Correlation Between Body Mass Index and Dysmenorrhea in Preclinical Female Students Aged 16-24 at The Hang Tuah University Medical Faculty, Surabaya

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Abstract Primary dysmenorrhea is a menstrual pain in the abdominal area that occurs on the first day of menstruation, and generally, it becomes gynecological problems in women. It occurred because there is an enhancement of PGF2α which can cause excessive myometrium spasm and lead to abnormal uterine contraction, which the levels of prostaglandins in women with a BMI more than normal (overweight) higher than women with normal BMI. This study was observational analytic by using cross-sectional methods. The population of this study is female students at Medical Faculty of Hang Tuah University Surabaya was aged 16-23 year old. The study was conducted in February 2014 with a sample size of 50 people were taken by simple random sampling technique. The data were collected by measuring directly on the respondents to determine the BMI and the presence of primary dysmenorrhea. The results showed that primary dysmenorrhea was 56% in women with BMI more than normal (overweight). From the results obtained chi-square significance value of p=0,023 ($p<0.05$; $\alpha=0,05$). It can be concluded that there was influence 1,8x between BMI and primary dysmenorrhea in female students aged 16-23 years in 2014 at the Medical faculty of Hang Tuah University Surabaya.

1 INTRODUCTION

One of the most common disorders of women during menstruation is menstrual pain or commonly known as dysmenorrhea. Dysmenorrhea is a gynecological complaint that most often makes women uncomfortable in their daily activities. In general, about 45-90% of women sustain dysmenorrhea in the world. In the United States, the peak incidence of dysmenorrhea occurs in late adolescence and in the early 20s the incidence of dysmenorrhea is reported to be around 92% (Anurogo, 2008). While in Indonesia it is estimated that the incidence of dysmenorrhea about 45-95% among women of childbearing age (Proverawati & Misaroh, 2009). The high prevalence and morbidity of dysmenorhhea needs special attention from the medical world. Besides that, supported by data in Indonesia, according to Santoso (2008) the most occurs dysmenorrhea is primary dysmenorrhea. Risk factors associated with severe symptoms of dysmenorrhea was obesity (Calis, 2006). Dysmenorrhea usually starts at a young age, when the ovulation cycle starts regularly. The cause of primary dysmenorrhea is still unclear, related to weight gain that can trigger myometrial spasm because it is thought that excessive production of prostaglandin can cause ischemia in the uterus then causing pain. Prostaglandins are said to reduce or temporarily inhibit blood supply to the uterus, which causes the uterus to be deprived of oxygen, causing myometrial contractions and pain (Eby, 2006).

Therefore, it is necessary to know the correlation between Body Mass Index (BMI) and the incidence of primary dysmenorrhea through the calculation of body weight (BB) in kilograms and height (TB) in meters in preclinical students aged 16-24 years at the University Medical Faculty Hang Tuah Surabaya. The purpose of this study was to determine the correlation between Body Mass Index (BMI) and the incidence of primary dysmenorrhea in preclinical female students aged 16-24 at the Hang Tuah University Medical Faculty, Surabaya

2 METHODS

This research was a quantitative analytic study. In term of data collection, this study included cross

sectional. The sample of this study were 50 female students aged 16-23 years at the Hang Tuah University Medical Faculty in Surabaya whom meet the inclusion criteria such as women wuth aged 16-24 years,having menstruated period and willingly participated in the research. While some exclusion criteria determined, including not willing to follow this research., married or in a pregnant condition, taking hormonal drugs and students with tumors diagnosed in the genital tract.

The sampling technique in this study was simple random sampling. In this study the independent variable was the Body Mass Index (BMI). The dependent variable was primary dysmenorrhea. Body weight was measured by the CAMRY brand analog weight scale with BR-9015 type. Whereas the height of the body was measured with a ZT-150 microtoise stature. BMI was measured according to WHO standards (kg/m^2). Data on dysmenorrhea was collected using a questionnaire.

3 RESULT AND DISCUSSION

Respondents Overview

Characteristics of respondents randomly selected who met the criteria, aged between 16-23 years and have BMI range 18.5-25

Table 1 The Data of Respondent's BMI at the Hang Tuah University Medical Faculty Surabaya in 2017

BMI	Number	%
Normal	25	50
Overweight/Obese	25	50
Total	50	100

Based on the results of the study, there were 25 (50%) respondents with normal BMI and 25 (50%) respondents with overweight or obese BMI groups. The data on Primary Dysmenorrhea at the Hang Tuah University Medical School in 2017. According to research data obtained in the sample, the distribution of Primary Dysmenorrhea in female students of the Medical Faculty of Hang Tuah University Surabaya, obtained the following data:

Table 2 Data on Primary Dysmenorrhea in Respondents

Dysmenorrhea Primer	Number	%
Yes	28	56
No	22	44
Total	50	100

From table 2, there were 28 groups of Primary Dysmenorrhea (56%) compared to 22 people who did not have Primary Dysmenorrhea (44%).

Analysis of BMI Relations with the incidence of Primary Dysmenorrhea at the Hang Tuah University Medical School in 2017. This analysis used Koefisien Phi statistical test where the test was used to determine whether there was an independent variable correlation with the dependent variable. The hypothesis was H1: There was a correlation between the independent variable and the dependent variable. α: 0.05

Tabel 3 Data Summary of BMI and Incidence of Dysmenorrhea

BMI	Dysmenorrhea		
	Dysmenorrhea	No	Total
Normal	10	15	25
Overweight	18	7	25
Total	28	22	50

Based on calculations using the SPSS 20.0 computer statistical program, the results of the analysis were as follows:

Table 4 Data analysis of the effect of BMI with Primary Dysmenorrhea

		Approx. Sig.
Nominal by Nominal	Phi	.023
	Cramer's V	.023
	Contingency Coefficient	.023
	N of Valid Cases	

Based on table 4, the data was determined into two groups: Primary Dysmenorrhea and do not sustain on Primary Dysmenorrhea. The number of p value = 0.023 < α = 0.05. It meant that Ho was rejected and H1 was accepted. The conclusion was Body Mass Index (BMI) had correlation on Primary Dysmenorrhea. Based on the data in this study, the respondents were 50 female students who suffered from primary dysmenorrhea during menstruation as many as 28 people (56%). Whereas the respondents who did not suffer from primary dysmenorrhea during menstruation were 22 people (44%).

One of the risk factors for primary dysmenorrhea was overweight and obesity. According to French (2005) the incidence of primary dysmenorrhea is thought to be due to excessive prostaglandin expenditure in women with BMI more than normal. This shows that there is excess fat tissue which can cause blood vessel hyperplasia (pressure of blood vessels by fat tissue) in the female reproductive organs so that blood that should flow during menstruation is disrupted and primary dysmenorrhea develops.

Based on the results of the study, the incidence of primary dysmenorrhea in female students at the University of Hang Tuah Medical Faculty Surabaya

with more than normal BMI dominating experienced primary dysmenorrhea by 56%. More than normal body mass index (BMI) categories can be grouped into two, which are overweight and obesity.

Effect of Primary Dysmenorrhea on Female Students aged 16-23 at the Hang Tuah University Medical School in 2017

Based on the results of the study, the incidence of primary dysmenorrhea in female students with normal BMI with more than normal BMI was obtained by students with overweight and obese BMI had more primary dysmenorrhea as many as 28 people (56%) than students with normal BMI 22 people (44%) . After being tested by Koefisien Phi Test showed a significant effect between female students with normal BMI and BMI more than normal on the incidence of primary dysmenorrhea with p = 0.023. so, it can be concluded that there was a correlation between BMI and dysmenorrhea.

This fact is consistent with the theory stated by Emudson (2006) which states that people with a body mass index (BMI) more than normal showed an increase in excessive levels of prostaglandin (PG), thus triggering myometrial spasms triggered by menstrual blood, similar natural fat that can be found in the uterine muscle and uterine contractions that result in primary dysmenorrhea. Prostaglandins are released during menstruation, because of the loss of the endometrial wall and its contents (Lethaby A, Augood C, Duckitt K, Farquhar C, 2007). According to French (2005), dysmenorrhea is thought to be due to the release of prostaglandins in menstrual fluid, which results in uterine contractions and pain. The level of endometrial prostaglandin that increases during the luteal phase and the menstrual phase causes uterine contractions (Chandran, 2008). During the menstrual period, prostaglandin levels increase, then at the beginning of the period, prostaglandin levels remain high, with the continuation of the menstrual period decreased prostaglandin levels. This explains why pain tends to decrease after the first few days of the menstrual period (ACOG, 2006). Vasopressin also contributes to increased uterine contractility and causes ischemic pain as a result of vasoconstriction. An increase in vasopressin levels has been reported in women with primar dysmenorrhea.

According to Clitheroe and Pickles Get very high levels of PGE2 and PGF2α in the endometrium, myometrium and menstrual blood of women who suffer from primary dysmenorrhea. Prostaglandins cause an increase in uterine activity and pain-inducing terminal nerve fibers. On that basis it was concluded that prostaglandins produced by the uterus play a role in causing myometrial hyperactivity. Furthermore myometrial contractions caused by prostaglandins will reduce blood flow, resulting in ischemia of myometrial cells which results in spasmodic pain. If prostaglandin is released in excessive amounts into the bloodstream, other than primary dysmneorrhea other effects such as diarrhea, nausea, vomiting (Yuniyanti, 2014).

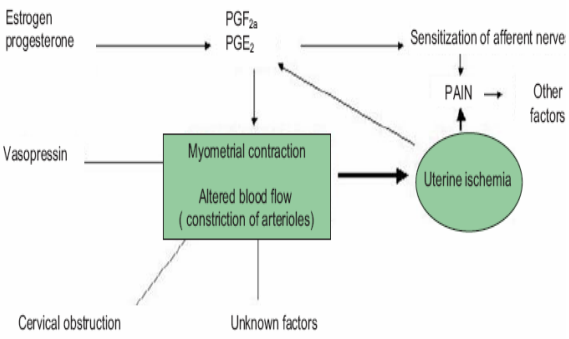

Figure 1 Patofisiologi *dysmenorrhea* primer (source: *Primary Dysmenorrhea Consensus Guideline*, Lefebvre et al, 2005)

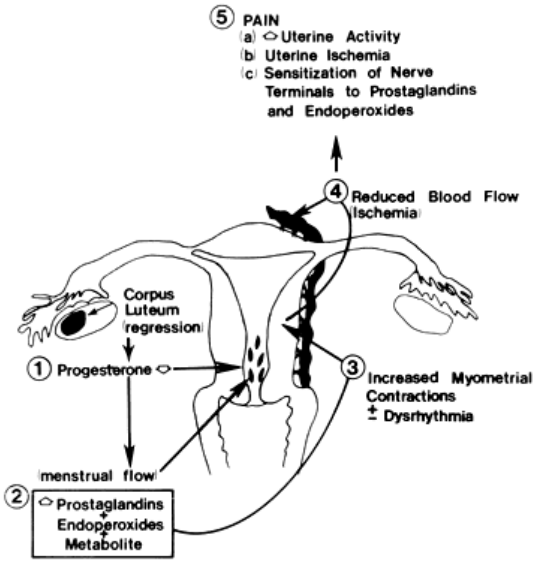

Figure 2: The Mechanism of pain in primary dysmenorrhea (Dawood MY [ed]:Dysmenorrhea,p21. Baltimore:Wiliams and Wilkins, 1981)

In the mechanism of pain when the occurrence of primary dysmenorrhea can begin when the remaining follicles that have ruptured are in the ovary. Granulosa cells undergo luteinization and form the corpus luteum. The corpus luteum is the main source of the sexual steroid hormone, estrogen, and progesterone released by the ovary in the post

ocvulation phase (luteal phase). The formation of the corpus luteum will cause progesterone secretion to continue to increase and there is also an increase in estradiol levels. At the end of the luteum phase, there is a decrease in estrogen and progesterone production. This decrease is followed by spasmodic contractions of the spiral arteries resulting in ischemia and necrosis of the superficial layer of the endometrium resulting in bleeding. Vasospasm occurs due to the production of local prostaglandins, where prostaglandins also cause contractions of the uterus during menstruation. Increased production and release of prostaglandins during menstruation reacts to increased uterine activity and causes uterine hypoxia and pain (Fortier MA, Krishnaswamy K, Danyod G, Boucher-Kovalik S, Chapdelaine P, 2008).

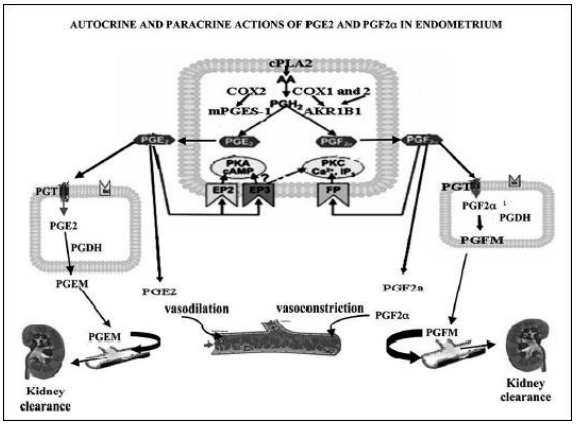

Figure 3 Autocrine and paracrine actions of PGE2 and PGF2α in the endometrium. In the reproductive system PGE2 and PGF2α often show opposite actions. PGF2α is a potent constructor in the endometrium and uterine blood vessels. Contrast with PGE2 which is a vasodilator that can suppress luteotropic action in humans. During menstruation PGF2α is higher than PGE2 concentration (Fortier MA, Krishnaswamy K, Danyod G, Boucher-Kovalik S, Chapdelaine P, 2008)

According to the research (Novita, 2018) which concluded that the majority of respondents experienced menstrual disorders such as premenstrual syndrome (PMS) and dysmenorrhoea, and there was a significant relationship between nutritional status and the incidence of menstrual disorders (p = 0.035). This study was in accordance with the results of Mentari's research (2015) which stated that there was a significant relationship between nutritional status and menstrual disorders in adolescent girls. The same thing was also produced by Setyani (2014) which stated that there was a correlation between nutritional status and cases of dysmenorrhea in female students.

According to Calis (2006) overweight is one of the many factors causing primary dysmenorrhoea. The cause of cases of dysmenorrhea in women with overweight is due to the increasing estrogen production related with over cholesterol, whereas cholesterol is a trigger of estrogen (Pritchard et al, 1991). Hormones can change due to fat deposits in obese women. Estrogen hormone is a hormone that is triggered by the amount of accumulated fat. Obese women produce estrogen not only from the ovary but also from fat under the skin (Yanto, 2007). This estrogen increases uterine contractility resulting in primary dysmenorrhoea (Sarwono, 1999).

Another theory says excess nutritional status is a trigger for dysmenorrhoea because fat tissue causes hyperplasia of the blood vessels which is squeezing blood vessels by fat tissue in the female reproductive organs so that blood flow during menstruation becomes obstructed and causes pain. The habit of eating unhealthy food as the main food or as snacks such as junk food which has minimal or even contains little calcium, iron, folic acid, vitamins A and C, but high saturated fat and cholesterol. Consumption of high-fat foods can increase prostaglandin hormone which is the cause of lower abdominal cramps or dysmenorrhoea (French, 2005). This causes vascular disorders in the reproductive organs that trigger excessive contractions and dysmenorrhea (Widjanarko, 2012).

The results of this study were also in accordance with Harmoni (2018) which stated that BMI and physical activity were significantly related to dysmenorrhoea. Just like a study in Japan by Nohara et al (2011) which concluded that there was a correlation between BMI and dysmenorrhea, in this study, abnormal BMI were not only overweight and obesity but underweight could also cause the incidence of dysmenorrhoea. The Madhubala and Jyoti (2012) study also described similar results, which stated BMI correlated with cases of dysmenorrhea.

This study was in accordance with the research of Ju, Jones and Mishra (2015) which concluded that the risk of dysmenorrhea in obese adolescents were 22% higher. Similarly, the results of the Asia Pacific Cohort Study Collaboration (2007) study concluded that there was an increase in pandemic obesity by 20-40% with increasing years. Riskesdas (2010) stated the prevalence of obesity in adults was 11.7% while overweight was 10%.

Androgen hormone has a close relationship as a cause of primary dysmonorrhea according to Withney, Rolfes (2011). Overweight causes primary dysmenorrhea due to increased inflammatory

mediators namely prostaglandin F2α. This hormone results in hypertonus in the myometrium which creates dysrhythmic uterine contractions, resulting in primary dysmenorrhea (Ju et all, 2015).

In individuals who have an obese situation, there are many adipose and adipocyte tissues, adipocytes and adipose tissues produce proinflammatory substances, one of them is prostaglandin F2α which is a powerful mediator in the form of vasoconstrictors, so that if there is an increase in the number of prostaglandins can cause constriction of blood vessels so that blood flow to the uterine muscle decreases and results in primary dimenorrhea (Errol, 2012).

Silalahi et al (2017) stated in their study that there was a relationship between nutritional status and the incidence of dysmenorrhea in young women. The results of this study were also consistent with Sartika's (2013) study which concluded that there was a correlation between nutritional status with dysmenorrhea in adolescent girls. This study was strengthened by Beddu, Mukarramah and Lestahulu (2015) research on the relationship of nutritional status and dysmenorrhea was significant with a p-value=0.006. In the same year, a similar study conducted by Kasumayanti (2015) concluded that there was a relationship between nutritional status and dysmenorrhea.

4 CONCLUSIONS

There was a correlation between the Body Mass Index (BMI) on primary dysmenorrhea in students aged 16-23 years at the Medical Faculty of Hang Tuah University Surabaya. The effect of primary dysmenorrhea in overweight female students was 1.8 times higher than female students who had a normal Body Mass Index (BMI) with a value of p = 0.023 where p <0.05, which means H1 is accepted. Some suggestions we suggest include:

1. Efforts to pay more attention to risk factors for primary dysmenorrhea, such as an increase in body mass index (BMI) that exceeds normal.
2. For educational institutions, especially health education regarding primary dysmenorrhea is expected to be of special concern in order to prevent the occurrence of primary dysmenorrhea.
3. For further research, to do more research on primary dysmenorrhea and to add factors beyond this study, considering many factors that influence the incidence of primary dysmenorrhea.

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