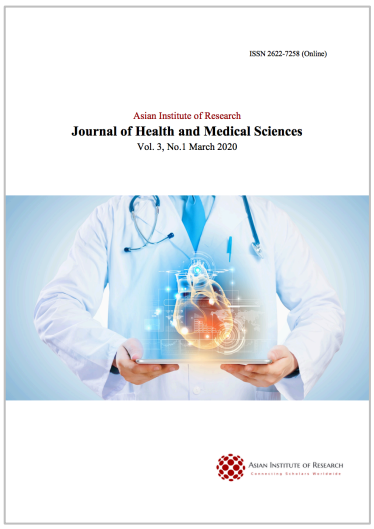

Journal of Health and Medical Sciences

Rifati, Wiam, and Sudiarti, Trini. (2020), A Family History as Dominant Factors Associated with Dysmenorrhea Among Adolescents. In: *Journal of Health and Medical Sciences*, Vol.3, No.1, 90-97.

ISSN 2622-7258

DOI: 10.31014/aior.1994.03.01.102

The online version of this article can be found at:
https://www.asianinstituteofresearch.org/

Published by:
The Asian Institute of Research

The Asian Institute of Research *Journal of Health and Medical Sciences* is a peer-reviewed International Journal. The journal covers scholarly articles in the fields of Medicine and Public Health, including medicine, surgery, ophthalmology, gynecology and obstetrics, psychiatry, anesthesia, pediatrics, orthopedics, microbiology, pathology and laboratory medicine, medical education, research methodology, forensic medicine, medical ethics, community medicine, public health, community health, behavioral health, health policy, health service, health education, health economics, medical ethics, health protection, environmental health, and equity in health. As the journal is Open Access, it ensures high visibility and the increase of citations for all research articles published. The *Journal of Health and Medical Sciences* aims to facilitate scholarly work on recent theoretical and practical aspects of Health and Medical Sciences.

ASIAN INSTITUTE OF RESEARCH
Connecting Scholars Worldwide

ASIAN INSTITUTE OF RESEARCH
Connecting Scholars Worldwide

The Asian Institute of Research
Journal of Health and Medical Sciences
Vol.3, No.1, 2020: 90-97
ISSN 2622-7258

DOI: 10.31014/aior.1994.03.01.102

A Family History as Dominant Factors Associated with Dysmenorrhea Among Adolescents

Wiam Rifati[1], Trini Sudiarti[1]

[1] Nutrition Programme, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia

Correspondence: Trini Sudiarti, Nutrition Programme, Faculty of Public Health, Universitas Indonesia, Pondok Cina Depok, Depok 16424, West Java, Indonesia. Tel: + 620217863501. E-mail: trini@ui.ac.id / trini.fkmui@gmail.com

Abstract
Menstrual pain that can be felt like cramps in the lower middle abdomen, pelvic pain, bloated, and nausea. This study aims to determine the dominant factors associated with dysmenorrhea in adolescents. A cross-sectional study was conducted among 177 female students in High School 5 Bekasi, West Java, Indonesia. The multistage sampling method was used to select the subject. Data is collected by anthropometry measurement for weight and height. A self-administered questionnaire for age, physical activity, breakfast habits, family history of dysmenorrhea, menstrual duration, and stress data. Data were analyzed using Chi-square, two-mean difference, correlation, and multiple logistic regression analysis. The result showed that 85.9% of respondents had dysmenorrhea. Significant associations were found between dysmenorrhea and breakfast habits (p = 0.044, OR = 1.3), and family history of dysmenorrhea (p = <0.001, OR = 6.8). The conclusion of this study family history of dysmenorrhea was the dominant determinant for dysmenorrhea among adolescents (OR=6.80) after controlling age of menarche and brekfast habits.

Keywords: Adolescents, Breakfast Habits, Dysmenorrhea, Family History

1. Introduction

Dysmenorrhea, which is pain that occurs during menstruation, can have an impact on the quality of life of individuals who experience it (Unsal et al 2010). Dysmenorrhea which is common in the age of 15-17 years can affect the performance and attendance of students in the school (Derseh et al 2017). Dysmenorrhea disrupts student school activities, including in the process of learning, school attendance, and academic performance. Individuals with severe dysmenorrhea have more absent classes than individuals with mild and no dysmenorrhea (Abd-El-Mawgod et al 2016, Al-Jefout et al 2015). Based on the results of a systematic review conducted by Latthe et al 2006, the prevalence of dysmenorrhea in women aged 10-20 years worldwide was 94%. Research in Iran shows the prevalence of dysmenorrhea in high school students is 67% (Kharaghani &Damghanian 2016)

and in Malaysia, it is 74.5% (Wong & KHO 2010). The results of the study in Surabaya (Indonesia) showed the prevalence of primary dysmenorrhea in adolescent girls aged 14-19 years around 54.9% (Mahmudiono 2011).

Various factors affect dysmenorrhea. The prevalence of dysmenorrhea is more prevalent in adolescents whose nutritional status is lacking (Chauhan & Kala 2012, Ju et al 2015). In addition to nutritional status, menarche age and physical activity also affect the incidence of dysmenorrhea (Khodakarakami et al 2015, Kazama 2015, Mahvash et al 2015). Based on the research of Fujiwara dysmenorrhea it is also influenced by breakfast habits. The group who breakfasted 0-3 times per week tended to have dysmenorrhea with higher severity than the group that ate 4-7 times a week (Fujiwara et al 2009). According to Kural et al 2015 individuals who have a family history of dysmenorrhea are three times more likely to develop dysmenorrhea. The characteristics of other individuals that influence the incidence of dysmenorrhea are the duration of menstruation. Students with abnormal periods of menstruation or more than 7 days experience dysmenorrhea (Proverawati 2009). Stress is known to be one of the risk factors for dysmenorrhea. Women with higher stress levels are more at risk for dysmenorrhea (Kordi et al 2013, Wang 2004). Dysmenorrhea is still a problem that is often suffered by young women, can affect the daily activities of adolescents, and can even cause the individual to be absent from school activities. The prevalence of dysmenorrhea in adolescents in Indonesia is quite high. This study aims to determine the determinants factors of dysmenorrhea.

2. Subject and Methods

This research is a quantitative study with cross-sectional study design. As the dependent variable is dysmenorrhea, while the independent variables are nutritional status, menarche age, physical activity, breakfast habits, family history of dysmenorrhea, menstrual period, and stress. The research is located at High School 5 Bekasi District, West Java Province, Indonesia and conducted in June 2018. The target population of all active female students for the 2017/2018 school year. The number of samples in this study was 177 samples consisting of 10th and 11th-grade students. The inclusion criteria were menstruation, active students in the 2017/2018 school year, and were willing to become respondents. The sample size calculated by hypothesis tests for a population proportion (two-sided) was carried out by the simple size determination software (Lemeshow and Lwanga, 1997). It is used $\alpha = 5\%$ and $\beta = 20\%$. Data collection was carried out by filling out questionnaires including data on dysmenorrhea, age of menarche, physical activity, breakfast habits, family history, duration of menstruation, and stress. Data on body weight and height as an indicator of nutritional status obtained through anthropometric measurements using a digital weight scale Seca has an accuracy of 0.1 kg and *microtoice* for height measurements having an accuracy of 0.1 cm.

Data on dysmenorrhea were obtained through filling in a modified questionnaire from the Women's Health Questionnaire and the Dysmenorrhea Assessment Questionnaire (Girod 2006, Right Diagnosis 2018). Data on physical activity through the Physical Activity Questionnaire for Adolescents (PAQ-A) questionnaire and stress using the Perceived Stress Scale 10 (PSS-10) questionnaire (Kowalski et al 2004, Cohen et al 1983). Data were analyzed by univariate, bivariate by Chi-square, two different mean tests, correlation analysis, and multivariate entering method multiple logistic regression analysis. A p-value of less than 0.05 was considered statistically significant. The data were analyzed using SPSS version 16.

3. Ethical Considerations

Ethical clearance was obtained from The Research and Community Engagement Ethical Committee Faculty of Public Health Universitas Indonesia (Ethical Approval: No.22 /UN2.F10/PPM.00.02/2018). Written informed consent was obtained from the parents of subjects. Furthermore, they were informed about the possibility to leave the study at any stage of the research.

4. Results

The frequency distribution of various characteristic subject is presented in Table 1. The prevalence of dysmenorrhea in adolescents is 85.9% and 48% of these groups state that their daily activities are disrupted due to dysmenorrhea. As many as 31.1% of respondents have obese nutritional status. The average age menarche of

respondents is 12.1 ± 1.15 years. The physical activity of the respondents showed 45.2% had low physical activity. The median frequency of the respondent's breakfast is five times a week and 51.4% of respondents had a history of dysmenorrhea in the family. Further, 25.4% of respondents have abnormal menstrual periods and the duration of menstruation has variation 3-18 days. The stress level of respondents showed 83.1% had moderate stress.

Table 1. Frequency distribution of the characteristics subject

Variables	Amount (n)	Percentage (%)
Dysmenorrhea (n = 177)		
Dysmenorrhea	152	85.9
Not dysmenorrhea	25	14.1
Pain level (n = 152)		
Low (1-3)	49	32.2
Moderate (4-6)	83	54.6
Severe (7-10)	20	13.2
Activity		
Disrupted	73	48.0
Difficulties in studying	58	78.4
Staying at school clinic	7	9.5
Absent from school	7	9.5
Nearly fainted	2	2.7
Not disrupted	79	52.0
Nutrition status (n = 175)		
Normal	120	68.6
Overweight	55	31.4
Physical activities (n = 177)		
Low	80	45.2
Moderate	84	47.5
High	13	7.3
Family history of dysmenorrhea (n = 177)		
Yes	91	51.4
No	186	48.6
Menstrual duration (n = 177)		
3-7 days	132	74.6
> 7 days	45	25.4
Stress (n = 177)		
Low stress	23	12.9
Moderate stress	147	83.1
Severe stress	7	4.0

Variables of the dysmenorrhea pain scale, nutritional status, physical activity, menstrual duration, and stress are categorized as listed in Table 2 were analyzed by Chi-square. A family history of dysmenorrhea has a significant relationship with dysmenorrhea ($p < 0.0001$). While for numerical variables as menarche age, breakfast habits, and stress were analyzed by two mean different tests is presented in Table 3. The results of the study show that there are no different means of stress variables and nutritional status but mean breakfast habits different at the dysmenorrhea and not dysmenorrhea groups ($p=0.044$).

Table 2. Chi-square analysis for categoric variables

Variables	Dysmenorrhea				Total		OR (95% CI)	*p value*
	Dysmenorrhea		Not dysmenorrhea					
	N	%	n	%	n	%		
Nutrition status								
Overweight	51	92.7	4	7.3	55	100	2.70	0.118
Normal	99	82.5	21	17.1	120	100		
Physical activities								
Low	70	87.5	10	12.5	80	100	1.28	0.853
Moderate	82	84.5	15	15.5	84	100		
Family history								
Yes	87	95.6	4	4.4	91	100	7.0	< 0.001*
No	65	75.6	21	24.4	86	100	(2.3-21.1)	

*Statistically significant (p<0.05)

Table 3. Independent t-test analysis for numeric variables

Variabel	N	Mean	Median	*p value*
Age of menarche				
Dysmenorrhea	152	12.04	11.99	0.063
Not dysmenorrhea	25	12.50	12.47	
Breakfast habits				
Dysmenorrhea	152	4.27	4	0.044*
No Dysmenorrhea	25	5.6	6	
Stress				
Dysmenorrhea	152	18.37	18	0.729
Not dysmenorrhea	25	18.72	18	

*statistically significant (p< 0.05)

After being tested bivariate, the significant variables were tested multivariate by logistic regression analysis. The results of multivariate modeling are presented in Table 4. Based on the final modeling it is known that the variable has the highest OR against the incidence of dysmenorrhea is a history of family dysmenorrhea (OR=6.80). Thus the dominant factor associated with dysmenorrhea is a family history after controlled age of menarche and breakfast habits.

Table 4. Logistic regression Analysis

Variable	p-value	OR	95% CI
Age of menarche	0.137	1.36	0.908-2.025
Breakfast habits	0.017	1.30	1.047-1.607
Family history of dysmenorrhea	0.001	6.80	2.184-21.173

5. Discussion

Based on the results of research on adolescents, the prevalence of dysmenorrhea was 85.9%. The high prevalence of dysmenorrhea shows that it is a common problem in adolescents. The prevalence of this study is higher than the prevalence of adolescent dysmenorrhea in Surabaya 54.89% (Mahmudiono 2011). More than three-quarters of respondents reported that they had difficulty learning, had to rest, not go to school, and felt almost faint when they experienced dysmenorrhea. These results are in line with previous studies that dysmenorrhea can disrupt student activities in schools as well as student learning activities, academic performance, learning processes, and attendance at school (Derseh et al 2017, Abd El-Mawgod et al 2016).

As many as 31.4% of respondents were overweight and most had dysmenorrhea. Based on bivariate tests, there was no significant relationship between nutritional status and dysmenorrhea. The results of the study are in line with research by Kazama et al 2015 which states there is no significant relationship between BMI and dysmenorrhea in adolescents. The results of this study are not in line with the results of the study of Ju et al 2015 which states that there is a significant relationship between dysmenorrhea and malnutrition and more. Differences in results may be caused by differences in the definition of dysmenorrhea and nutritional status indicators used. According to Ju et al respondents were said to be dysmenorrhea if several times or often experience pain, while respondents who rarely experience menstrual pain are considered not dysmenorrhea. The assumption from the research results that are not significant because the prevalence of dysmenorrhea at the study site is high (85.9%), so it tends to be homogeneous. More samples are needed to be able to detect differences in the proportion of dysmenorrhea in each nutritional status group (Filho et al., 2013).

The average age of the respondent's menarche was 12.11 ± 1.15 years. That is younger if be compare the results of the study by Batubara et al 2010 in women Indonesia which is 12.96 years and Amaliah et al 2012 amounting to 12.4 ± 1.08. This condition shows that as time changes, teens experience menarche at an increasingly young age. These results support Sohn's theory that there is a trend of decreasing age of menarche in developing countries since the 20th century (Sohn 2015). Based on the results of the independent t-test between menarche age and dysmenorrhea, the p-value of 0.043 was obtained. The results of this study indicate that there are differences in the average age of menarche between the dysmenorrhea and non-dysmenorrhea groups. The group of dysmenorrhea has a younger menarche age of 12.04 years compared with non-dysmenorrhea of 12.50 years. The results of the study are in line with the research by Kural et al 2015. This mechanism can be explained because women who menarche faster tend to be more and longer exposed to prostaglandin, so it is more likely to experience dysmenorrhea (Charu et al 2012). However, the exact mechanism underlying the relationship between menarche age and dysmenorrhea needs further investigation.

Almost 45.2% of respondents have a low level of activity, while 54.8% of respondents have a moderate level of physical activity. Based on the results of the bivariate test in Table 2, the value of p 0.853, so that the two variables are not significantly related. These results are in line with studies that state no significant association between physical activity and dysmenorrhea (Faramarzi & Salmalian 2014, Kamel et a. 2017). However, these results are not in line with the research by Mahvash et al, 2015 and Kazama et al 2012. There is a tendency for the risk of dysmenorrhea in a group of adolescents who had low physical activity. This can be explained through hormonal mechanisms when a person is physically active. Physical activity is known to increase endorphins in the blood. These hormones can reduce pain so that pain during menstruation can be reduced (Karoly &Yensen 1987). In addition, endorphins can also increase pain thresholds. This causes a person to be more resistant to pain and not quickly perceive that feeling as pain (Mahvash et al. 2012). The results of this study are not significant and assumed. to be the level of physical activity of respondents who tend to be homogeneous. PAQ-A is used to assess the level of physical activity through daily activities, both at school and outside of school. The questionnaire can only describe the general measure of physical activity carried out. The questionnaire cannot describe specific information about expenditure energy, frequency, time, and intensity of one's physical activity. The results obtained from the questionnaire tend to be homogeneous.

The distribution of breakfast habit data is not normal therefore the Mann-Whitney nonparametric test was conducted. It was found that there was a significant difference in the median breakfast frequency between the dysmenorrhea and non-dysmenorrhea groups. Median breakfast in the dysmenorrhea group 4, meanwhile the median group not - dysmenorrhea was 6. The results of the study were in line with the research of Fujiwara and Fujiwara et al which states that there is a significant relationship between breakfast habits and dysmenorrhea (Fujiwara et al 2009, Fujiwara 2003). The Fujiwara study found that the level of pain in dysmenorrhea was higher in the breakfast group compared to breakfast several times and every day of the week. The results of this study are not in line with some previous studies that did not find any relationship between breakfast and dysmenorrhea (Khodakarakami et al 2015, Faramazi &Salmalian 2014). The relationship between breakfast and dysmenorrhea can be explained by the mechanism of the sympathetic and sympathetic nerves that mediate pain during menstruation. The group of women who skip breakfast will experience deficiencies in certain nutrients due to incomplete frequency of eating a day (Fujiwara 2003). Nutritional deficiencies can cause the

hypothalamic-pituitary-ovarian axis to be disrupted. These disorders can trigger the production of excess prostaglandin during menstruation to cause pain (Dawood 1990).

The prevalence of respondents had a family history of dysmenorrhea is 85.9% and the majority of respondents experienced dysmenorrhea (95.6%). Based on the results of the Chi-square test, a p-value of <0.001 means that there is a significant relationship between family history and dysmenorrhea. Odds Ratio value was obtained at 7 that meaning the group with a family history of dysmenorrhea was 7 times more likely to experience dysmenorrhea than the group with no family dysmenorrhea history. The results of this study are supported by previous studies (Ju et al 2014, Pejcic & Jokovic 2016, Aher & Rajole 2016). The relationship between family history and dysmenorrhea can be explained through two theories, namely genetic and behavioral. Based on the genetic theory, the severity of dysmenorrhea pain is affected by chromosome 1p13.2 which is close to the locus nerve growth factor (NGF). NGF acts as a mediator of the inflammatory response and can increase the body's sensitivity to pain (Sanctis et al. 2016). Silberg et al 1987 state that there is a genetic influence in the incidence of dysmenorrhea that occurs in monozygotic and dizygotic twins. Based on behavioral theory, the risk of individuals with a family history of dysmenorrhea to experience dysmenorrhea can also be caused by the similarity of behavior and learning processes that the child does to his mother. This causes similarities to the perception of pain during menstruation between mother and child (Jones et al 2016).

As many as 25.4% of respondents experienced the duration of abnormal menstruation, more than 7 days. Most 91.1% of these groups experienced dysmenorrhea, as respondents from their menstrual group normal. Chi-square test results showed no significant relationship between menstruation and dysmenorrhea (p = 0.385). These non-significant results are in line with the research in Japan (Nagata et al 2005). Other results suggest a relationship between the duration of menstruation and dysmenorrhea. There was a tendency in the duration of menstruation groups to experience abnormal dysmenorrhea compared to the normal duration group, although the difference in proportions did not differ statistically. The tendency of the risk of dysmenorrhea in the group of an abnormal duration of duration may be due to excessive exposure of prostaglandin to the uterus (Unsal et al 2010, Fujiwara 2003).

Two different mean test results obtained a p-value of 0.729, meaning that there was no significant difference in mean stress levels in the dysmenorrhea and non-dysmenorrhea groups. The results of this study are in line with th, e research of Maryam et al 2016 which states that there is no relationship between stress severity with menstrual pain. While the dysmenorrhea group found a relationship between stress levels and the severity of dysmenorrhea. Several other studies differ from the results of this study which found a significant relationship between stress and dysmenorrhea on the results of the correlation test between stress and dysmenorrhea pain, a statistically significant relationship was found p-value 0.025. The correlation value obtained by 0.181. These results indicate that the higher a person's stress level, the higher the scale of pain dysmenorrhea she feels. This can be explained by the mechanism of stress and the neuroendocrine response in a person's body. When a person experiences stress, Corticotrophin Releasing Hormone (CRH) will trigger the secretion of Adrenocorticotrophic Hormone (ACTH) from the pituitary. These hormones are the main regulator of the stress response in the human body. ACTH produced will trigger cortisol secretion from the adrenal gland (Wadhwa 1996). Secretions that occur in the adrenal gland will affect the concentration of prostaglandins in the myometrium (Austin &Leader 2000).

6. Conclusion

The prevalence of dysmenorrhea in adolescents is 85.9%, the average age of menarche is 12.1 ± 1.15 years and breakfast habits are five times a week. There is a significant relationship between breakfast habits and a history of family dysmenorrhea with the incidence of dysmenorrhea. The dysmenorrhea group had a lower frequency of breakfast per week than the non-dysmenorrhea group. Adolescents who have a family history of dysmenorrhea are 7 times more likely to experience dysmenorrhea compared to adolescents who have no family history of dysmenorrhea. The dominant factor associated with dysmenorrhea among adolescents is a history of family dysmenorrhea after controlling age menarche and breakfast habit.

References

Abd El-Mawgod MM, Alshaibany AS, Al-Anazi AM. (2016). Epidemiology of dysmenorrhea among Secondary School students in Northern Saudi Arabia. Journal of the Egyptian Public Health Association 91(3): 115-119.

Aher JY, Rajole KM. A cross-sectional study of prevalence of dysmenorrhea among adolescent girls. (2016).*Sch J App Med Sci* 4(9D): 3421-3423.

Al-Jefout M, Seham A, Jameel H, Randa A, Ola A, Oday A et al. (2015). Dysmenorrhea: Prevalence and Impact on Quality of Life among Young Adult Jordanian Females. Journal of Pediatric and Adolescent Gynecology 28(3):173-185.

Amaliah N, Sari K, Rosha BC.(2015). Status tinggi badan pendek berisiko terhadap keterlambatan usia *menarche* pada perempuan remaja usia 10-15tahun. *Penel Gizi Makanan* 35(2) :150-158.

Austin MP, Leader L. (2000). Maternal stress and obstetric and infant outcomes: epidemiological findings and neuroendocrine mechanisms. *Aust N Z J Obstet Gynaecol* 2000; 40: 331–337.

Batubara JRL, Soesanti F, van de Waal HD. Age at menarche in Indonesian girls: a national survey. *Acta Med Indones-Indones J Intern Med* 42(2): 78-81.

Charu S, Amita R, Sujoy R, Thomas G. (2012). Menstrual characteristics and prevalence and effect of dysmenorrhea on quality of life of medical students. *J Collaborat Res Intern Med Public Health* 4(4): 276–94

Chauhan M, Kala J. (2012). Relation between dysmenorrhea and body mass index in adolescents with rural versus urban variation. J Obstet Gynaecol India 62(4): 442-445.

Cohen s, Kamarck T, mermelsteinR. A Global measure perceived stress. (2003). Journal of Health and Behavior 24, 386-396.

Dawood MY. Dysmenorrhea. (1990). *Clin Obstet Gynecol* 33:168-178.

Derseh BT, Afessa N, Temesgen M, Semaya YW, Kassaye M. (2017). Prevalence of dysmenorrhea and its effects on school performance: A cross-sectional study. Journal of Womens Health Care 6(2).

Faramarzi M, Salmalian H. (2014). Association of psychologic and non-psychologic factors with Primary-dysmenorrhea. *Iranian Red Crescent Medical Journal* 16(8).

Filho DBF, Paranhos R, da Rocha EC, Batista M, da Silva Jr, JA, Santos MLWD Marino C. (2013). When is statistical significance not significant? *Brazilian Political Science Review* 7(1): 31-55.

Fujiwara, T. Skipping breakfast is associated with dysmenorrhea young women in Japan. (2003) *International Journal of Food Sciences and Nutrition* 54(6): 505-509.

Fujiwara T, Sato N, Awaji H, Sakamoto H, Nakata R. (2009). Skipping breakfast adversely affects menstrual disorder in young college students. International Journal of Food Sciences and Nutrition 6 (sup 6) :23-31.

Girod I, de la Loge C, Keininger D, Hunter MS. (2006). Development of a revised version of the Women 's Health Questionnaire. Climateric 9(1): 4-12.

Jones A, Hockley J, Hyde C, Gorman D, Sredic-Rhodes A, Bilsland J, et al. (2016). Genome-wide association analysis of pain severity in dysmenorrhea identifies association at chromosome 1p13.2, near the nerve growth factor locus. *PAIN* 157(11): 2571-2581.

Ju H, Jones M, Mishr G. (2015). A u-shaped relationship between body mass index and dysmenorrhea: A longitudinal study. PLOS ONE 10(7): 134.

Ju H, Jones M, Mishra G. (2014). The prevalence and risk factors of dysmenorrhea. *Epidemiol* Rev 36: 104 - 113.

Kamel, Tantawy S, Abdelsamea G.(2017). Experience of dysmenorrhea among a group of physical therapy students from Cairo University: an exploratory study. *Journal of Pain Research*10:1079-1085.

Kantero R, Widholm O. (1971). Correlations of menstrual traits between adolescent girls and their mothers. *Acta Obstetricia et Gynecologica Scandinavica* 50 (s14): 30-37.

Karoly P, Jensen MP. Multimethod Assessment of Chronic Pain. New York: 1987.

Kazama M, Maruyama K, Nakamura K.(2015). Prevalence of dysmenorrhea and its correlating lifestyle factors in Japanese female junior high school student. Tohoku J. Exp. Med 236:107-113

Kharaghani R, Damghanian M.(2016). The prevalence of dysmenorrhea in Iran: a systematic review and meta-analysis. Iranian Red Crescent Medical Journal 19(3).

Khodakarami B, Masoumi SZ, Faradmal J, Nazari M, Saadati M, Sharifi F, Shakhbabaei M. (2015).The Severity of Dysmenorrhea and its Relationship with Body Mass Index among Female Adolescents in Hamadan,Iran. Journal of Midwifery and Reproductive Health 3(4): 444-450.

Kordi M, Mohamadirizi S, Shakeri MT. (2013). The relationship between occupational stress and dysmenorrhea in midwives employed at public and private hospitals and health care centers in Iran (Mashhad) in the years 2010 and 2011. Iran J Nurs Midwifery Res 18(4): 316-322.

Kural M, Noor NN, Pandit D, Joshi T, Patil, A. (2015). Menstrual characteristics and prevalence of dysmenorrhea in college going girls. J Family Med Prim Care 2015; 4(3): 426-431.

Kowalski KC, Crocker PR, Donen RM. The Physical Activity Questionnaire for Older Children (PAQ-C) and Adolescents (PAQ-A) Manual 2004; 2:13-15.

Latthe M, Say L, Gulmezoglu M, Khan KS.(2006). WHO systematic review of prevalence of chronic pelvic pain: Neglected reproductive health morbidity. BMC Public Health 6:177.

Lemeshow S,Hosmer DW, Klar J, Lwanga SK, WHO. 1997. Adequacy of sample size in health studies. Enggland . John Wiley and Sons.

Mahmudiono T.(2011). Fiber, PUFA and Calcium intake is associated with the degree of primary dysmenorrhea in adolescent girl Surabaya, Indonesia. Journal Obstetrics and Gynecology.

Mahvash N, Eidy A, Mehdi K, Zahra MT, Mani M, Shahla H. (2012). The effect of physical activity on primary dysmenorrhea of female university students. World Appl. Sci. J 17(10) :1246-1252.

Maryam, Ritonga MA, Istriati.(2016). Relationship between menstrual profile and psychologicalstress with dysmenorrhea. Althea Medical Journal 3(3): 382-87.

Nagata C, Hirokawa K, Shimizu N, Shimizu, H. (2005). Associations of menstrual pain with intakes of soy, fat, and dietary fiber in Japanese women. European Journal of Clinical Nutrition 59(1): 88–92

Pejcic A, Jankovic S.(2016). Risk factors for dysmenorrhea among young adult female university students. *Ann I^st^ Super Sanità* 52(1): 98-103.

Proverawati A. (2009). Menarche: *Menstruasi Pertama Penuh Makna* (The First Menstruation is Full Meaning) Yogyakarta: Nuha Medika.

Right Diagnosis by Health Grades. Dysmenorrhea Assessment Questionnaire (online). (2015). Retrieved from https://www.rightdiagnosis.com/symptoms/dysmenorrhea/questions.htm#pagetop on March 2018

Sanctis VD, Soliman AT, Elsedfy H, Soliman NA, Elalaily R, Kholy ME. (2016). Dysmenorrhea in adolescents and young adults: a review in different countries. *Acta Biomed* 87(3): 232-246.

Silberg J, Martin N, Heath A.(1987). Genetic and environmental factors in primary dysmenorrhea and its relationship to anxiety, depression, and neuroticism. *Behavior Genetics* 17(4): 363-383.

Sohn K. (2015). The trend in age at menarche in Indonesia: birth cohorts 1944-1988. *J BiosocSci.* 47(3): 407-412.

Unsal A, Ayranci U, Tozun M, Arslan G, Calik E. (2010). Prevalence of dysmenorrhea and its effect on quality of life among a group of female university students. Upsala Journal of Medical Sciences 115(2):138-145.

Wadhwa PD, Dunkel-Schetter C, Chicz-De Met A, *et al*.(1996). Prenatal psychosocial factors and the neuroendocrine axis in human pregnancy. Psychosom Med 58: 432-46.

Wang L.(2004). Stress dysmenorrhea: a population based prospective study. Occupational and Environmental Medicine 61(12):1021-1026.

Wong LP, Kho EM. (2010). Dysmenorrhea in a multi ethnic population of adolescent Asian Girls. Int J Gynaecol Obstet108(2): 139-142.