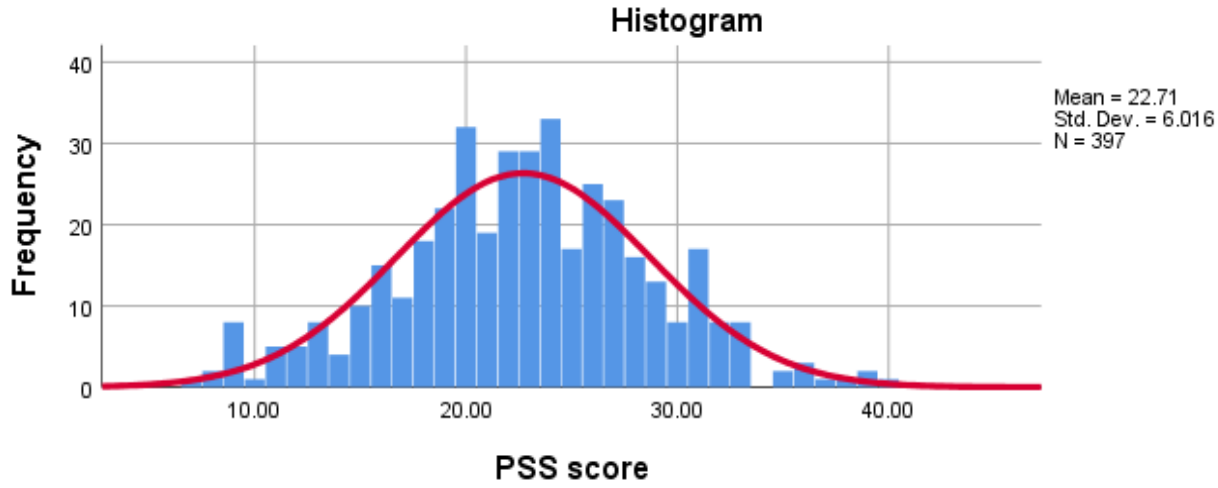


Figure III. Shows the PSS score distribution, the mean score was 22.71.

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%) (Table II). 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 II.). As shown in table III. Majority of the students reported low levels of stress 74.06% and the prevalence of high stress levels was 25.94%, also it shows the Prevalence of high stress levels in medical within each stage in which the prevalence was the highest among the Second year

students (36.1%), followed by the first year (31.1%), fourth year (27.3%), third year (19.0%), and fifth year students (16.0%) (Table III.).

Table II. 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 III. Prevalence of stress in medical students within each stage of the sample (*n* = 397).

Stage	High stress		Low stress		total	%
	Count	%	Count	%		
1st stage	28	31.1	62	68.9	90	22.67
2nd stage	13	36.1	23	63.9	36	9.06
3rd stage	16	19.0	68	81.0	84	21.15
4th stage	42	27.3	112	72.7	154	38.79
5th stage	4	16.0	21	84.0	25	6.29
6th stage	0	0.0	8	100.0	8	2.01
Total	**103**	**25.94**	**294**	**74.06**	**397**	**100**

Table IV. Shows the distribution of students according to stress at baseline (high stress ≥ 27 PSS; low stress < 27) and the χ2 -test was used to analyze the difference.

Table IV. Relationship between menstrual abnormalities and 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	
Residence	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	

Age

152 of students who are ≤ 20 years 30.9% of them in high stress and 69.1% in low stress while 245 of students whose are > 20 years 22.9% in high stress and 77.1% in low stress, (p = 0.075) which indicates a weak association between age and perceived stress.

Body Mass Index (BMI)

42 of students whose are underweight 33.3% of them are in high stress and 66.7% in low stress. 269 of students who are in normal weight show that 25.3% of them in high stress and 74.7% in low stress. 78of students who are overweight 23.1% of them in high stress and 76.9% in low stress and only 8 students in obese state show that 37.5% of them in high stress and 62.5% in low stress, (p = 0.543) which indicates a weak association between BMI and perceived stress.

Residence

351 of students who live in home with their families show that 27.1% in high stress and 72.9% in low stress. 22 of students who stay in dormitories 13.6% of them of them in high stress and 86.4% in low stress and 24 of students who live with their friends show that 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.

Irregular Cycle

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

Heavy Bleeding

217 of students who have heavy bleeding show about 32.3% in high stress and 67.7% in low stress while 180 of students who have normal bleeding show that 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 IV.a).

Dysmenorrhea

369 of students who have dysmenorrhea show that about 26% of them are in high stress and 74% are in low stress while 28 of students who do not have dysmenorrhea show that about 25% of them are in high stress and 75% are in low stress, (p = 0.906) which indicates a weak association between dysmenorrhea and perceived stress.

Dysmenorrhea Sever Enough for Medication

283 of students who have Dysmenorrhea severe enough for medication show that about 26.9% of them are in high stress and 73.1% are in low stress while 114 of

students who do not have dysmenorrhea severe enough for medication show that about 23.7% are in high stress and 76.3% in low stress, (p = 0.514) which indicates a weak association.

Dysmenorrhea Sever Enough to Miss Class

85 of students who have dysmenorrhea severe enough to miss classes show that about 34.1% are in high stress and 65.9% are in low stress while 312 of students who do not have dysmenorrhea severe enough to miss classes show that about 22.4% are in high stress and 77.6% are in low stress, (***p* = 0.027**) which indicates a significant association between dysmenorrhea that was severe enough to miss classes and perceived stress (Figure IV.b).

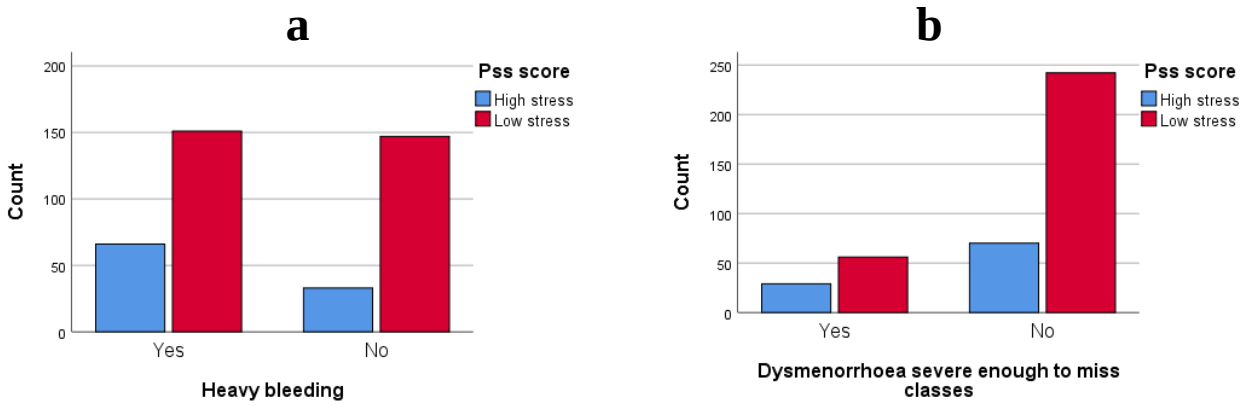


Figure IV. (**a**) Shows the significant association between perceived stress and experience of heavy bleeding, (**b**) Shows the significant association between perceived stress and experience of dysmenorrhea that was sever enough to miss class (absenteeism).

Figure V. Shows the relationship between 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.

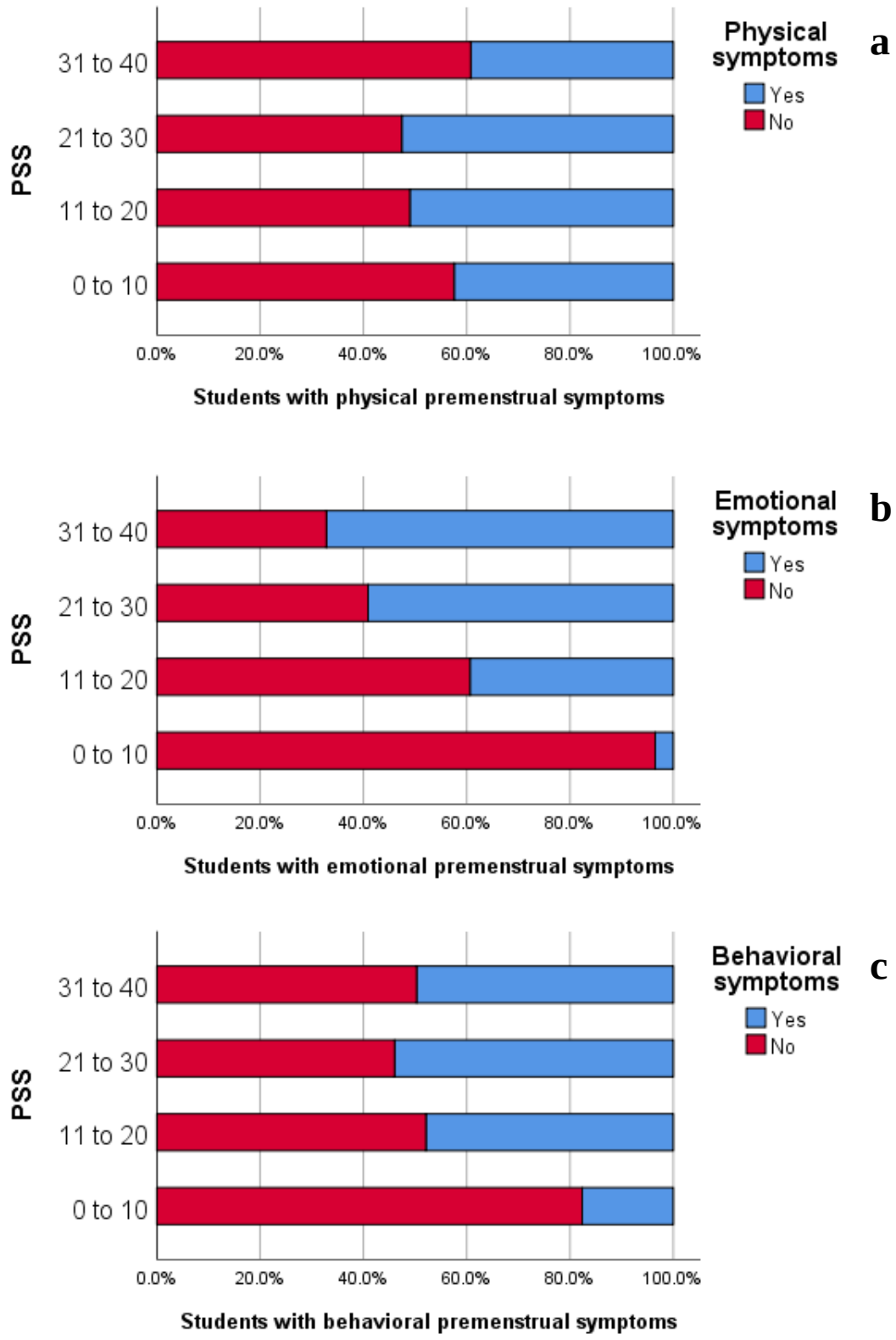


Figure V. Relationship between PSS Score and proportion of students with premenstrual symptoms. (**a**) Physical premenstrual symptoms, (**b**) Emotional premenstrual symptoms, (**c**) Behavioral premenstrual symptoms.

Discussion

Medical education is perceived as being stressful, as it is characterized by many psychological changes in students, so, 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 are available in the other countries [5-7], very scant such data among medical students are available in Iraq.

In our study, most of our respondents started their menarche at a normal age range of 11–15 years, with a mean age of 12.65 years, which is comparable with other reports in Khartoum schools girls in Sudan [8], 13.85 year in Egypt [9,10]. 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). 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 Saudi, Egypt, 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 in University of Dammam, Saudi Arabia reported that 18.3% of the students perceived severe stress levels during their medical schooling, in which were 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].

Out of the students who reported dysmenorrhea in our study, 21.4 % of them were severe enough for missing classes and 71.3% were using medications to control dysmenorrhea. A study was 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 drugs In Iraq specifically and widely available, students are prone towards its self-medication [20].

We choose 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 significantly higher mean PSS score. Concerning reasons of absentees from the study, (24.4 %) of the respondents confirmed very painful period, hindering them from attending their study. This finding is supported by the literature that evident painful menses is an important health problem in university female students and has a negative effect on their attendance [21].

There are certain limitations in our study. As the study is a cross-sectional study, it is difficult to draw a causal relationship between premenstrual symptoms and heavy bleeding flow in menstrual cycles and psychological stress. It may be possible for us to speculate that psychosocial stress is partly responsible for heavy bleeding flow or premenstrual symptoms, or that heavy bleeding flow in menstrual cycle and premenstrual symptoms may be associated with stress. Further studies with longitudinal study design should be implemented in order to determine the causative relationship between stress and premenstrual symptoms or irregular menstrual cycles.

Due to Covid-19 pandemic and its limitations, lack of the close contact between the researcher and participants in order to communicate and obtain accurate information in addition to accurate measurements of height and weight for calculating BMI, makes differences in individualized interpretation and variations. The reader should also remember that as the study was based on online one time subjective questionnaire, its reliability totally depended on the recall power of the enrolled subjects. Participants estimated their menstrual amount and duration by calculating the quantities of sanitary pads used or by the number of days of menstruation and blood loss or passage of clots, this approach is likely to also suffer varying degrees of individual variations. Another limitation in the study that there were poor responses from some universities and stages for some reasons that makes our findings could not be generalized.

Conclusion

In the wake of fast paced life, full of stress among medical students, this study was a small step to assess the problems suffered by females studying medicine among their mensural cycle. The results showed that:

- ✓ Most of students suffer from premenstrual symptoms, heavy bleeding flow, and dysmenorrhea which severe enough to take analgesics. These menstrual abnormalities not only hamper quality of college life but also are associated with future health risks like infertility, diabetes mellitus and cardiovascular disorders.
- ✓ Within our sample quartile of students reported high levels of stress, specifically students in the fourth stage.
- ✓ There was a significant relationship between high stress levels and the occurrence of menstrual abnormalities like premenstrual symptoms, heavy bleeding flow, and dysmenorrhea which severe enough to missing classes (absenteeism). So an early detection and elevation of factors may have a prevention role, and more attention should be paid to mental health factors such as psychological stress.

Recommendation

We recommend that further studies may be undertaken with multi-centric and larger sample size of similar age group for the assessment of stress and clinical manifestations of menstrual disorders. Though similar studies have been reported in recent years, there are no major interventions in the curriculum of medical students to combat stress. We recommend various interventions to reduce stress, such as yoga, deep breathing exercises, music, sports and stress management techniques to be included in the curriculum of the medical students, to overcome stress.

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Appendix

Questionnaire

Age:
Weight:
Height:
Marital Status:
University:
Stage:
Your accommodation during the study period:
Do you suffer from any chronic medical diseases? **Yes\No**, if yes, mention the disease: _____.
Are you on any hormonal therapy? **Yes\No**

Menstrual details for the past 6 months

1. At what age did you attain menarche? _____ years.
2. Are your menstrual cycles regular (+\- 3 days is accepted as regular)? **Yes\No**
3. If yes for the previous question, what is the duration between the first day of menstrual flow and first day of next menstrual flow (Menstrual cycle length)? _____ days.
4. How many days did you have bleeding in each cycle? _____ days.
5. Do you pass clots during menstruation? **Yes\No**
6. Do you experience abdominal pain/low back pain during menstruation? **Yes\No**
7. If yes for the previous question, Do you...?
   a) Skip classes (college absenteeism) due to pain? **Yes\No**
   b) Take pain killers (Analgesic) due to pain? **Yes\No**
8. Do you suffer from any of the following symptoms prior to menstruation?
   a) Abdominal pain: **Yes\No**
   b) Headache: **Yes\No**
   c) Nausea: **Yes\No**
   d) Abdominal bloating: **Yes\No**
   e) Increased frequency of stools: **Yes\No**
   f) Breast pain: Yes\No
   g) Swelling of extremities: **Yes\No**
   h) Irritability: **Yes\No**
   i) Anger: **Yes\No**
   j) Depression: **Yes\No**
   k) Increased food intake: **Yes\No**
   l) Decreased food intake: **Yes\No**
   m) Lethargy (fatigue): **Yes\No**

Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by circling how often you felt or thought a certain way.
0=Never, 1=Almost never, 2=Sometimes, 3=Fairly often, 4=Very often

In the last month, how often have you been upset because of something that happened unexpectedly?	**1 2 3 4**
In the last month, how often have you felt that you were unable to control the important things in your life?	**1 2 3 4**
In the last month, how often have you felt nervous and stressed?	**1 2 3 4**
In the last month, how often have you felt confident about your ability to handle your personal problems?	**1 2 3 4**
In the last month, how often have you felt that things were going your way?	**1 2 3 4**
In the last month, how often have you found that you could not cope with all the things that you had to do?	**1 2 3 4**
In the last month, how often have you been able to control problems in your life?	**1 2 3 4**
In the last month, how often have you felt that you were on top of things?	**1 2 3 4**
In the last month, how often have you been angered because of things that were outside of your control?	**1 2 3 4**
In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	**1 2 3 4**