Prevalence of primary dysmenorrhea and its effect on the quality of life amongst female medical students at King Saud University, Riyadh, Saudi Arabia

A cross-sectional study

Refan T. Hashim, Medical Student, *Sara S. Alkhalifah,* Medical Student, *Alanoud A. Alsalman,* Medical Student, *Demah M. Alfaris,* Medical Student, *Munira A. Alhussaini,* Medical Student, *Raghda S. Qasim,* Medical Student, *Shaffi A. Shaik,* PhD.

ABSTRACT

الأهداف : إحصاء مدى شيوع عسر الطمث الأولي بين طالبات الطب بجامعة الملك سعود، قياس مدى الارتباط بين عسر الطمث الأولي وجودة حياة الطالبات و تحديد العوامل المساهمة في حدوث عسر الطمث الأولي .

المنهجية : أجريت دراسة مقطعيه مستعرضه، والتي عملت على عينة متوالية غير عشوائية من طالبات الطب بجامعة الملك سعود من السنة الأولى إلى السنة الخامسة، خلال الفترة الزمنية من سبتمبر 2017م حتى مايو 2018م، وقد بلغ العدد النهائي للعينة 376 طالبة .

النتائج : نسبة شيوع عسر الطمث الأولي بين طالبات الطب بجامعة الملك سعود بلغ 80.1%. معظم المشاركات (134) لديهن ألم معتدل بنسبة (49.8%). استهلاك الكافيين كان العامل الوحيد المساهم في حدوث عسر الطمث الأولي (p<0.05) . باستخدام SF-36، بينت النتائج بأن عسر الطمث الأولي قد حد من صحة الطالبات الجسدية (p<0.001) والنفسية (p=0.01) ، وكان له علاقة بالتغييرات الصحية (p=0.033) ، و الآلام الجسدية (p<0.001) . كان لعسر الطمث الأولي تأثير كبير على مستوى الطالبات الأكاديمي حيث أثر سلباً على حضورهن، تركيزهن، وقت دراستهن، ومشاركتهن في الصف .

الخلاصة : نسبة شيوع عسر الطمث الأولي كان مرتفع في هذه الدراسة، حيث أثر سلباً على جودة حياة الطالبات، ومستواهن الأكاديمي. استهلاك الكافيين كان عاملاً مساهماً في حدوث عسر الطمث الأولي . لذلك، نحن بحاجة إلى برامج توعوية لتقليل مضاعفات عسر الطمث الأولي .

Objectives: To quantify the prevalence of primary dysmenorrhea, study its associated factors, and to assess its effect on the quality of life of female medical students.

Methods: A cross-sectional study was conducted among 376 female medical students at King Saud University student campus and King Khalid University Hospital (KKUH), Riyadh, Saudi Arabia, between September 2017 and May 2018. The study was conducted using a consecutive, non-random sampling technique.

Results: The prevalence of primary dysmenorrhea among female medical students was 80.1%; most of the participants (n=134) reported moderate pain (49.8%). Primary dysmenorrhea was significantly associated with caffeine consumption ($p<0.05$) and did not show an association with factors, body mass index, diet, lack of physical activity, and smoking. Among the SF-36 domains, the 4 domains physical health ($p<0.001$) and emotional health ($p=0.01$) including health changes ($p=0.033$) and pain ($p<0.001$) were statistically significantly affected by dysmenorrhea. Primary dysmenorrhea also had a significant impact on the students' academic performance where a higher proportion of students suffering from primary dysmenorrhea showed negative effects on their attendance, concentration, study time, and participation in class.

Conclusion: Most female medical students suffer from primary dysmenorrhea, which adversely affects their quality of life and academic performance. Caffeine consumption demonstrated a significant association with primary dysmenorrhea. Periodical awareness programs to minimize the consequences of primary dysmenorrhea should be introduced.

Keywords: dysmenorrhea, medical students, Saudi Arabia, academic performance, quality of life

Address correspondence and reprint request to: Prof. Shaffi A. Shaik, Prince Sattam Chair for Epidemiology and Public Health Research, Department of Family & Community Medicine, College of Medicine, King Khalid University Hospital, King Saud University, Riyadh, Kingdom of Saudi Arabia. E-mail: sshaik@ksu.edu.sa
ORCID ID: https://orcid.org/0000-0001-9900-5116

Dysmenorrhea is defined as painful menstrual cramps of uterine origin. It is commonly divided into primary dysmenorrhea (pain without organic pathology) and secondary dysmenorrhea (pelvic pain associated with an identifiable pathological condition, such as endometriosis or ovarian cysts).[1] It is known with certainty that primary dysmenorrhea affects millions of women worldwide. Recent local studies revealed that dysmenorrhea is a common problem among more than two-thirds of Saudi females.[2,3] As for medical students in our region, dysmenorrhea was found to be prevalent among 60% and 92% of nursing students.[4,5] It is a problem of great significance, not only to the affected individuals but to society as a whole by affecting women's functional abilities.[6] However, it is not yet known how exactly dysmenorrhea affects students' quality of life across different aspects, such as their level of activity, emotional health, energy level, and social life.

Maintaining the same level of adequate academic performance throughout menstruation is a challenge for students. Several studies reported a decrease in students' attendance and concentration due to dysmenorrhea.[4,7-9] Moreover, multiple factors are known to be related to dysmenorrhea, including the following: smoking, diet, lack of physical activity, body mass index (BMI), caffeine consumption, and so on.[4,10] However, it is not currently known which of these factors has the greatest impact on dysmenorrhea in women.

This study aims to quantify the prevalence of primary dysmenorrhea and to observe the factors related to dysmenorrhea in female medical students at King Saud University, Riyadh, Saudi Arabia. Also, to evaluate its effects on the quality of life, so that students become aware of the magnitude of the problem and can make the necessary changes to improve their quality of life

Methods. This cross-sectional study was conducted between September 2017 and May 2018 at the College of Medicine, King Saud University female campus, and the KKUH female academic center, Riyadh, Saudi Arabia. Both sites of the study included a total of 692 female students. Riyadh is the capital city of the Kingdom of Saudi Arabia.

Assuming a prevalence of 50% of dysmenorrhea, with a precision of ±5%, and at 0.05 level of significance,

the study requires 384 subjects. Anticipating 50% non-response due to electronic survey, the sample size was increased by 192, with a total target sample size of 576. To compensate for the exclusion of subjects due to clinical criteria, all female students were approached to participate in the study; as a result, a consecutive non-random sampling technique was used. Students who reported the use of oral contraceptive pills and those with gynecological/pelvic pathologies were excluded. This exclusion was due to the fact that our focus in this study is primary dysmenorrhea.

Development of study questionnaire and using SF-36 scale. The authors have developed a data collection form which includes: sociodemographics, medical and medication history, the status of dysmenorrhea, (whether it is present or absent), and the severity of the pain (mild/moderate/severe). The form also included factors contributing to dysmenorrhea such as, smoking, BMI, diagnosed psychological disorders, diet, exercise, and consumption of caffeine. Participants were also asked about their academic performance: attendance, concentration, study time, and participation. This data collection form was developed to meet the objectives of the study and by reviewing the articles on this topic.[9,11] In addition, the English version of the SF-36 instrument was used. Its domains include physical functioning, role limitations due to emotional health, role limitations due to physical health, energy fatigue, emotional well-being, social functioning, pain, general health, and health changes.[12] The SF-36 scale is a validated questionnaire which is widely used for measuring Health related quality of Life (HRQoL). Scores range 0 to 100 for each domain was used to quantity the HRQoL. A pilot study was carried out on 10 female students to observe the clarity of variables and its responses. A consent form was attached to the questionnaire.

Data was collected using self-administered questionnaire (which takes 10 to 20 minutes to complete) after obtaining consent to participate in the study. The study questionnaire was sent to all the female students electronically to their e-mail addresses. Those who did not respond but provided consent to participate, were approached personally to collect the data.

Statistical analysis. The statistical analysis was performed by Statistical Package for Social Sciences, for Windows version 21.0 (IBMCorp, Armonk, NY, USA). Descriptive statistics (mean, standard deviation, frequencies, and percentages) were used to describe the quantitative and categorical variables. Pearson's Chi-square test was used to test the association and to compare the proportion of categorical study variables

in relation to dysmenorrhea (yes/no). Odds ratios were calculated to measure the association between study variables and dysmenorrhea. Binary multiple logistic regression was used to find the independent factors associated with dysmenorrhea. Non-parametric statistical test, Mann-Whitney U-test was used to compare the mean ranks of scores of domains of SF-36. A *p*-value of <0.05 and 95% confidence intervals (CI) were also used to report the statistical significance and precision of the results.

International Review Board approval from College of Medicine (Ref no: CMED305F1 [2017-2018]) was obtained. Voluntary participation was insured by requiring all participants providing informed consent. The consent form was clear, indicating the purpose of the study and the right of the participants to withdraw at any time without any obligation toward the study team. Participants' anonymity was insured by assigning each participant a code number for the purpose of analysis only. No incentives or rewards were provided to participants. There was no conflict of interest to be reported.

Results. *Sociodemographic and menstrual history.*
A total of 376 students responded and completed the survey questionnaire, out of which 40 students' responses were not considered for the analysis due to use of OCP (n=10), and gynecological/pelvic pathologies (n=30). In this study, 336 student's responses were analyzed. The mean age was 20.97±1.49 years with a range of 19-26 years. Baseline characteristics are shown in **Table 1**.

Most respondent's were from first year (26%) and third year (25%). The majority (99%) were single, in comparison to those who were married (1%) or divorced (0.3%). A family income of more than 20,000 riyals per month was reported by 17.1% (n=239) of the students, while only a small number (1%) reported an income of less than 5000 per month. In this study, menstrual characteristics were also assessed; most students (82%) had regular menstruation, with 78% menstruating for 3-7 days each month. Moreover, up to 81% of respondents reported moderate heaviness, assessed by the use of 3-5 pads per day. Furthermore, 61% of research participants reported a positive family history of primary dysmenorrhea. The prevalence of primary dysmenorrhea among female medical students was 80.1% (n=269), half of which (n=134) reported moderate pain at 50%. However, 73 participants (27%) reported severe pain and only 62 (23%) reported mild pain.

Factors associated with dysmenorrhea. The distribution of study variables in relation to

Table 1 - Distribution of socio-demographic variables and menstrual/gynecological history of study subjects (N=336).

Variables	n (%)
Age in years (mean±SD)	20.9±1.5
Year of study	
1st	86 (25.6)
2nd	72 (21.4)
3rd	84 (25.0)
4th	44 (13.1)
5th	50 (14.9)
Marital status	
Single	332 (98.8)
Married	3 (0.9)
Divorced	1 (0.3)
Family income (in Saudi Riyals)	
<5000	4 (1.2)
5000-10000	17 (5.1)
10000-20000	76 (22.6)
>20000	239 (71.1)
Menstruation duration	
<3 days	3 (0.9)
3-7 days	263 (78.3)
>7 days	70 (20.8)
Pads used	
≤2 pads/day (mild)	38 (11.3)
3 to 5 pads/day (moderate)	272 (81.0)
≥6 pads/day (heavy)	26 (7.7)
Regularity of menstrual cycle	
Regular	276 (82.1)
Irregular	60 (17.9)
Use of other medications	
Yes	62 (18.5)
No	274 (81.5)
Family history	
Yes	206 (61.3)
No	130 (38.7)

dysmenorrhea has indicated the statistically significant association with the "caffeine consumption". That is those who consume caffeine (84%) had dysmenorrhea when compared to those who did not consume caffeine (72%). Thus higher prevalence of dysmenorrhea was observed among caffeine consumers. Also, the odds ratio of 2.06 shows a highly statistically significant association

Table 2 - The study variable associated with dysmenorrhea (N=336).

Variables	Dysmenorrhea		Total n (%)	*P*-value	Odds ratio(95%CI)
	Yes (n=269)	No (n=67)			
Body mass index					
<18.5	33 (80.5)	8 (19.5)	41 (12.2)	0.987	1.06 (0.45,2.45)
18.5-24.9	168 (79.6)	43 (20.4)	211 (62.8)		1.0 (ref.)
25-29.9	49 (81.7)	11 (18.3)	60 (17.9)		1.14 (0.55,2.38)
≥30	19 (79.2)	5 (20.8)	24 (7.1)		0.97 (0.34,2.75)
Stress level					
Usually	75 (76.5)	23 (23.5)	98 (29.2)	0.271	0.93 (0.18,4.80)
Often	103 (85.8)	17 (14.2)	120 (35.7)		1.73 (0.33,9.04)
Occasionally	84 (77.1)	25 (22.9)	109 (32.4)		0.96 (0l.19,4.92)
Hardly ever	7 (77.8)	2 (22.2)	9 (2.7)		1.0 (ref.)
Smoking					
Yes	4 (66.7)	2 (33.3)	6 (1.7)	0.407	0.49 (0.09,2.74)
No	265 (80.3)	65 (19.7)	330 (98.2)		1.0 (ref.)
Consumption of fruits/ vegetables					
Yes	102 (80.3)	25 (19.7)	127 (37.8)	0.927	1.0(ref.)
No	167 (79.9)	42 (20.1)	209 (62.2)		0.97 (0.56,1.69)
Consumption of caffeine (n=282)					
Yes	139 (83.9)	37 (16.1)	176 (62.4)	0.009*	2.06 (1.19,3.57)
No	76 (71.7)	30 (28.3)	106 (37.6)		1.0 (ref.)
Exercise/week					
0	134 (79.3)	35 (20.7)	35 (20.7)	0.929	0.87 (0.40,1.90)
1-2	91 (80.5)	22 (19.5)	22 (19.5)		0.94 (0.41,2.15)
≥3	44 (81.5)	10 (18.5)	10 (18.5)		1.0 (ref.)
Sleep hours/day					
≤4	13 (68.4)	6 (31.6)	19 (5.6)		0.53 (0.18,1.61)
5-7	187 (81.0)	44 (19.0)	231 (68.8)	0.421	1.05 (0.56,1.95)
>7	69 (80.2)	17 (19.8)	86 (25.6)		1.0 (ref.)

Data are presented as numbers and percentage (%). *Statistically significant

between caffeine consumption and dysmenorrhea. The other study variables (BMI, stress level, smoking, consumption of fruits/vegetables, exercise/week and sleep hours/day) were not significantly associated with dysmenorrhea (Table 2).

Multivariate analysis also shows caffeine consumption as associated factor of primary dysmenorrhea with an adjusted odds ratio of 2.19 (95% CI: 1.24, 3.89) (*p*=0.007). Other variables stress, smoking and sleep hours/day in the model were not significantly associated with primary dysmenorrhea (Table 3).

Quality of life. The comparison of mean rank values of domains of SF-36 between the students who had dysmenorrhea and who did not have dysmenorrhea shows a statistically significant difference in the mean rank values of 4 domains (role limitation due to physical health, role limitation due to emotional health, pain

and health changes). The mean rank values of these 4 domains are significantly lower in students who had dysmenorrhea when compared with the students who did not have dysmenorrhea. This finding clearly indicates that dysmenorrhea has a negative effect on some of the domains of quality of life. Other domains mean rank values did not show a statistically significant difference in relation to the presence or absence of dysmenorrhea (Table 4).

Female medical students who suffered from primary dysmenorrhea reported a negative impact on their attendance, with more than half of the sample (67%) reporting an increase in their absenteeism. A high percentage of these students also reported a decrease in their study time (94%), participation (86%), and concentration (89%). A highly statistically significant difference was observed between the subjects who had

Table 3 - Independent factors associated with dysmenorrhea (using binary logistic regression*)

Variables	Adjusted odds ratio (95% CI)
Stress level	
Usually	0.84 (0.16,4.49)
Often	0.96(0.18,5.04)
Occasionally	1.64 (0.31,8.80)
Hardly ever	1.0 (ref.)
Smoking	
Yes	0.48 (0.07,3.27)
No	1.0 (ref.)
Consumption of caffeine (n=282)	
Yes	2.19 (1.24,3.88)
No	1.0 (ref.)
Sleep hours/day	
≤4	0.53 (0.16,1.72)
5-7	0.99 (0.52,1.87)
>7	1.0 (ref.)

*Variables with $p<0.5$ in uni-variate analysis were included in the model

Discussion. In this study, the prevalence of primary dysmenorrhea among female medical students was 80%. A similar prevalence of 71%, 88%, and 74%, were reported among Saudi females.[2,3,13] It is well known that increased psychological stress is a predisposing factor for developing dysmenorrhea; therefore, the stressful lifestyle of medical students could explain the high prevalence of dysmenorrhea in our studied population.[14,15] Moreover, in another Nepalese study, up to 85% of students experienced an increase in the frequency and severity of dysmenorrhea after enrolling in medical school.[16] However, some studies have reported prevalence as high as 94% and others, as low as 53% or 43%.[17-19] Prevalence varies widely among different populations, which is thought to be due to social and cultural reasons, the subjective nature of

dysmenorrhea and who did not had dysmenorrhea towards these 4 variables of academic performance (Table 5)

Table 4 - Comparison of mean ranks of SF-domains in relation to dysmenorrhea.

SF-36 domains	Dysmenorrhea		Mann-Whitney U-value	*P*-value
	Yes mean rank	No mean ranks		
Physical functioning	104.19	105.42	4059.00	0.891
Role limitation due to physical health	158.12	210.19	6218.00	<0.0001*
Role limitation due to emotional health	161.92	194.93	7240.50	0.009*
Energy fatigue	130.71	121.35	4575.50	0.433
Emotional well-being	111.67	110.70	3465.50	0.932
Social functioning	129.02	131.77	4690.50	0.817
Pain	154.82	223.42	5331.00	<0.0001*
General health	65.47	65.66	1051.50	0.984
Health changes	162.50	192.60	7397.00	0.012*

*Statistically significant

Table 5 - Comparison of academic performance variables in relation to dysmenorrhea (N=336).

Academic variables	Dysmenorrhea		Difference of proportion (95%CI)	Chi-squared-value	*P*-value
	Yes (n=269)	No (n=67)			
Attendance (affected)	181 (67.3)	9 (13.4)	53.9(41.8,62.9)	61.25	<0.0001*
Participation (affected)	232 (86.2)	24 (35.8)	50.4(36.9,62.4)	72.27	<0.0001*
Concentration (affected)	239 (88.8)	27 (40.3)	48.5(35.1,60.8)	73.49	<0.0001*
Studying time (affected)	253 (94.0)	30 (44.8)	49.2(36.1,61.6)	93.88	<0.0001*

Data are presented as numbers and percentage (%). *Statistically significant

the symptoms, and the variety of diagnostic criteria.[20] In this study, the degree of pain severity was rated as mild by 23%, moderate by 50%, and severe by 27% of our study sample. Similarly, a study in Oman reported mild dysmenorrhea in 27% of participants, moderate in 41%, and severe in 32%.[17]

Epidemiological studies have shown an association between primary dysmenorrhea and several environmental factors, including cigarette smoking and a lack of physical activity.[4] However, in this study, we did not find an association between cigarette use and the occurrence of primary dysmenorrhea, probably due to small number of smokers among our study (6 out of 376). In addition, this study did not show a positive association between dysmenorrhea and lack of physical activity, in contrast to an experimental study where physical activity was found to have a positive impact on primary dysmenorrhea.[21]

The results of our analysis showed that caffeine consumption has a statistically significant association with primary dysmenorrhea ($p<0.05$), in line with previous studies.[11,22] The mechanism through which caffeine could precipitate cramp-like pain is yet to be known for certain and further studies are warranted. One hypothesized mechanism was the vasoconstricting effect of caffeine in blood vessels.[23] A study on pregnant women suggests that caffeine causes increased uterine stimulation and contraction. Uterine hypercontraction reduces blood flow and results in pain.[24]

This study showed no association between BMI, diet and dysmenorrhea, which contradicts other studies.[10] This discrepancy may be due to the differences between the study populations. Results of the current study found that there is also no association between stress and dysmenorrhea, unlike other studies which found it to be a predictor of primary dysmenorrhea in women.[4]

In this study, dysmenorrhea was associated with a negative effect on the SF-36 domains, including role limitation due to physical health, role limitation due to emotional health, pain, and health changes. Findings related to role limitations due to physical health and pain were consistent with a study conducted in Western Turkey.[11] However, as opposed to the previous study, dysmenorrhea had a strong influence on students' emotional health in this study, possibly because it focuses on medical students in particular. Furthermore, primary dysmenorrhea did not show an evident effect on the students' energy and physical functioning in this study. However, a major impact was found in the study conducted in Western Turkey.[11]

The social life of women suffering from primary dysmenorrhea appeared to be unaffected in this study,

agreeing with the results of other studies using the SF-36 scale.[11] The majority of female medical students in this study also reported that dysmenorrhea had a negative impact on their academic performance. More than half (67%) reported an increase in their absenteeism due to primary dysmenorrhea; related findings of 50% and 45% were found in the literature.[25,8] Furthermore, the majority of students also reported a decrease in their participation (86%), concentration (89%), and study time (94%). These results align with other studies, which showed similar effects on academic performance.[6-8,25,26]

As this is a cross-sectional study, causal relationships could not be established. Other limitations included recall bias, because the students were asked for conditions in the past prior to the study. It is important to mention that secondary dysmenorrhea could not be excluded with certainty as the cause of dysmenorrhea, because health care professionals did not examine the medical students.

In conclusion, a majority of female medical students suffer from primary dysmenorrhea, which adversely affects their quality of life and academic performance. Caffeine consumption had a significant association with primary dysmenorrhea. Periodical awareness programs should be introduced to minimize the consequences of primary dysmenorrhea.

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