JBE
Jurnal Berkala EPIDEMIOLOGI

JURNAL BERKALA EPIDEMIOLOGI
Volume 8 Nomor 2 (2020) 125–133
DOI: 10.20473/jbe.v8i22020. 125-133
p-ISSN: 2301-7171 ; e-ISSN: 2541-092X
Website: http://journal.unair.ac.id/index.php/JBE/
Email: jbe@fkm.unair.ac.id / jbepid@gmail.com

ORIGINAL RESEARCH

RELATIONSHIP BETWEEN DEGREE OF STRESS AND PHYSICAL ACTIVITY OF FEMALE STUDENTS WITH PREMENSTRUAL SYNDROME

Hubungan antara Derajat Stressor dan Aktivitas Fisik Mahasiswi Terhadap Kejadian Premenstrual Syndrome

Rina Wahyu Andani
Faculty of Public Health, Universitas Airlangga, andanirina@gmail.com
Corresponding Author: Rina Wahyu Andani, andanirina@gmail.com, Faculty of Public Health, Universitas Airlangga, Dr. Ir. H. Soekarno St, Mulyorejo, Surabaya City, East Java, 60115, Indonesia

ARTICLE INFO

Article History:
Received October, 2nd, 2019
Revised form October, 29th, 2019
Accepted May, 12th, 2020
Published online May, 31st, 2020

Keywords:
stressor degree;
physical activity;
premenstrual syndrome;
female students

Kata Kunci:
derajat stressor;
aktivitas fisik;
premenstrual syndrome;
mahasiswi

ABSTRACT

Background: Premenstrual syndrome (PMS) is a group of symptoms consisting of physical, psychological, and behavioral disorders that can occur in women before menstruation and can be triggered or aggravated by factors such as their degree of stress and physical activity. **Purpose:** This research aimed to analyze the relationship between degree of stress and physical activity and premenstrual syndrome occurrence in female students. **Method:** This study used analytical observational research with a cross-sectional research design. Female students of the S1 Public Health class of 2016-2019 were used as the sample (n = 93) in this research. Sampling was conducted via the simple random sampling technique. A bivariate analysis was conducted using chi-square testing. The research was conducted between August and September of 2019 at the Faculty of Public Health, Universitas Airlangga. **Results:** Severe to extreme symptoms felt most often by respondents were muscle and joint pain, abdominal pain, and irritability. The prevalence of premenstrual syndrome with moderate to severe symptoms in female students of the S1 Public Health class was 46.24% and the prevalence of stressed female students was 70.97%. Statistical test results showed a relationship between the degree of stress and premenstrual syndrome occurrence (p = 0.01) and a relationship between physical activity and premenstrual syndrome occurrence (p = 0.04). Statistical tests also showed no relationship between the age of menarche and premenstrual syndrome occurrence (p = 0.50). **Conclusion:** There was a significant relationship between degree of stress and physical activity and premenstrual syndrome occurrence.

How to Cite: Andani, R. W. (2020). Relationship between students' stressor degree and physical activity with premenstrual syndrome. *Jurnal Berkala Epidemiologi*, *8*(2), 125–133. https://dx.doi.org/10.20473/jbe.v8i22020. 125-133

ABSTRAK

Latar Belakang*: Premenstrual syndrome (PMS) merupakan sekumpulan gejala berupa gangguan fisik, psikologis dan perilaku yang bisa terjadi pada wanita menjelang menstruasi dan dapat*

dipicu atau diperberat oleh beberapa faktor seperti derajat stressor dan aktivitas fisik. ***Tujuan****: Penelitian ini bertujuan untuk menganalisis hubungan antara derajat stressor dan aktivitas fisik terhadap kejadian premenstrual syndrome pada mahasiswi.* ***Metode:*** *Penelitian adalah penelitian analitik observasional dengan studi penelitian cross sectional. Mahasiswi S1 Kesehatan Masyarakat angkatan 2016 – 2019 diambil sebanyak 93 orang untuk menjadi sampel pada penelitian ini. Pengambilam sampel menggunakan teknik simple random sampling. Analisis bivariat menggunakan uji statistik chi square. Penelitian dilakukan pada bulan Agustus – September 2019 di Fakultas Kesehatan Masyarakat Universitas Airlangga.* ***Hasil****: Gejala berat sampai ekstrem yang paling banyak dirasakan oleh responden berturut-turut adalah nyeri otot dan sendi, nyeri perut dan mudah marah. Prevalensi kejadian premenstrual syndrome dengan gejala sedang sampai berat pada mahasiswi S1 Kesehatan Masyarakat Universitas Airlangga sebesar 46,24% dan prevalensi mahasiswi yang mengalami stress sebesar 70,97%. Hasil uji statistik menunjukkan terdapat hubungan antara derajat stressor dengan kejadian premenstrual syndrome (p=0,01) dan terdapat hubungan antara aktivitas fisik dengan kejadian premesntrual syndrome (p=0,04). Uji statistik juga menunjukkan tidak ada hubungan antara umur menarche dan kejadian premenstrual syndrome dengan p value=0,50.* ***Kesimpulan****: Ada hubungan yang signifikan antara derajat stressor dan aktivitas fisik terhadap kejadian premenstrual syndrome.*

INTRODUCTION

Some women experience symptoms characterized by physical, psychological, and behavioral changes from a week to several days before menstruation, known as premenstrual syndrome (PMS) (Hashim et al., 2019). Khayat et al (2014) stated that the severity of PMS is determined through three groups of symptoms—physical symptoms (headache, breast pain, abdominal pain, muscle stiffness, swelling of the extremities, back pain, weight gain, nausea, and gastrointestinal symptoms), psychological symptoms (irritability, fidgety, depression, anxiety, and sadness), and behavioral symptoms (changes in appetite, difficulty concentrating, fatigue, insomnia, and lack of energy).

Research conducted by Goker, Artunc-Ulkumen, Aktenk, & Ikiz (2015) found that the symptoms most often felt were bloating (89.50%), irritability (88.30%), and breast pain (82.60%). Research by Fatimah, Prabandari, & Emilia (2016) showed that 22.30% of women experienced physical symptoms due to PMS, such as breast pain, dizziness, pain in muscles or joints, weight loss and bloating; 21.60% experienced symptoms of fatigue and weakness; and 18.10% experienced a decreased desire to do activities at home. Hashim et al (2019) revealed that the most commonly reported premenstrual symptoms were feelings of depression (95%), fatigue/decreased energy (92%), muscle, joint, stomach, and back pain (89%), feelings of anger (86% %), and desire for certain foods (85%).

PMS is a condition that is experienced by almost all women throughout the world, both young and middle-aged. It occurs during the luteal phase and then gradually disappears after menstruation (Saryono, 2009). The results of a meta-analysis showed that the overall prevalence of PMS in the world was 47.80%, with the lowest and highest prevalence in France (12%) and Iran (98%), respectively (Direkvand-Moghadam, Sayehmiri, Delpisheh, & Satar, 2014). The occurrence of PMS in Indonesia ranges from 70% to 90% in reproductive-age women, while 2% to 10% experience severe PMS symptoms called Premenstrual Dysphoric Disorder (PMDD) (Sari & Priyanto, 2016).

A large proportion of female students experience premenstrual syndrome. The prevalence of PMS in female medical students at a university in Turkey was 91.80% (Goker, Artunc-Ulkumen, Aktenk, & Ikiz, 2015). Another study found that 68.20% of female students experienced PMS (Rudiyanti & Nurchairina, 2015). Andiarna (2018) in her research on female students in Surabaya, found that 26 out of 35 female students had experienced PMS (74.30%).

Premenstrual syndrome can decrease a woman's daily productivity. Tolossa & Bekele (2014) state that about 15% of women aged 20 to 35 years who experience PMS take a break from lectures or work. Julianti, Marfuah, & Hayati (2017) explained that PMS can disrupt interpersonal relations, daily activities, and learning concentration.

Saryono (2009) mentioned factors that can lead to premenstrual syndrome, such as hormonal factors (imbalance between progesterone and estrogen before the menstrual phase), genetic factors (family relationships), chemical factors (changes in serotonin levels in the brain), psychological factors (stress effect), and lifestyle factors (diet control). Other risk factors that can affect PMS were age, marital status, stress, eating patterns, smoking habits, certain nutritional deficiencies, level of physical activity, having given birth, and obesity.

Wijayanti (2015) concluded that factors related to PMS occurrence in adolescent girls were obesity ($p = 0.03$), exercise ($p = 0.03$), and stress ($p = 0.04$). Faiqah & Sopiatun (2015) found a significant relationship (p-value <0.05 and OR = 4.02) between stress and PMS occurrence; people who experienced stress were four times as likely to experience PMS than people who were not stressed. This result was supported by research from Fatimah, Prabandari, & Emilia (2016) who revealed that stressed female students were 3.30 times more likely to experience PMS. They found that stress had a 12% influence on PMS occurrence, while other factors had an 82% influence.

Some studies have shown that physical activity is also related to PMS occurrence. Shrestha et al (2019) in their research on female students from the Teaching Hospital in Nepal, showed a significant relationship between PMS occurrence and physical activity ($p = 0.02$). The research of Safarzadeh, Zare, Yousefabadi, & Ghoreishinia (2016) at Zahedan University, showed that moderate to severe PMS symptoms were experienced more often by female students who exercised less than two times per week. Young women who exercise regularly and engage in physical activity can prevent PMS effectively.

This research aims to analyze the relationship between degree of stress and physical activity and premenstrual syndrome (PMS) occurrence in female students enrolled in S1 Public Health at Universitas Airlangga.

METHOD

This study used observational analytic research and a cross-sectional design. The population in this research was regular female students enrolled in the S1 Public Health class of 2016-2019 at the Faculty of Public Health, Universitas Airlangga (FKM UNAIR), providing a total of 876 people. The sample calculation, conducted according to the difference test formula of two proportions for two tailed by Lwanga & Lemeshow (1991) formula was obtained from the difference test formula of two proportions for two tailed as follows:

$$n=\frac{(Z_{1-\alpha/2}\sqrt{2P(1-P)}+Z_{1-\beta/2}\sqrt{P_1(1-P_1)+P_2(1-P_2)})^2}{(P_1-P_2)^2}$$

Based on a sample with 93 respondents, calculations were obtained using a 95% confidence level and a 90% strength test. In previous studies, the proportion of PMS occurrence with moderate to severe symptoms in adolescent girls who had stress (P1) was 0.30 and the proportion of PMS occurrence with moderate to severe symptoms in adolescent girls without stress (P2) was 0.11 (Wahyuni, Asparian, & Izhar, 2018).

Simple random sampling was conducted to determine the population sample size. Research subjects were selected randomly based on attendance data for each class. The inclusion criteria in this research was female students between the ages of 15 and 24, who had menstruated, were willing to participate, and were not currently chronically ill. This research was conducted between August and September 2019 at the FKM UNAIR Surabaya campus. Primary data was collected by distributing questionnaires.

The dependent variable in this research was PMS occurrence, as measured by the Shortened Premenstrual Assessment Form (SPAF) questionnaire. There were 10 questions that assessed the symptoms and severity of PMS using a scale of 1-6, based on the level of change. The independent variables were the degree of stress and the level of physical activity. The degree of

stress variable was measured by the Kessler Psychological Distress Scale (K10) questionnaire, which contains 10 items on emotional states, each with a 5-level response scale. Assessment of physical activity was measured by the Baecke questionnaire. The Baecke questionnaire contains 22 questions divided into three sections—employment index, sports index, and leisure time index—with scores ranging from 1 to 5. The SPAF, K10, and Baecke questionnaires have been declared valid and reliable in both English and Indonesian.

PMS occurrence variables were classified into two categories. If the total score was less than 30, the participant was classified as having no PMS or mild PMS. If the total score was 30 or more, the participant was classified as having moderate to severe PMS. The degree of stress variable was classified into four categories. If the total score was less than 20, this was categorized as no stress; if the total score was 20-24, this was categorized as mild stress; if the total score was 25-29, this was categorized as moderate stress; and if the total score was 30 or more, this was categorized as severe stress. The physical activity variable was classified into three categories. Light physical activity was categorized as a total score of less than 5.60, moderate physical activity was categorized as a total score of 5.60-7.90, and heavy physical activity was categorized as more than 7.90.

The data was then analyzed using univariate and bivariate analyses. A univariate analysis was conducted on the frequency distribution of the respondents' characteristics, PMS occurrence, degree of stress, and physical activity. The bivariate analysis was conducted on the chi-square (X2) statistical tests to determine the relationship between degree of stress and physical activity and PMS occurrence.

RESULTS

Table 1 shows that, out of 10 PMS symptoms, three of the most severe to extreme symptoms experienced by respondents were muscle and joint pain (37 respondents), abdominal pain (37 respondents), and irritability (33 respondents). Table 2 shows that the respondents were between the ages of 17 and 22, with most respondents being 19 years of age (30 respondents, 32.26%). Most of the respondents first experienced menstruation (menarche) between the ages of 12 and 13 (59 respondents, 63.44%). Of the total respondents, 81 (87.10%) had menstrual periods of 3-9 days and 63 (67.74%) had menstrual cycles of 25-30 days. When assessing the regularity of the menstrual cycle, 56 respondents (60.21%) reported experiencing irregular menstrual cycles and 23.66% of respondents experienced regular menstrual periods.

Table 3 shows that 60.22% of respondents who experienced PMS symptoms claimed that these disrupted daily activities or productivity and 58.06% claimed that their PMS symptoms had an impact on others. Of the total respondents, 50 (63.76%) did not experience PMS (or experienced mild symptoms) and 43 (46.24%) experienced PMS with moderate to severe symptoms. Of the respondents who experienced moderate to severe PMS symptoms, 32.26% had a normal age of menarche. Statistical tests resulted in a p-value of 0.50, which means that the age of menarche has no relationship with PMS occurrence.

The prevalence of female students who experienced stress was 70.97%, with 34.41% experiencing severe stress, 21.51% experiencing moderate stress, and 15.05% experiencing mild stress. The prevalence of respondents who were not stressed and did not experience PMS or experienced PMS with mild symptoms was 22.58%. The prevalence of respondents who experienced severe stress and moderate to severe PMS was 26.88%. Statistical test results showed a significant relationship between the degree of stress and PMS occurrence. This can be seen from the p-value of 0.01 (Table 4).

The majority of respondents engaged in moderate physical activity (76.34%), while the prevalence of respondents engaging in low and high activity was 11.83%. Based on cross tabulation, 45.15% of respondents who engaged in moderate physical activity experienced no PMS symptoms or mild PMS symptoms. Chi-square test results showed a p-value of 0.04, indicating a significant relationship between physical activity and PMS occurrence (Table 4).

DISCUSSION

Relationship between Menarche Age and PMS Occurrence

Menarche, or the first menstruation, is a sign that a woman has entered puberty and usually occurs between 10 and 16 years of age (Proverawati & Misaroh, 2009). This study found no relationship between the age of menarche and PMS occurrence in female students enrolled in S1 Public Health ($p = 0.50$).

Table 1
Frequency Distribution of Respondents by Type of PMS Symptoms in FKM UNAIR in September 2019

	Rate of Change							
	None		Mild		Moderate		Extreme	
	n	%	n	%	n	%	n	%
PMS symptoms								
Breast pain	23	24.73	53	56.99	11	11.83	6	6.45
Depressed	23	24.73	37	39.78	15	16.13	18	19.35
Irritability	5	5.38	30	32.26	25	26.88	33	35.48
Feeling sad	5	5.38	38	40.86	18	19.35	32	34.41
Muscle and joint pain	7	7.53	24	25.81	25	26.88	37	39.78
Weight-gain	44	47.31	38	40.86	6	6.45	5	5.38
Abdominal pain	9	9.68	28	30.10	19	20.43	37	39.78
Edema	57	61.29	30	32.26	4	4.30	2	2.15
Bloating	45	48.39	35	37.63	7	7.53	6	6.45
Overwhelmed by problems	27	29.03	39	41.94	22	23.66	5	5.38

Table 2
Characteristics of Research Subjects

Variable	n	%
Age (years)		
17	3	3.22
18	26	27.96
19	30	32.26
20	22	23.66
21	10	10.75
22	2	2.15
Age of *menarche* (years)		
Fast (<12)	16	17.20
Normal (12 – 13)	59	63.44
Slow (>13)	18	19.36
Menstrual period (days)		
<3	2	2.15
3 – 9	81	87.10
>9	10	10.75
Menstrual cycle (days)		
<25	15	16.13
25 – 30	63	67.74
>30	15	16.13
Menstrual regularity		
Always on time	22	23.66
Earlier than usual	15	16.13
Irregular	56	60.21
Total	93	100.00

Research conducted by Wahyuni, Asparian, & Izhar (2018) and Ratikasari (2015) is in line with the results of this study, as they also found no relationship between the age of menarche and PMS occurrence ($p > 0.05$).

This study was not in accordance with the research of Abeje & Berhanu (2019), Amjad, Kumar, & Mazher (2014), and Fatimah, Prabandari, & Emilia (2016), who found there was a relationship between the age of menarche and PMS occurrence. Fatimah, Prabandari, & Emilia (2016) showed that there was a significant relationship between the age of menarche and PMS occurrence ($p < 0.05$) and students who had an early age of menarche experience PMS 0.5 times more than students who had a later age of menarche. This was in line with the research of Amjad, Kumar, & Mazher (2014), who showed

that an early age of menarche (<12 years) tends to lead to PMS. This tendency may be caused by the maturation of ovarian functions while physical and psychological features were still developing.

Relationship between Degree of Stress and PMS Occurrence

Various academic and non-academic demands can influence a student's degree of stress. Stressors that affect students include college assignments, end-of-semester exams, home assignments, social problems, and financial problems (Bakhsh & Sayed, 2015). The results of a chi-square analysis found a significant relationship (p = 0.01) between degree of stress and PMS occurrence in female S1 Public Health students. This was supported by Walton, Machamer, Asumbrado, & Behrens (2018), who found a significant relationship between perceived stress and the severity of PMS symptoms (p <0.05). Research by Fatimah, Prabandari, & Emilia (2016) also found a significant relationship between stress and PMS occurrence (p = 0.01). The higher a person's degree of stress, the higher the risk of experiencing PMS.

Stress factors can aggravate PMS symptoms due to the influence of the hormonal system, which is regulated by the central nervous system. In times of stress, the hypothalamic-pituitary-adrenal (HPA) axis is active, resulting in secretion of corticotropic releasing hormone (CRH) by the hypothalamus. CRH secretion stimulates the anterior pituitary to release adrenocorticotropic hormone (ACTH); this stimulates the release of cortisol by the adrenal glands. Cortisol can cause imbalances of the hormones estrogen and progesterone, triggering PMS (Guyton & Hall, 2006).

Contrary to this research, Wahyuni, Asparian, & Izhar (2018) in their study of junior high school girls in Jambi City, revealed that there was no relationship between stress and PMS occurrence (p > 0.05). This was because the young women researched were able to cope with and manage stressors well and apply problem-focused coping approaches, so that their problem solving was focused on the problems at hand.

Table 3
Impact of PMS

Complaint	n	%
Disturbing daily activities		
Yes	56	60.22
No	37	39.78
The symptoms affect other people		
Yes	54	58.06
No	39	41.94
Total	93	100.00

Table 4
Relation between Stressor Degree Variables and Physical Activity with PMS Occurence

Variable	PMS				Total		*p value*
	None-Mild		Moderate-Severe				
	n	%	n	%	n	%	
***Menarche* Age (years)**							
Fast (<12)	10	10.75	6	6.45	16	17.20	0.50
Normal (12-13)	29	31.18	30	32.26	59	63.44	
Slow (>13)	11	11.83	7	7.53	18	19.36	
Stress							
None	21	22.58	6	6.45	27	29.03	0.01
Mild stress	9	9.68	5	5.38	14	15.05	
Moderate stress	13	13.98	7	7.53	20	21.51	
Severe stress	7	7.53	25	26.88	32	34.41	
Physical Activity							
Light	6	6.45	5	5.38	11	11.83	0.04
Moderate	42	45.15	29	31.18	71	76.34	
Heavy	2	2.15	9	9.68	11	11.83	
Total	50	63.76	43	46.24	93	100.00	

Relationship between Physical Activity and PMS Occurrence

Measurement of physical activity in this research included work, sports, and leisure activities. As the respondents were all students, their main activity was learning. More than half of the respondents engaged in sports activities (69.89%), including jogging, swimming, badminton, and gymnastics. This study found that the majority of respondents engaged in moderate physical activity (76.34%) and that there was a relationship between physical activity and PMS occurrence ($p = 0.04$).

This result was corroborated by Kusumawardani & Adi (2017), who stated that there was a significant relationship between physical activity and PMS occurrence. Mufida (2015) in his research on female students, found that physical activity has a p-value of <0.05 and an Exp (B) of 10.81, which means that women who do not engage in routine physical activity every week are 10.81 times more at risk of experiencing PMS than women who do engage in routine physical activity every week.

Physical activity, especially regular exercise, can trigger an increase in the production and release of endorphins. Endorphins are hormones that play a role in the body's immune control and stress responses, and the presence of endorphins can trigger feelings of happiness. Excess estrogen, which can cause women to experience PMS, can be prevented by increasing endorphins (Anggraeni, Pangestuti, & Aruben, 2018).

Research Limitation

This research was limited to female students enrolled in S1 Public Health at Universitas Airlangga. The collection of PMS data in this study was conducted using a retrospective questionnaire instead of a more ideal method, such as prospective PMS recording for at least two cycles.

CONCLUSION

Female students enrolled in S1 Public Health at Universitas Airlangga experienced severe stressors and engaged in moderate physical activity. The majority of respondents had a normal age of menarche (12-13 years). This research found that the age of menarche did not have a significant relationship with PMS occurrence, but the degree of stress and physical activity both had a significant relationship with PMS occurrence in female students enrolled in S1 Public Health at Universitas Airlangga.

CONFLICT OF INTEREST

The authors declare that no conflict of interest in this study.

ACKNOWLEDGMENTS

Gratitude is conveyed to the parties who helped in this research process, particularly the students enrolled in the S1 Public Health class from 2016 to 2019 at Universitas Airlangga, who were willing to become respondents in the research.

REFERENCES

Abeje, A., & Berhanu, Z. (2019). Premenstrual syndrome and factors associated with it among secondary and preparatory school students in Debremarkos town, North-west Ethiopia, 2016. *BMC Research Notes*, *12*(535), 1–5. https://doi.org/10.1186/s13104-019-4549-9

Amjad, A., Kumar, R., & Mazher, S. B. (2014). Socio-demographic factors and premenstrual syndrome among women attending a teaching hospital in Islamabad, Pakistan. *Journal of Pioneering Medical Sciences*, *4*(4), 159–162.

Andiarna, F. (2018). Korelasi tingkat stres dengan kejadian sindrom premenstruasi pada mahasiswi. *Journal of Health Science and Prevention*, *2*(1), 8–13.

Anggraeni, N., Pangestuti, D. R., & Aruben, R. (2018). Hubungan pengetahuan gizi, status gizi, asupan kalsium, magnesium, vitamin B6, dan aktifitas fisik dengan sindrom pramenstruasi (studi pada mahasiswi peminatan gizi kesmas FKM UNDIP tahun 2017). *Jurnal Kesehatan Masyarakat (e-Journal)*, *6*(1), 526–536.

Bakhsh, M. M., & Sayed, S. A. (2015). Sources of academic stress: stress management among regular and executive MBA students. *International Journal of Endorsing Health Science Research*, *3*(1), 17–22. https://doi.org/10.29052/ijehsr.v3.i1.2015.17-22

Direkvand-Moghadam, A., Sayehmiri, K., Delpisheh, A., & Satar, K. (2014). Epidemiology of premenstrual syndrome, a systematic review and meta-analysis study.

Journal of Clinical and Diagnostic Research, *8*(2), 106–109. https://doi.org/10.7860/JCDR/2014/8024.4021

Faiqah, S., & Sopiatun, R. (2015). Faktor-faktor yang berhubungan dengan pre menstrual syndrome pada mahasiswa TK II semester III jurusan kebidanan Poltekkes Kemenkes Mataram. *Jurnal Kesehatan Prima*, *9*(2), 1486–1494.

Fatimah, A., Prabandari, Y. S., & Emilia, O. (2016). Stres dan kejadian premenstrual syndrome pada mahasiswi di asrama sekolah. *BKM Journal of Community Medicine and Public Health*, *32*(1), 7–12.

Goker, A., Artunc-Ulkumen, B., Aktenk, F., & Ikiz, N. (2015). Premenstrual syndrome in Turkish medical students and their quality of life. *Journal of Obstetrics and Gynaecology*, *35*(3), 275–278. https://doi.org/10.3109/01443615.2014.948820

Guyton, A. C., & Hall, J. E. (2006). Textbook of medical physiology. In *Physiology* (11th ed.). Philadelphia: Elsevier Inc.

Hashim, M. S., Obaideen, A. A., Jahrami, H. A., Radwan, H., Hamad, H. J., Owais, A. A., … Faris, "Mo'ez Al-Islam" E. (2019). Premenstrual syndrome is associated with dietary and lifestyle behaviors among university students: a cross-sectional study from Sharjah, UAE. *Nutrients*, *11*(1939), 1–18. https://doi.org/10.3390/nu11081939

Julianti, W., Marfuah, D., & Hayati, S. N. (2017). Pengalaman hidup remaja yang mengalami premenstrual syndrome (PMS) di SMK Moch Toha Cimahi. *Jurnal Keperawatan Komprehensif*, *3*(2), 63–71. https://doi.org/10.33755/jkk.v3i2.86

Khayat, S., Kheirkhah, M., Behboodi Moghadam, Z., Fanaei, H., Kasaeian, A., & Javadimehr, M. (2014). Effect of treatment with ginger on the severity of premenstrual syndrome symptoms. *ISRN Obstetrics and Gynecology*, *2014*, 1–5. https://doi.org/10.1155/2014/792708

Kusumawardani, E. F., & Adi, A. C. (2017). Aktifitas fisik dan konsumsi kedelai pada remaja putri yang mengalami premenstrual syndrome di SMKN 10 Surabaya. *Media Gizi Indonesia*, *12*(1), 54–63. https://doi.org/10.20473/mgi.v12i1.54-63

Lwanga, S. K., & Lemeshow, S. (1991). *Sample size determination in health studies: a practical manual*. Geneva: World Health Organization. ttps://doi.org/10.2307/2290547

Mufida, E. (2015). Faktor yang meningkatkan risiko premenstrual syndrome pada mahasiswi. *Jurnal Biometrika dan Kependudukan*, *4*(1), 7–13.

Proverawati, A., & Misaroh, S. (2009). *Menarche, menstruasi pertama penuh makna*. Yogyakarta: Nuha Medika.

Ratikasari, I. (2015). Faktor-faktor yang berhubungan dengan kejadian sindrom pramenstruasi (PMS) pada siswi SMA 112 Jakarta tahun 2015. *Undergraduated Thesis.* Universitas Islam Negeri Syarif Hidayatullah Jakarta.

Rudiyanti, N., & Nurchairina. (2015). Hubungan status gizi dan stress dengan kejadian pre menstrual syndrome pada mahasiswa jurusan kebidana Poltekkes Tanjungkarang. *Jurnal Keperawatan*, *11*(1), 41–46.

Safarzadeh, A., Zare, S., Yousefabadi, S. R., & Ghoreishinia, G. (2016). The relationship between exercise and premenstrual syndrome. *International Journal of Medical Research & Health Sciences*, *5*(9), 183–189.

Sari, B. P., & Priyanto. (2016). Hubungan status gizi dengan kejadian sindrom pre menstruasi pada siswi SMA Wirausaha Bandungan tahun 2016. *Jurnal Ilmu Keperawatan Maternitas*, *1*(2), 1–7.

Saryono, S. W. (2009). *Sindrom premenstruasi*. Yogyakarta: Nuha Medika.

Shrestha, D. B., Shrestha, S., Dangol, D., Aryal, B. B., Shrestha, S., Sapkota, B., & Rai, S. (2019). Premenstrual syndrome in students of a teaching hospital. *Journal of Nepal Health Research Council*, *17*(43), 253–257. https://doi.org/10.33314/jnhrc.v0i0.1213

Tolossa, F. W., & Bekele, M. L. (2014). Prevalence, impacts and medical managements of premenstrual syndrome among female students: cross-sectional study in college of health sciences, Mekelle University, Mekelle, Northern Ethiopia. *BMC Women's Health*, *14*(1), 1–9. https://doi.org/10.1186/1472-6874-14-52

Wahyuni, S. D., Asparian, & Izhar, M. D. (2018). Determinan yang berhubungan dengan premenstrual syndrome (PMS) pada remaja putri di SMPN 7 Kota Jambi. *Jurnal Kesmas Jambi (JKMJ)*, *2*(1), 59–70.

Walton, L. ., Machamer, L., Asumbrado, R. ., & Behrens, M. . (2018). Physiotherapy & physical rehabilitation relationship between nutrition (REAP), exercise (VSAQ), and stress on premenstrual syndrome severity

(PSST): correlation , cross-section, purposive sample of 75 females ages 18-55. *Journal of Physiotherapy & Physical Rehabilitation*, *3*(2), 1–6. https://doi.org/10.4172/2573-0312.1000158

Wijayanti, Y. T. (2015). Analisis faktor yang berhubungan dengan kejadian premenstrual syndroma pada remaja putri. *Jurnal Kesehatan Metro Sai Wawai*, *8*(2), 1–7.