CODEN [USA]: IAJPBB ISSN : 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES
SJIF Impact Factor: 7.187
http://doi.org/10.5281/zenodo.4742767

Online at: http://www.iajps.com *Research Article*

PATTERNS OF MENSTRUAL IRREGULARITIES AND DYSMENORRHEA AMONG THE FEMALE GENERAL POPULATION IN TABUK-SAUDI ARABIA. A DESCRIPTIVE CROSS-SECTIONAL STUDY

Rahaf Ahmed A Alharthy[1], Yazeed Albalawi[2], Renad Mohammed H Alanazi[1], Areej Hassan Alatawi[1], Amani Salem Kheder Alamrani[1], Maha Saleem Salem Alharbi[1], Layan Hussain Alharbi[1], Nouf Mohammed A Albalawi[1].

[1]University Of Tabuk, Tabuk, Saudi Arabia.

[2]Assistant Professor of Obstetrics and Gynecology, Faculty of Medicine, University of Tabuk, Tabuk, Saudi Arabia.

Article Received: April 2021 **Accepted:** April 2021 **Published:** May 2021

Abstract:

Introduction: *Menstrual irregularities and dysmenorrhea are both considered public health problems. They cause economic loss as regards healthcare costs due to consuming overpriced hormonal drugs and laboratory tests, in addition to the consequences of not attending work or school.* ***Methodology:*** *A descriptive cross-sectional study was implemented among females in Saudi Arabia. A pre-designed self-administrated questionnaire was published online to collect data.* ***Results:*** *Out of the 933 women included in the study, over half of the participants (51.6%) aged from (19-29 years). Approximately, half of them (50.8%) were married and most of them inhabited urban areas (89.4%). The age of menarche was from (12-14 years) in 43.3% of them. The prevalence of menstrual irregularities and dysmenorrhea was (25.1%) and (89.5%), respectively. We found a significant association between age (P=0.00) and marital status (P=0.00) and dysmenorrhea. The duration of menstrual bleeding was significantly associated with menstrual irregularities (P=0.000).* ***Conclusion:*** *This study interpreted a high prevalence of dysmenorrhea and a relatively low prevalence of menstrual irregularities among Saudi women. There was a lack of concern regarding consulting physicians for dysmenorrhea. We found that the longer duration of bleeding may cause more irregularities. We also noticed that younger women suffered dysmenorrhea at a higher rate than older ones.*

Corresponding author:
Rahaf Ahmed A Alharthy *,
University Of Tabuk, Tabuk, Saudi Arabia.

QR code

Please cite this article in press Rahaf Ahmed A Alharthy et al., ***Patterns of Menstrual Irregularities and Dysmenorrhea Among the Female General Population in Tabuk-Saudi Arabia. A Descriptive Cross-Sectional Study.,*** *Indo Am. J. P. Sci, 2021; 08(05).*

INTRODUCTION:

Menstrual disorders comprise menstrual irregularities (of duration or length), dysmenorrhea, poly- or oligomenorrhoea, hyper- or hypomenorrhea, amenorrhea, menorrhagia, and premenstrual syndrome (PMS) [1]. Such disorders have a significant effect on the quality of life of adolescents and young adult women, particularly those who sustain dysmenorrhea and heavy menstruation [2]. Menstrual disorders also have an economic squeal as regards healthcare costs due to consuming overpriced hormonal drugs and laboratory tests, as well as the consequences of not attending work and school which may affect their academic achievements and employment attainments [3, 4].

Menstrual cycles are irregular within the first year of menarche as a result of anovulatory cycles. Height, weight, and body fat content increase continually for the first two years after menarche and the cycles become regular within 2-3 years. Generally, a menstrual flow continues for 2-7 days in about 70-80% of women. The duration between one cycle and the other ranges from 21-45 days in the first two years after menarche. Then, the menstrual cycle lasts for 21-34 days long in 60-80% of women when the ovulatory cycle starts, which is a parallel pattern to that in adults [5]. Different menstrual dysfunctions occur in about 75% of adolescent girls and accordingly, may have an impact on their life [6].

Dysmenorrhea is one of the most prevalent gynecologic problems among adolescent girls. It is interpreted as pelvic pain associated with menstruation, and it is accompanied by symptoms such as headache and back pain to nausea, vomiting, and diarrhea. It is classified into two types: primary when ovulatory function and pelvic examination are both normal, and secondary when there is a determined gynecological pathology. Primary dysmenorrhea peculiarly starts when adolescents reach their ovulatory cycles; commonly during the first year following menarche [7].

It is ratified that the cause of the pain is prostaglandin (PG) overflow in the endometrium during the ovulatory cycle. PG induces the myometrial contraction and local vasoconstriction that result in the menstrual outflow to be dislodged from the uterine cavity. It was explained that females with dysmenorrhea have higher levels of PG in their plasma and menstrual outflowing than females without dysmenorrhea [7]. Moreover, high serum levels of vasopressin, nitric oxide, and interleukin-6 have been determined in women with primary dysmenorrhea. However, this condition is usually treated as physiological pain and disregarded by women and adolescents, and only a few of them need to confer with a physician for dysmenorrhea and the majority of them self-medicate with painkillers [8, 9].

The World Health Organization has reported that approximately 18 million women aging from (30-55 years) evaluated their menstrual to be heavy [10]. Former studies have demonstrated a high prevalence of dysmenorrhea and menstrual irregularities among female students with 73% and 65%, respectively, and they reported that these disorders affect their daily activities and school attendance [4, 11]. Another study conducted a cross-sectional survey among Iranian women to assess the prevalence of dysmenorrhea and found that 10% of them did not suffer any menstrual pain, 41% had mild pain, 28% had moderate pain and 22% experienced severe pain [12].

A high percentage of women in some other studies have reported suffering from oligomenorrhoea and amenorrhea, and these conditions were associated with body mass index (BMI) and other complications including polycystic ovarian syndrome (PCOS), hirsutism, and infertility [13]. Menstrual irregularities have various etiologies and studies of related variables have established associations with eating disorders [14], BMI and exercise [15], stress [16], and chronic diseases [13, 17-19].

Rationale

According to the changes in the quality of life and sexual life of women who suffer from menstrual pain and menstrual irregularities, it is necessary to investigate the current burden in Saudi Arabia. Up to the researchers' knowledge, no similar studies have been done in Tabuk, KSA.

Aim of the Study

To evaluate the prevalence and associated factors of menstrual irregularities and dysmenorrhea in Tabuk, Saudi Arabia.

Objectives

The objectives of this study were to estimate the prevalence of menstrual irregularities and dysmenorrhea among the general population of women in Tabuk, Saudi Arabia and to investigate some of the associated factors.

METHODS & PARTICIPANTS:

Study design and setting:

A descriptive cross-section study was implemented in Tabuk, Saudi Arabia. The study was done during the period from March to July 2020.

Sampling and Data collection:

The targeted population was the female general population in Tabuk, Saudi Arabia. All those agreeing to participate were included. The total sample obtained was about 933 participants.

A pre-designed disseminated questionnaire was distributed and published online for data collection throughout the period (March to July 2020).

Inclusion criteria: participants enrolled in the study were female adults, Saudi, and completed the correct filling of the form.

Exclusion criteria: participants who were not willing to participate, who did not understand the questions properly and incorrectly or incompletely filled the form.

Data collection tools:

Participants received a self-administered questionnaire to be filled by them with the guidance of the data collectors' notes and instructions at the beginning of the questionnaire. A message that explained the objectives of the study and asks for participants' consent was attached to the questionnaire.

The questionnaire contained two sections; the first section is for socio-demographic data, while the second section collects information regarding risk factors, menstrual cycle regularities, painful menstruation, and its characters.

Sample size:

A high response rate was expected, however, all incomplete and invalid responses or any responses that did not match the selection criteria were eliminated with a goal of 900 participants.

Data management and Statistical analysis:

The collected data was entered and analyzed using the Statistical Package for the Social Science (SPSS Inc. Chicago, IL, USA) version 26. Descriptive statistics were performed. Percentages were given for qualitative variables. The determinant factors were determined using the Chi-square test. P-value was considered significant if $P < 0.05$.

Ethical considerations:

The participants were informed that participating is completely voluntary. All the participants were aware that their data was dealt with confidentially. No names were written in the forms and the data was kept safely.

RESULTS:

Table (1) shows the background socio-characteristics of the sample. Of the 933 women included in the study, over half of the participants (51.6%) aged from (19-29 years) and only 4% aged 50 years or more. Approximately, half of them (50.8%) were married and 43.6% were single. The vast majority of the sample (87.2%) had a university degree, 18.4% had a secondary degree and only 0.3% were illiterate. Less than half of the fathers and mothers had a university degree (48.4%) and (38.9%), respectively. 35.9% of the participants had an average monthly income of form (9000-19000 SAR) and 12.2% had monthly income less than 5000 SAR. Most of them inhabited urban areas (89.4%) and 5.7% lived in rural areas. Regarding the type of accommodation, 93.5% lived in a family house and 6.2% had single accommodation. Most of the participants (84.8%) are non-smokers. 70.6% frequently consume caffeine and 53.9% had a stressful lifestyle.

Table (2) shows the characteristics of menstruation among participants. Out of the total population, 43.4% reported their age of menarche to be from (12-14 years) and 38.2% from (10-12 years). 60.3% reported that the average duration of their menstrual flow was from (5-7 days) and four days or less 22.3% of the participants. About three fourth of the population (74.9%) had regular menstruation and the majority of them (89.5%) suffered from dysmenorrhea. More than half of the participants (56%) assessed their menstrual pain to be moderate, 29.9% had severe pain and 14% had mild pain. Out f the 835 participants who had dysmenorrhea, 61% determined the site of pain to be in the lower abdomen and 22.5% had the pain in the lower back. 36.6 reported that the onset of pain was one day or more before menstruation and 29.9% reported it to be for only the first day of menstruation. The pain of 40% of the participants lasted for two days and one day for 26.3% of them. Most of them (77.6%) did not consult a physician for dysmenorrhea.

Table (3) details menstrual irregularities and dysmenorrhea in association with socio-demographic factors. Age was found to be

significantly associated with menstrual irregularities (P=0.000), as 33.3% of the participants aged from (18-29 years) had menstrual disorders followed by the age group from (30-39) (19.1%) of them had menstrual irregularities. Marital status and fathers' education were also significantly associated with menstrual irregularities (P=0.000) and (P=0.002), respectively. Of the single women (33.9%) and widowed women (23.1%) ranked with reporting the highest rates of irregularities. The participants whose fathers had secondary degrees of education and a university degree (35.3%) and (24.3%), respectively, reported to have menstrual irregularities more than the other groups. Age and marital status were both significantly associated with dysmenorrhea (P=0.000) and (P=0.000), respectively. Younger age groups from (18-29 years) and (30-39 years) complained of dysmenorrhea more than the others (93.8%) and (89.4%), respectively. 95.6% of the single women and 87.2% of the divorced women reported suffering from dysmenorrhea. Fathers' education (P=0.003) and mothers' education (P=0.032) were also significantly associated with dysmenorrhea. 94.5% of the participants whose fathers had secondary education, 94.3% of the ones whose mothers had intermediate educations, and 94.2% of the ones whose mothers had secondary education reported suffering from dysmenorrhea.

Table (4) details menstrual irregularities and dysmenorrhea in association with characters of menstruation. We found a significant association between the duration of menstrual bleeding and menstrual irregularities (P=0.000), as 38.7% of the women whose menstrual bleeding lasted for more than seven days accounted that they have menstrual irregularities. Dysmenorrhea was significantly associated with menstrual irregularities (P=0.002) and vice versa.

Table (1): Description of Socio-demographic characteristics of the participants (=933)

Parameter	Frequency	Percent
Age		
• **18 - 29**	481	51.6%
• **30 - 39**	246	26.4%
• **40 - 49**	169	18.1%
• **≥ 50 years**	37	4.0%
Marital status		
• **Single**	407	43.6%
• **Married**	474	50.8%
• **Divorced**	39	4.2%
• **Widowed**	13	1.4%
Educational level		
• **Primary education**	2	0.2%
• **Intermediate education**	18	1.9%
• **Secondary education**	96	10.3%
• **University or more**	814	87.2%
• **Illiterate**	3	0.3%
Father's Educational level		
• **Primary education**	110	11.8%
• **Intermediate education**	121	13.0%
• **Secondary education**	201	21.5%
• **University or more**	452	48.4%
• **Illiterate**	49	5.3%
Mother's Educational level		
• **Primary education**	152	16.3%
• **Intermediate education**	105	11.3%
• **Secondary education**	172	18.4%
• **University or more**	363	38.9%
• **Illiterate**	141	15.1%
Average family monthly income		
• **Less than 5000 SAR**	114	12.2%
• **5000 – 9000 SAR**	223	23.9%
• **9000 - 19000 SAR**	335	35.9%
• **More than 19000 SAR**	261	28.0%
Area of residency		
• **Urban**	834	89.4%
• **Semi-urban**	46	4.9%
• **Rural**	53	5.7%
Type of accommodation		
• **Family house**	872	93.5%
• **Students' accommodation/dormitory**	3	0.3%
• **Single accommodation**	58	6.2%
Smoking status		
• **Yes**	75	8.0%
• **Occasional smoking**	67	7.2%
• **No**	791	84.8%
Frequent caffeine consumption		
• **Yes**	659	70.6%
• **No**	274	29.4%
Stressful lifestyle		
• **Yes**	503	53.9%
• **No**	430	46.1%

Table (2): Characters of menstruation among participants (N=933)

Parameter	Frequency	Percent
Age of menarche		
• **≤ 10 years**	56	6.0%
• **-12**	356	38.2%
• **-14**	405	43.4%
• **-16**	99	10.6%
• **≥ 17 years**	17	1.8%
The average duration of menstrual bleeding (in days)		
• **Four days or less**	208	22.3%
• **Five to seven days**	563	60.3%
• **More than seven days**	162	17.4%
Regular menstruation		
• **Yes**	699	74.9%
• **No**	234	25.1%
Dysmenorrhea		
• **Yes**	835	89.5%
• **No**	99	10.6%
Pain severity (N=835)		
• **Mild**	117	14.0%
• **Moderate**	468	56.0%
• **Severe**	250	29.9%
Site of pain (N=835)		
• **Lower abdomen**	509	61.0%
• **Lower back**	188	22.5%
• **Lower abdomen and back**	30	3.6%
• **Right and/or left flanks**	54	6.5%
• **Femoral area**	54	6.5%
The onset of pain (N=835)		
• **One to three days of menstruation**	152	18.2%
• **More than three days of menstruation**	36	4.3%
• **The first day of menstruation only**	250	29.9%
• **Few hours before menstruation**	91	10.9%
• **One day or more before menstruation**	306	36.6%
Duration of pain (N=835)		
• **One day**	220	26.3%
• **Two days**	334	40.0%
• **Three days**	219	26.2%
• **Four or more**	62	7.4%
Hospital visit due to dysmenorrhea (N=835)		
• **Yes**	187	22.4%
• **No**	648	77.6%

Table (3): Menstrual regularity, and dysmenorrhea in association with socio-demographic factors (N=933).

Parameter		Regular Menstruation		P-value	Dysmenorrhea		P-value
		No	Yes		No	Yes	
Age	• **18 - 29**	33.3%	66.7%	**0.000**	6.2%	93.8%	**0.000**
	• **30 - 39**	19.1%	80.9%		10.6%	89.4%	
	• **40 - 49**	15.4%	84.6%		21.3%	78.7%	
	• **≥ 50 years**	2.7%	97.3%		16.2%	83.8%	
Marital status	• **Single**	33.9%	66.1%	**0.000**	4.4%	95.6%	**0.000**
	• **Married**	18.1%	81.9%		15.4%	84.6%	
	• **Divorced**	17.9%	82.1%		12.8%	87.2%	
	• **Widowed**	23.1%	76.9%		15.4%	84.6%	
Educational level	• **Primary education**	0.0%	100.0%	0.438	0.0%	100.0%	0.885
	• **Intermediate education**	27.8%	72.2%		11.1%	88.9%	
	• **Secondary education**	27.1%	72.9%		8.3%	91.7%	
	• **University or more**	24.3%	75.7%		10.6%	89.4%	
	• **Illiterate**	22.4%	77.6%		24.5%	75.5%	
Father's education	• **Primary education**	18.2%	81.8%	**0.002**	12.7%	87.3%	**0.003**
	• **Intermediate education**	18.2%	81.8%		10.7%	89.3%	
	• **Secondary education**	35.3%	64.7%		5.5%	94.5%	
	• **University or more**	24.3%	75.7%		10.6%	89.4%	
	• **Illiterate**	22.4%	77.6%		24.5%	75.5%	
Mother's education	• **Primary education**	23.0%	77.0%	0.103	11.2%	88.8%	**0.032**
	• **Intermediate education**	27.6%	72.4%		5.7%	94.3%	
	• **Secondary education**	29.7%	70.3%		5.8%	94.2%	
	• **University or more**	26.2%	73.8%		12.1%	87.9%	
	• **Illiterate**	17.0%	83.0%		14.9%	85.1%	
Average family monthly income	• **Less than 5000 SAR**	22.8%	77.2%	0.188	7.0%	93.0%	0.142
	• **5000 – 9000 SAR**	30.5%	69.5%		7.6%	92.4%	

	• **9000 - 19000 SAR**	24.2%	75.8%		12.5%	87.5%	
	• **More than 19000 SAR**	22.6%	77.4%		11.9%	88.1%	
Area of residency	• **Urban**	24.8%	75.2%	0.223	10.6%	89.4%	0.905
	• **Semi-urban**	19.6%	80.4%		8.7%	91.3%	
	• **Rural**	34.0%	66.0%		11.3%	88.7%	
Smoking	• **Yes**	24.0%	76.0%	0.351	5.3%	94.7%	0.196
	• **Occasionally**	17.9%	82.1%		7.5%	92.5%	
	• **No**	25.8%	74.2%		11.3%	88.7%	
Frequent caffeine consumption	• **Yes**	25.8%	74.2%	0.434	10.6%	89.4%	0.855
	• **No**	23.4%	76.6%		10.2%	89.8%	
Stressful lifestyle	• **Yes**	24.5%	75.5%	0.633	8.9%	91.1%	0.093
	• **No**	25.8%	74.2%		12.3%	87.7%	

Table (4): Menstrual regularity, and dysmenorrhea in association with characters of menstruation (N=933).

Parameter		Regular Menstruation		P-value	Dysmenorrhea		P-value
		No	Yes		No	Yes	
Age of menarche	• **≤ 10 years**	23.2%	76.8%	0.177	7.1%	92.9%	0.361
	• **-12**	25.6%	74.4%		9.8%	90.2%	
	• **-14**	22.5%	77.5%		12.6%	87.4%	
	• **-16**	34.3%	65.7%		7.1%	92.9%	
	• **≥ 17 years**	29.4%	70.6%		5.9%	94.1%	
Duration of menstrual bleeding	• **Four days or less**	25.5%	74.5%	**0.000**	11.1%	88.9%	0.139
	• **Five to seven days**	21.1%	78.9%		11.5%	88.5%	
	• **More than seven days**	38.3%	61.7%		6.2%	93.8%	
Menstrual regularity	• **Yes**				12.3%	87.7%	**0.002**
	• **No**				5.1%	94.9%	
Dysmenorrhea	• **Yes**	26.6%	73.4%	**0.002**			
	• **No**	12.2%	87.8%				

DISCUSSION:

Adolescence is a period of huge physical and hormonal alterations for women. Despite the infrequent organic gynecological pathologies at this time, menstrual dysfunction may be seen commonly and it has a considerable effect on the public health of the community. The lack of data and the private nature of menstruation in developing countries propose the debit of dysmenorrhea does not call the attention of the public health society [20]. We conducted a cross-sectional study among Saudi adult women to determine the prevalence of menstrual irregularities and dysmenorrhea, in addition to discussing the possible associated factors.

Our study determined that the age of menarche was from (12-14 years) in 43.4% and from (12-10 years) in 38.2%. We also reported that 60.3% of the participants have an average of (5-7 days) as the duration of menstrual bleeding. An epidemiological study conducted among secondary school students in Northern Saudi Arabia supported our study with similar results as the age of menarche was at ≥14 years in 42.6% of their population. They also reported that 61.7% of their sample had (2-6 days) as the average duration of bleeding [21]. This agrees with the general findings which supposed that the menstrual flow continues for (2-7 days in 70-80% of women [5].

The present study found that the prevalence of menstrual irregularities was among nearly one-quarter of the participants (25.1%) and the prevalence of dysmenorrhea was among a large portion of the sample (89.5%). Abdel-Salam et al [22], conducted an epidemiological study among female students at Jouf University in Saudi Arabia and reported a similar prevalence of dysmenorrhea (87.7%). This prevalence of dysmenorrhea was greater than the rate estimated in another Saudi study conducted at King Abdulaziz University (60.9%) [23], and among adolescent students in Egypt (74.8%) [24]. Abd El-Mawgod et al [21], found that the prevalence of dysmenorrhea and menstrual irregularities were (74.4%) and (34.4%), respectively. An Iranian study counted that the prevalence of dysmenorrhea to be (73%) among Iranian women and (39%) for menstrual irregularities which are higher than our finding.

More than half of the women in this study (56%) assessed the menstrual pain to be moderate. Abd El-Mawgod et al [21], counted that 57.3% of women found that the severity of dysmenorrhea was moderate. In contrast, Mohamed [25] conducted another epidemiological study in Egypt and reported that 32% of dysmenorrheic girls described their pain to be moderate and 41.4% found it severe.

Most of the women in the present study (61%) located the pain of dysmenorrhea in the lower abdomen and 40% of them reported that the pain usually lasts for two days. Banikarim et al [26], reported that 90% of Hispanic adolescent girls suffered dysmenorrhea for 48 hours or less. Whereas, Abdel-Salam et al [22], reported that 57.6% of women stated the duration of pain to be less than 24 hours.

Only 22.4% of our sample visited the hospital to consult a physician for dysmenorrhea, this may be since dysmenorrheic pain is neglected and treated as physiological pain [8].

Our pooled results found a significant association between age (P=0.000) and marital status (P=0.000) and menstrual irregularities. Also, age and marital status were significantly associated with dysmenorrhea. We found that younger participants had higher rates of menstrual disorders, this could be explained that menstrual cycles are irregular during the first year of menarche due to anovulatory cycles. We also noticed that younger women suffered dysmenorrhea at a higher rate than older ones. Karout and his colleagues [27], conducted a cross-sectional study among Lebanese nursing students and found that age was significantly associated with irregular cycles and dysmenorrhea (P<0.001). They also that the marital status was in a significant association with menstrual irregularities (P<0.001) and dysmenorrhea (P<0.001), which was consistent with our findings. In contrast, Abdel-Salam et al. [22], did not a significant association between age and menstrual irregularities (P=0.453).

We found that fathers' and mothers' education were significantly associated with dysmenorrhea with (P=0.003) and (P=0.032), respectively, as the participants whose parents had lower degrees of education had dysmenorrhea in higher rates than the other groups. We also found that the duration of menstrual bleeding was significantly associated with menstrual irregularities (P=0.000), as 38.7% of the women whose menstrual bleeding lasted for more than seven days accounted that they have menstrual irregularities.

CONCLUSION:

This study interpreted a high prevalence of dysmenorrhea and a relatively low prevalence of menstrual irregularities among Saudi women. There was a lack of concern regarding consulting physicians

for dysmenorrhea. We found higher rates of menstrual irregularities among single, widowed, and younger women. Moreover, we found that the longer duration of bleeding may cause more irregularities. We also noticed that younger women suffered dysmenorrhea at a higher rate than older ones.

REFERENCES:

1. Howard WJ. Novak's text book of gynecology, 12th ed. Philadelphia, Williams and Wilkins, 1996.
2. Cakir, M., Mungan, I., Karakas, T., Girisken, I., & Okten, A. (2007). Menstrual pattern and common menstrual disorders among university students in Turkey. Pediatrics International, 49(6), 938-942.
3. Bitzer, J., Tschudin, S., & Stadlmayr, W. (2005). Die Menstruation und ihre Bedeutung für die Frauengesundheit. Zentralblatt für Gynäkologie, 127(05),282-287.
4. Kadir, R. A., Edlund, M., & Von Mackensen, S. (2010). The impact of menstrual disorders on quality of life in women with inherited bleeding disorders. Haemophilia, 16(5), 832-839.
5. Hickey, M., & Balen, A. (2003). Menstrual disorders in adolescence: investigation and management. Human reproduction update, 9(5), 493-504.
6. Klein, J. R., & Litt, I. F. (1981). Epidemiology of adolescent dysmenorrhea. Pediatrics, 68(5), 661-664.
7. Durain, D. (2004). Primary dysmenorrhea: assessment and management update. Journal of midwifery & women's health, 49(6), 520-528.
8. Yeh, M. L., Chen, H. H., So, E. C., & Liu, C. F. (2004). A study of serum malondialdehyde and interleukin-6 levels in young women with dysmenorrhea in Taiwan. Life sciences, 75(6), 669-673.
9. Sun, M. F., Huang, H. C., Lin, S. C., Chang, L. P., & Liu, C. F. (2005). Evaluation of nitric oxide and homocysteine levels in primary dysmenorrheal women in Taiwan. Life Sciences, 76(17).
10. Goldrath MH. Hysteroscopic endometrial ablation. Obstetrics and Gynecology Clinics of North America, 1995, 22:559–572.
11. Houston, A. M., Abraham, A., Huang, Z., & D'Angelo, L. J. (2006). Knowledge, attitudes, and consequences of menstrual health in urban adolescent females. Journal of Pediatric and Adolescent Gynecology, 19(4), 271-275.
12. Tavallaee, M., Joffres, M. R., Corber, S. J., Bayanzadeh, M., & Rad, M. M. (2011). The prevalence of menstrual pain and associated risk factors among Iranian women. Journal of Obstetrics and Gynaecology Research, 37(5), 442-451.
13. Glueck, C. J., Morrison, J. A., Daniels, S., Wang, P., & Stroop, D. (2011). Sex hormone-binding globulin, oligomenorrhea, polycystic ovary syndrome, and childhood insulin at age 14 years predict metabolic syndrome and class III obesity at age 24 years. The Journal of pediatrics, 159(2), 308-313.
14. Vyver, E., Steinegger, C., & Katzman, D. K. (2008). Eating disorders and menstrual dysfunction in adolescents. Annals of the New York Academy of Sciences, 1135(1), 253-264.
15. CHANG, P. J., CHEN, P. C., HSIEH, C. J., & CHIU, L. T. (2009). Risk factors on the menstrual cycle of healthy Taiwanese college nursing students. Australian and New Zealand Journal of Obstetrics and Gynaecology, 49(6), 689-694.
16. Allsworth, J. E., Clarke, J., Peipert, J. F., Hebert, M. R., Cooper, A., & Boardman, L. A. (2007). The influence of stress on the menstrual cycle among newly incarcerated women. Women's Health Issues, 17(4), 202-209.
17. Gast, G. C. M., Grobbee, D. E., Smit, H. A., Bueno-de-Mesquita, H. B., Samsioe, G. N., & van der Schouw, Y. T. (2010). Menstrual cycle characteristics and risk of coronary heart disease and type 2 diabetes. Fertility and sterility, 94(6), 2379-2381.
18. Adachi T. [Anemia in the field of obstetrics and gynecology]. Japanese Journal of Clinical Medicine, 2008, 66:548–552 [in Japanese]
19. Bauer, J., & Cooper-Mahkorn, D. (2008). Reproductive dysfunction in women with epilepsy: menstrual cycle abnormalities, fertility, and polycystic ovary syndrome. International review of neurobiology, 83, 135-155.
20. Harlow, S. D., & Campbell, O. M. (2000). Menstrual dysfunction: a missed opportunity for improving reproductive health in developing countries. Reproductive health matters, 8(15), 142-147.
21. Abd El-Mawgod, M. M., Alshaibany, A. S., & Al-anazi, A. M. (2016). Epidemiology of dysmenorrhea among secondary-school students in Northern Saudi Arabia. Journal of the Egyptian Public Health Association, 91(3), 115-119.
22. Abdel-Salam, D. M., Alnuman, R. W., Alrwuaili, R. M., Alrwuaili, G. A., & Alrwuaili, E. M. (2018). Epidemiological aspects of dysmenorrhea among female students at Jouf University, Saudi Arabia. Middle East Fertility Society Journal, 23(4), 435-439.
23. Ibrahim, N. K., AlGhamdi, M. S., Al-Shaibani, A. N., AlAmri, F. A., Alharbi, H. A., Al-Jadani,

A. K., & Alfaidi, R. A. (2015). Dysmenorrhea among female medical students in King Abdulaziz University: Prevalence, Predictors and outcome. Pakistan journal of medical sciences, 31(6), 1312.

24. El Gilany, A. H., Badawi, K., & El Fedawy, S. (2005). Epidemiology of dysmenorrhoea among adolescent students in Mansoura, Egypt. EMHJ-Eastern Mediterranean Health Journal, 11 (1-2), 155-163, 2005.
25. Mohamed, E. M. (2012). Epidemiology of dysmenorrhea among adolescent students in Assiut City, Egypt. Life Sci J, 9(1), 348-353.
26. Banikarim, C., Chacko, M. R., & Kelder, S. H. (2000). Prevalence and impact of dysmenorrhea on Hispanic female adolescents. Archives of pediatrics & adolescent medicine, 154(12), 1226-1229.
27. Karout, N., Hawai, S. M., & Altuwaijri, S. (2012). Prevalence and pattern of menstrual disorders among Lebanese nursing students. EMHJ-Eastern Mediterranean Health Journal, 18 (4), 346-352, 2012.