Prevalence of menstrual problems and their association with psychological stress in young female students studying health sciences

Nazish Rafique, MBBS,FCPS, **Mona H. Al-Sheikh,** MBBS, PhD.

ABSTRACT

الأهداف: التعرف على مدى انتشار مشاكل الطمث المختلفة لدى الشابات اللواتي يدرسن العلوم الصحية وتحديد ارتباطهن بالضغط الأكاديمي .

الطريقة: كانت هذه الدراسة مستعرضة أجريت في كليات الصحة التابعة لجامعة الإمام عبد الرحمن بن فيصل بالدمام في الفترة ما بين فبراير 2015م وفبراير 2016م . وقد استكملت مائة وثمانية وثلاثون طالبة تتراوح أعمارهن بين 18 و 25 سنة مجهول الهوية هوية الطمث، استبيان مقياس الضغط . تم تحليل البيانات باستخدام سبس الإصدار 16.0 .

النتائج: 91.9% من الطالبات يعانون من نوع ما من مشكلة الحيض . وشملت حالات الحيض المختلفة، وشملت حالات الحيض غير المنتظمة (27%)، والنزيف المهبلي غير الطبيعي (9.3%)، وانقطاع الطمث (9.2%)، ونزيف الطمث (3.4%)، وعسر الطمث (89.7%)، وأعراض ما قبل الدورة الشهرية (46.7%) . تم تحديد الضغط العالي المدرك (HPS) في 39% من الطالبات . تم العثور على ارتباط إيجابي كبير بين هس ومشاكل الدورة الشهرية . كان الطالبات مع HPS أربع مرات، مرتين، و 2.8 مرات زيادة نسبة الأرجحية لمرض انقطاع الطمث، عسر الطمث، ومتلازمة ما قبل الحيض، في (p<0.05) .

الخاتمة: كانت مشاكل الحيض الأكثر انتشارا (عسر الطمث وأعراض ما قبل الحيض) في السكان المستهدفين ترتبط بقوة مع الإجهاد . ولذلك، فمن المستحسن أن يتم تزويد الطالبات العلوم الصحية مع المشورة النفسية والنسائية في وقت مبكر لمنع المضاعفات في المستقبل .

Objectives: To identify the prevalence of various menstrual problems in young females studying health sciences and to identify their association with academic stress.

Methods: This was a cross-sectional study, conducted in the health colleges of Immam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia between February 2015 and February 2016. Seven hundred and thirty-eight female students aged 18-25 years anonymously completed menstrual problem identification and perceived stress scale questionnaire. The data was analyzed using the Statistical Package for Social Sciences version 16.0.

Results: Ninety-one percent of the students were suffering from some kind of menstrual problem. The different menstrual problems reported, and their incidences included irregular menstruation (27%), abnormal vaginal bleeding (9.3%), amenorrhea (9.2%), menorrhagia (3.4%), dysmenorrhea (89.7%), and premenstrual symptoms (46.7%). High perceived stress (HPS) was identified in 39% of the students. A significant positive correlation was found between HPS and menstrual problems. Students with HPS had 4 times, 2 times, and 2.8 times increased odds ratio for experiencing amenorrhea, dysmenorrhea, and premenstrual syndrome ($p<0.05$).

Conclusion: The most prevalent menstrual problems (dysmenorrhea and premenstrual symptoms) in the target population were strongly associated with stress. Therefore, it is recommended that health science students should be provided with early psychological and gynecological counselling to prevent future complications.

Address correspondence and reprint request to: Dr. Nazish Rafique, Department of Physiology, Immam Abdul Rehman Bin Faisal University, Dammam, Kingdom of Saudi Arabia. E-mail: nryahmed@uod.edu.sa ORCID ID: orcid.org/0000-0002-1565-415X

Menstruation is a natural phenomenon involving the discharge of blood from the uterus through the vagina, occurring at more or less regular monthly intervals during the reproductive life of females.[1] Normal menstruation first occurs in adolescents between 11 and 14 years of age, with a period length of 7 days or less, and a normal cycle length of 21 to 45 days with average blood loss of 20-80ml.[2]

There are various types of menstrual disorders, including dysmenorrhea, premenstrual symptoms, menorrhagia, polymenorrhea, abnormal vaginal bleeding, amenorrhea, oligomenorrhea, and irregular menstruation.[3] Studies have shown that a large proportion of the female population of reproductive age suffers from menstruation-related health issues.[4-6] Menstrual problems not only carry an economic burden but are also one of the most common causes of absenteeism and poor academic performance among young females.[7-9]

Dysmenorrhea is one of the most prevalent menstrual problems during adolescence,[5-7] and can even cause women to become bed-ridden.[10] A review by Devis et al[11] showed that, 20-90% of adolescent girls reported dysmenorrhea, and almost 15% of those experienced severe dysmenorrhea. Another menstrual problem that can affect women's daily activities is premenstrual syndrome (PMS). In a systematic review, the pooled prevalence of PMS was found to be 47.8%.[12] Menstrual disorders such as menorrhagia, abnormal uterine bleeding, and polymenorrhea contribute to almost 12% of gynecology referrals, and are usually associated with a very high chance of surgical intervention.[13] Coulter et al[14] reported that 60% of women underwent a hysterectomy within 5-years of a referral for menorrhagia.

Menstrual patterns can be affected by a number of factors, including age, ethnicity, family history, smoking, physical activity, and dietary habits.[15] Stress can be a major contributor to, or cause of menstrual irregularities, and an association has been documented between stress and various menstrual irregularities including menorrhagia, oligomennorhea, dysmenorrhea, and PMS.[16,17] In addition, a high incidence of menstrual problems has been observed in students studying medicine and health sciences.[6,18,19]

The majority of health science students reported that they are under continuous and chronic academic stress related to their studies and exams,[20] resulting in negative health outcomes, including menstrual problems in females.[18,19]

A few studies regarding the prevalence of menstrual problems and their association with psychological stress are available in the literature. However, most of the existing studies either relied on a small sample size or did not utilize a validated stress questionnaire. Therefore, the present study was designed to fill this gap. The rationale of this study is to explore that either an association exists between psychological stress and menstrual problems using a validated perceived stress scale questionnaire (PSS10).[21] The study results will be helpful to explore this association, and for creating strategies for improving psychological and reproductive health.

Methods. This was a cross sectional study of one-year duration (February 2015 to February 2016), in which 1,200 students from the various health colleges of Immam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia including the College of Medicine and College of Applied Medical Sciences (Dental College, Nursing College, Physiotherapy, Respiratory Therapy, Medical Lab Technicians) were invited to participate.

Inclusion criteria. Young female Saudi university students (aged between 18 and 25 years), who were willing to participate in the study.

Exclusion criteria. Females with chronic health problems, psychiatric problems, any type of diagnosed pelvic pathology (fibroids, pelvic inflammatory disease), a positive pregnancy test, and lactating mothers were excluded from the study.

In total, 738 students fulfilled the inclusion criteria and were recruited. Ethical approval was obtained from the Deanship of Scientific Research at Immam Abdulrehman Bin Faisal University. As this study involved human subjects; the principles of Helsinki Declaration were followed strictly.

The subjects were asked to complete a menstrual problem identification questionnaire anonymously. The questionnaire was designed by the authors, based on some previous similar studies.[4-6] The questionnaire included items relating to the participants' demographic details, and concerned their menstrual pattern (menarche age, cycle length in days, duration of flow in days, menstrual regularity), characteristics of blood loss, and history of dysmenorrhea, amenorrhea, and premenstrual symptoms. The reliability and validity of the questionnaire was checked using the test-retest

technique. The same questionnaire was completed by 20 students, with a gap of 3 weeks in between, to determine whether they answered in the same way. Cronbach's alpha, calculated using the Statistical Package for Social Sciences software, showed the reliability of the questionnaire to be 0.807. In order to measure individual stress levels, PSS10 was used, which is found to be very reliable for determining the role of stress in the aetiology of disease and behavioral disorders. Based on PSS 10, Scores ranging from 0-13 were considered to indicate low perceived stress, 14-26 moderate perceived stress, and 27-40 high perceived stress (HPS).[21]

Written consent was obtained and all the participants were assured that their identity would be kept confidential. A short, 15-minutes briefing was carried out to explain to participants the terminologies used in the questionnaires. As the students belonged to the health sciences schools, they understood and completed the questionnaires very well, reducing the opportunities for error.

The following definitions were used to define normal menstruation and various menstrual disorders: Normal menstrual cycle: The duration of a normal menstrual cycle is 21 to 35 days, with a menstrual flow ranging from 2 to 6 days, and average blood loss is 20 to 80 ml. Irregular cycle: If there is an abnormal variation in the length of the menstrual cycle, it is considered to be irregular. Cycle length variation between 8 to 20 days is classified as moderately irregular, whereas variation of 21 days or more is categorized as very irregular.[22] Amenorrhea means without menstruation. Primary amenorrhea refers to the absence of menstruation by 16 years of age in the presence of normal secondary sexual characteristics; secondary amenorrhea is the absence of menstruation for 3 normal cycles, or for 6 months. Oligomenorrhea is a condition in which the menstrual cycle lasts longer than 35 days. Hypomenorrhea is a condition in which uterine bleeding may be slight in volume, short in duration (<2 days), or both. Polymenorrhea refers to cyclic bleeding that is normal in terms of volume but occurs at too frequent intervals of less than 21 days, for example 5/21. Menorrhagia is cyclic bleeding at normal intervals; namely, 5/28, which is excessive in amount (>80 ml), or at normal intervals with prolonged duration, for example 8/28. Primary dysmenorrhea refers to the presence of painful menses, where there is no underlying pathology that can account for the pain. Usually the pain is felt in the hypogastrium but it may radiate to the front of the thighs. There may also be some lower backache, and the condition may or may not be associated with autonomic symptoms such as sweating, nausea, and diarrhea. Premenstrual symptoms are a group of psychological and somatic changes occurring a few days preceding menstruation, and are resolved once menstruation is established. In some women, these manifestations become sufficiently exaggerated to constitute premenstrual syndrome (PMS).[3] In the present study, all the above mentioned definitions were applicable if the symptoms were present for at least the last 3 menstrual periods.

Statistical analysis. The data was analyzed using Statistical Package for Social Sciences (SPSS) for Windows, Version 16.0. Descriptive statistics were used to determine the demographic data, menstrual patterns, and incidence of different menstrual disorders in the young female university students. The Chi-square test was used to compare the presence or absence of menstrual irregularity in the students with various menstrual problems, and a $p<0.05$ was considered statistically significant. Correlation between stress and various menstrual problems was carried out via Spearman Pearsons correlation coefficient. Whereas odds ratios were calculated by applying logistic regression analysis.

Results. The demographic data is shown in **Table 1**. **Table 2** shows the menstrual patterns of participants, including cycle length, quantity of blood loss, and duration of flow in days. The study identified a high incidence of menstrual problems in the young Saudi students, where 91% were suffering from some kind of menstrual problem. The frequency of occurrence of different disorders is presented in **Table 3**, while **Table 4** elaborates on the frequencies and percentages of different premenstrual symptoms. **Table 5** shows the presence or absence of menstrual irregularity in the students with various menstrual problems,

Table 1 - Demographic data of 738 female students aged 18-25 years anonymously completed menstrual problem identification and perceived stress scale questionnaire.

Demographic data	n	(%)
Age		
≤20	321	(43.4)
21-25	417	(56.5)
Residence		
Home	716	(97.0)
Hostel	22	(3.0)
Family size		
≤4	155	(21.0)
5-8	364	(49.3)
>8	136	(18.4)
Marital status		
Single	569	(77.0)
Married	169	(22.8)

Table 2 - Various menstrual patterns of 738 female students.

Menstrual patterns	n	(%)
Cycle length in days		
<21	98	(13.2)
21 - 27	316	(42.8)
28 - 35	263	(35.6)
>35	41	(5.5)
Duration of flow in days		
≤2	59	(7.9)
5-7	523	(70.8)
>7	139	(18.8)
Menstrual blood loss		
Scarce (1 - 49 ml, <5 pads/day)	205	(27.7)
Average (50 - 80 ml, 5 - 7 pads/day)	486	(65.8)
Abundant (> 80 ml, >7 pads/day)	25	(3.4)

Based on these results: Subjects with a cycle length of <21 days were considered to have polymenorrhea; Subjects with a cycle length of >35 days were considered to have oligomennorhea; Subjects with a cycle duration of ≤2 days were considered to have hypomenorrhea; and Subjects with blood loss of >80 ml/day were considered to have menorrhagia

Table 3 - Prevalence of various menstrual disorders in 738 female students.

Menstrual disorders	n (%)
Regular	525 (71.1)
Irregular	201 (27.0)
History of amenorrhea	68 (9.2)
Menorrhagia	25 (3.4)
Premenstrual symptoms	345 (46.7)
History of abnormal vaginal bleeding	69 (9.3)
History of dysmenorrhea	662 (89.7)

Table 4 - Prevalence of different premenstrual symptoms in 738 female students.

Different premenstrual symptoms	n	(%)
Are your menstrual cycles associated with premenstrual symptoms?		
Yes	345	(46.7)
If 'Yes', do you feel any of the following?		
Generalized pains	129	(37.4)
Headaches	59	(17.1)
Tiredness	150	(43.5)
All	44	(12.8)
Water retention		
Bloating	20	(5.7)
Tender breasts	83	(24.5)
Acne	60	(17.3)
All	49	(14.2)
Negative effects		
Loss of appetite	13	(3.7)
Mood swings, anger, irritability	159	(46.0)
All	38	(11.0)

Table 5 - Comparison of presence or absence of menstrual irregularity in the participants with various menstrual problems

Menstrual problems	Menstrual irregularity n (%)		P-value
	Yes	No	
Amenorrhea	40 (20.3)	28 (5.4)	<0.001*
Dysmenorrhea	188 (94.0)	471 (90.8)	0.16
Abnormal vaginal bleeding	26 (13.2)	43 (8.4)	0.05*
Premenstrual symptoms	91 (45.5)	252 (48.8)	0.35
Menorrhagia	7 (3.6)	18 (3.5)	0.9

P-value was determined by a Chi-square test, *$p<0.05$ is statistically significant

demonstrating that a significant number of students with irregular menstruation were also suffering from amenorrhea ($p<0.001$) or abnormal vaginal bleeding ($p<0.05$). An important finding of the present study was that 39% of the students were suffering from HPS, and 27% of these students indicated that their HPS was related to their studies and exams. **Table 6** shows a strong correlation between stress and various menstrual irregularities, highlighting that the students with HPS were 4 times, 2 times, and 2.8 times more likely to have amenorrhea, dysmenorrhea, or premenstrual syndrome, respectively.

Discussion. Menstrual problems and stress are among the most common health problems in young females studying health sciences.[4,6,18-21] This study identified that 39% of participants had HPS, and 91.9% were suffering from some type of menstrual problem. Amennorhea, dysmenorrhea, and premenstrual symptoms were strongly and positively associated with HPS. Focusing on the basic characteristics of the menstrual cycle, including length and the duration of flow in days, this study found that 77% of participants had a normal length cycle, 70% had normal duration of flow, and 65% had normal blood loss. However, variations in cycle duration have been observed in different populations, and intra- and inter-individual variations are also common. For instance, it has been reported that 2.2% of women in South India experience shorter (<21 days) and 4.1% longer menstrual cycles (>35 days).[23] In this study, 13% of the participants reported short and 5% reported long menstrual periods. However, a 7% and 24% occurrence of the same was reported in Nigeria.[24] Only 3.4% of the participants in the present study reported menorrhagia, and 13% reported polymenorrhea (short cycle length of less than 21 days). These results are consistent with the findings of other authors, indicating that menorrhagia is less

Table 6 - Correlation of stress with various menstrual problems.

Various menstrual problems	Stress		Correlation	P value (OR, 95% CI)
	HPS group (PSS >27)	Low and moderate stress (PSS <27)		
Amenorrhea	29 (10.3)	3 (2.7)	0.13**	0.012 (4.2, 1.2 - 14)
Dysmenorrhea	266 (94.3)	98 (88.3)	0.104**	0.04 (2.2, 1 - 4.8)
Abnormal vaginal bleeding	31 (11.2)	8 (7.2)	0.059	0.24 (1.6, 0.7 - 3.6)
Premenstrual symptoms	256 (91.1)	87 (78.4)	0.173**	0.001 (2.8, 1.5 - 5)
Menorrhagia	6 (2.2)	3 (2.7)	-0.02	0.4 (0.79, 0.2 - 3.2)
Irregular menstruation	76 (27.2)	25 (22.3)	0.051	0.32 (1.3, 0.7 - 2.2)

Correlation was calculated via Spearman's and Pearson's correlation coefficients; odds ratios (OR) were calculated by applying logistic regression analysis; **Significant positive correlation; P-value <0.05 is statistically significant; Students with a perceived stress score (PSS) of >27 were categorized in the high perceived stress (HPS) group

prevalent in the young population and occurs more frequently in subjects over 35 years of age.[4,6,9] However, in contrast to the findings of Zhou et al[17] and Fenster et al,[25] the present study did not find any association between psychological stress and menorrhagia or polymenorrhea.[17,25]

Irregular menstruation was found in 27% and amenorrhea (cycle length of more than 3 months) was found 9% of the study participants. A significant number of the students with irregular menstruation were also suffering from amenorrhea (*p*<0.001). Moreover, a strong positive correlation was also observed between amenorrhea and HPS. Allsworth et al,[26] also demonstrated a strong influence from stress as a cause of amenorrhea and menstrual irregularities. Similar effects from stress on the menstrual cycle length have also been identified by other authors.[17,27] However, the results of studies by Sood et al[28] and Willey et al[29] show no association between stress levels and menstrual patterns in medical students. These discrepancies may be due to the differences in the study methodologies, effects of other confounding factors, and individual differences in adapting to stress.[30] In the present study, many students exposed to almost the same degree of stress still had normal menstruation. A possible physiological mechanism responsible for irregular menstruation and amenorrhea in the students with HPS can be prolonged activation of the hypothalamic-pituitary adrenal axis by stress, which may alter hormonal profiles, resulting in the disruption of normal ovulation and menstrual cycles.[31] Among the study participants, the menstrual irregularity with the highest prevalence was dysmenorrhea (89.7%), with 12.4% suffering

from severe dysmenorrhea that prevented them from doing any type of work, and 66% had dysmenorrhea that moderately affected their daily routines. Similar results were reported by other authors, indicating the prevalence of dysmenorrhea and severe dysmenorrhea in their young study groups to be 50% and 28%, and 80% and 37%, respectively.[10,32] It has been reported that dysmenorrhea improves with advancing age and parity;[33] therefore, the high prevalence of dysmenorrhea found in the present study may be due to the fact that the study population included only young adults. Moreover, the participants with HPS also showed a significant and positive association with dysmenorrhea, which could be another factor contributing to this high prevalence. The data collected by Kollipaka et al[34] showed that 76.9% of medical students had dysmenorrhea, although there was no significant association between dysmenorrhea and PSS score in their study, although they did find that students with dysmenorrhea severe enough to take medication had higher mean PSS scores.[34] The pathophysiological mechanisms responsible for causing dysmenorrhea when under stress are not fully understood; some studies suggest that high levels of psychological stress can cause the activation of the stress-related circuits in the hypothalamus, which in turn can cause hyperalgesia through the activation of pain-facilitating neurons.[35]

Another notable finding of this study was that 46.7% of the participants were suffering from premenstrual symptoms. The most prevalent premenstrual symptoms reported by participants were mood swings/anger/irritability (46%), and tiredness (43.5%). Varying prevalences of premenstrual

symptoms have been reported in various studies,[4,6,9] but the lowest and highest prevalences were reported in France 12% and Iran 98%, respectively.[12] A study by Raval et al[36] reported a comparatively low prevalence of premenstrual symptoms (18.4%), but the most commonly reported symptoms in their subjects were fatigue/lack of energy (63%), followed by anger/irritability (59.9%).[36] Another noteworthy result of this study was that the students with a PSS of >27 showed a strong positive correlation with premenstrual symptoms ($p<0.0001$). Similar results were reported by Kollipaka et al[34] and Gollenberg et al[37] who also observed that high stress was significantly associated with premenstrual symptoms ($p<0.08$ and $p<0.0001$).[34,37] Premenstrual symptoms can be caused by abnormal functioning of the hypothalamic-pituitary-adrenal axis (HPA), hormonal imbalance, nutritional defects, and environmental factors.[38] The cause of the high prevalence of premenstrual symptoms, especially the anger and irritability in the current study's participants, may be related to stress-related premenstrual decline in brain serotonin function, resulting in the worsening of cardinal mood symptoms.[39]

Study limitations. Although this study recruited a large sample size to correlate psychological stress with menstrual disorders through the use of a validated stress questionnaire. However, there are a number of limitations of the present study; for instance, it was a cross sectional study, so it was not possible to conclude a causative relationship between psychological stress and menstrual problems. The effect of other confounding factors, such as body mass index, use of oral contraceptive pills, lack of sleep, and parents' socioeconomic status were not considered. Moreover, the analysis relied on data obtained via the questionnaire only, and no history was taken, or medical examination/investigations performed.

In conclusion, this study concludes that the prevalence of menstrual problems and stress is quite high in young, Saudi, female health sciences students. In addition, a strong positive association between psychological stress and amenorrhea, dysmenorrhea, and premenstrual symptoms was identified.

It is recommended that all health sciences students should be provided with short courses on stress management techniques as part of their curriculum. Moreover, all health sciences colleges should make arrangements for early identification of students with HPS and menstrual problems, as both of these conditions can not only affect the academic performance of the students, but can also have negative effects on their psychological and reproductive health. The students identified should be provided with timely psychological and gynecological counselling, as well as instructions and strategies for preventing future complications.

We recommend similar studies to be conducted in other schools and colleges, including the effects of confounding factors, such as body mass index, use of oral contraceptive pills, lack of sleep, and parents' socioeconomic status in causing psychological stress and menstrual disorders.

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Clinical Practice Guidelines

Clinical Practice Guidelines must include a short abstract. There should be an Introduction section addressing the objective in producing the guideline, what the guideline is about and who will benefit from the guideline. It should describe the population, conditions, health care setting and clinical management/diagnostic test. Authors should adequately describe the methods used to collect and analyze evidence, recommendations and validation. If it is adapted, authors should include the source, how, and why it is adapted? The guidelines should include not more than 50 references, 2-4 illustrations/tables, and an algorithm.