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Masters Program in Public Health, Universitas Sebelas Maret

Meta-analysis

Meta Analysis: Relationships of Risk Factors of Physical Activity and Obesity with Premenstrual Syndrome

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ABSTRACT

Background: Premenstrual syndrome is actually experienced by almost all women wherever they are, but most teenagers think the symptoms they feel do not require further intervention or treatment. This study aims to analyze the relationship between physical activity and obesity with premenstrual syndrome based on the results of several previous similar primary studies.
Subjects and Method: This study was conducted using a meta-analysis study with PICO as follows: P= women aged 17-50 years, I= high physical activity and obesity, C= low physical activity and not obesity, O= premenstrual syndrome. Article searches were conducted using electronic databases, namely Pubmed, Google Scholar, Springer Link, Clinical Key, and Proquest. Article searches were conducted using keywords and the Mesh method as follows "physical activity and obesity and premenstrual syndrome", "physical activity and obesity and premenstrual syndrome and adjusted Odds Ratio", "physical activity and obesity and premenstrual syndrome and study cross sectional", " physical activity or obesity or premenstrual syndrome", "physical activity or obesity or premenstrual syndrome or adjusted odds ratio", "physical activity or obesity or premenstrual syndrome or study cross sectional". Articles were analyzed using the Review Manager 5.3 application.
Results There are 13 articles from the continents of Africa, Asia, South America, and Europe which include Japan, Palestine, Arabia, Iran, Lebanon, Egypt, Brazil, and Turkey from 2000-2022 which were analyzed using PRISMA flow diagrams. Research studies show that women who do a lot of physical activity have a risk of developing premenstrual syndrome as much as 0.80 times compared to women who do less physical activity (aOR= 0.80; 95% CI = 0.51 to 1.25; p<0.001); and obese women had 1.03 times the risk of developing premenstrual syndrome compared with non-obese women (aOR = 1.03; 95% CI = 0.95 to 1.11; p = 0.49).
Conclusion: Physical activity can reduce the risk of premenstrual syndrome and obesity can increase the risk of premenstrual syndrome.

Keywords: physical activity, obesity, premenstrual syndrome

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BACKGROUND

Based on the WHO (World Health Organization) report, premenstrual syndrome has a higher prevalence in Asian countries compared to Western countries (Mohamadirizi and Kordi, 2013). The results of the study of the American College of Obstetricians and Gynecologists (ACOG) in Sri Lanka in 2012 reported that premenstrual syndrome symptoms experienced around 65.7% of adolescent girls. Premenstrual syndrome prevalence in Asia Pacific, it is known that in

Japan experienced by 34% of the female population. In Hong Kong experienced by 17% of the female population. In Pakistan experienced by 13% of the female population. In Australia experienced by 44% (Sylvia, 2010).

Moghadam (2013) stated that from 17 studies conducted in several countries in the world, the combined prevalence of the incidence of premenstrual syndrome was 47.8%. The highest prevalence was reported to be from Iran at 98% and the lowest prevalence was reported to be from France at 12%.

The incidence of premenstrual syndrome in Indonesia, out of 260 women of childbearing age, found that 95% had at least one symptom of premenstrual syndrome, with a moderate to severe level of premenstrual syndrome of 3.9% (Emilia, 2008). Adelia (2019) showed the results of the incidence of premenstrual syndrome in Indonesia experienced by adolescents were divided into several based on the symptoms they felt, namely, 66.3% experienced mild premenstrual syndrome, 31.4% experienced moderate premenstrual syndrome, and 2.3% experienced severe premenstrual syndrome.

Based on the data above, it is known that premenstrual syndrome is actually experienced by almost all women wherever they are, but most teenagers think that the symptoms they feel do not require further intervention or management. In fact, this can affect their daily activities, starting from the disruption of social function, concentration, learning achievement and relationships with family.

Helmi's research in 2017 found that the heavier the degree of premenstrual syndrome felt, the worse the disorder would be (Helmi, 2017). In addition, premenstrual syndrome also has a significant relationship with the level of anxiety experienced by women (Bohari, 2017). In another study conducted by Setyani in 2018 it was found that the higher the severity of premenstrual syndrome, the lower the perceived learning motivation so that appropriate treatment is needed related to premenstrual syndrome (Setyani, 2018).

Premenstrual syndrome is often experienced by women due to several factors. The main factor causing premenstrual syndrome is due to an imbalance in the work of the hormones estrogen and progesterone and changes in serotonin levels (Saryono and Sejati, 2009). Several other factors that cause premenstrual syndrome are physical activity, nutritional status, sleep patterns, stress, smoking habits, drinking alcohol, and age (Hapsari, 2009). Based on the various reviews above, the authors are interested in knowing more about "Meta Analysis: The Relationship between Risk Factors of Physical Activity and Obesity to the Incidence of Premenstrual Syndrome".

SUBJECTS AND METHOD

1. Study Design

This study was designed using a systematic review and meta-analysis. Article searches were conducted using 5 electronic databases, namely: PubMed, Google Scholar, Springer Link, and Proquest, which were published in 2000-2022.

2. Inclusion criteria

The inclusion criteria included full paper articles with a cross sectional study design, articles published in 2000-2022, articles published in English, the relationship measure used was Adjusted Odds Ratio or Odds Ratio with research subjects being women, the intervention given was high physical activity and obesity and the research result is premenstrual syndrome.

3. Exclusion criteria

Exclusion criteria were articles published in languages other than English, types of experimental research, and articles published

before 2000-2022.

4. Study Variables

The independent variable is physical activity and obesity, the dependent variable is premenstrual syndrome.

5. Operational Definition of Variables

The formulation of the research problem was carried out using the PICO as follows: P (population) = women aged 17-50 years, I (intervention) = physical activity and obesity, C (comparison) = low physical activity and not obesity, O (outcome) = premenstrual syndrome.

Physical activity is any activity or activity that causes an increase in energy by the body beyond resting energy. Physical activity is also called external activity, which is something that uses energy or energy to carry out various physical activities.

Obesity is an excessive accumulation of fat due to an imbalance in energy intake with energy used for a long time.

Premenstrual Syndrome is a collection of physical, psychological, and emotional symptoms experienced by women 7-14 days before menstruation due to hormonal changes associated with the ovulation cycle.

6. Study Instruments

This research was conducted using a critical appraisal checklist of a cross-sectional study (Survey) sourced from CEBMa to assess articles obtained through the database.

7. Data analysis

Data analysis was performed using Review Manager (RevMan) 5.3 software released by the Cochrane Collaboration. RevMan serves to calculate the overall OR value by describing the 95% Confidence Interval (CI) using the effects model and also the heterogeneity of the data.

RESULTS

Research on the relationship between physical activity and obesity with premenstrual syndrome consists of 13 articles from the continents of Africa, Asia, South America, and Europe which include Japan, Palestine, Arabia, Iran, Lebanon, Egypt, Brazil, and Turkey. The article review process can be seen in the search flow using the PRISMA flow diagram.

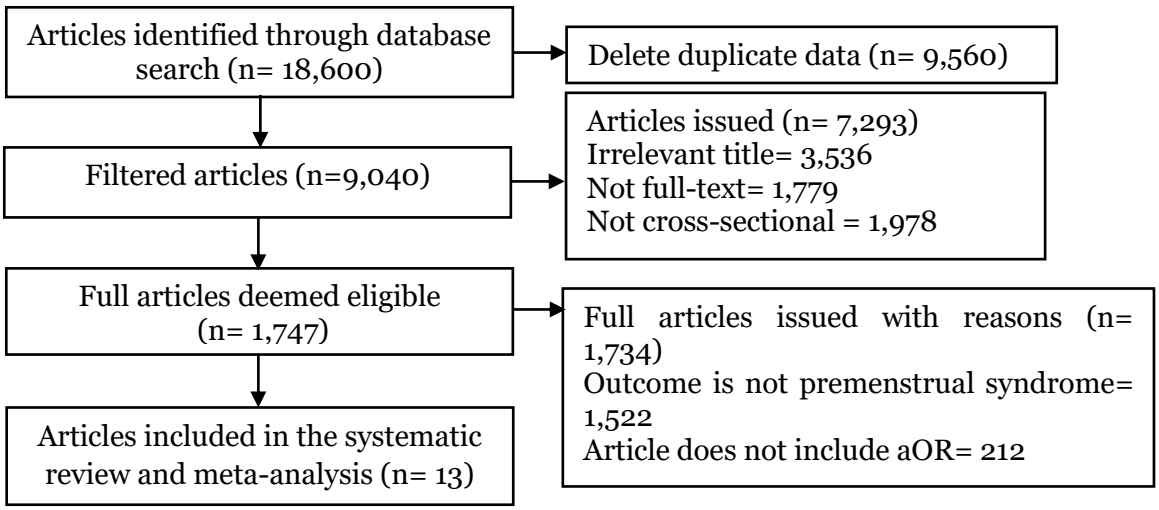

Figure 1. PRISMA flow diagram

Table 1. Description of the primary study of physical activity on premenstrual syndrome included in the meta-analysis study

Author (year)	Country	Study Design	Sample Size		P (Population)	I (Intervention)	C (Comparison)	O (Outcome)	aOR (95% CI)
			Total	Physical Activity					
Altamimi et al. (2021)	Arab	Cross sectional	420	81	18-30 year old student	Age, physical activity, income, education level, BMI	Low physical activity	Premenstrual syndrome	1.62 (0.82 to 3.20)
Alwafa et al. (2021)	Palestine	Cross sectional	380	14	Univ. National AnNajah who has been confirmed not to be pregnant	Physical activity, history of drug consumption, psychosocial status	Low physical activity	Premenstrual syndrome	0.17 (0.09 to 0.33)
Amjadian et al. (2016)	Iran	Cross sectional	255	30	High school students aged 15 – 18 years	Physical activity, mother's education, family income	Low physical activity	Premenstrual syndrome	0.45 (0.40 to 0.51)
Hashim et al. (2019)	Arab	Cross sectional	300	66	18-24 years old student	BMI (obesity), physical activity, smoking	Low physical activity	Premenstrual syndrome	0.99 (0.53 to 1.84)
Morino et al. (2016)	Japan	Cross sectional	349	116	Women aged 18 – 50 years	Physical activity, BMI, bedtime, caffeine consumption, alcohol, smoking	Low physical activity	Premenstrual syndrome	2.13 (1.01 to 4.49)
Rezende et al. (2022)	Brazil	Cross sectional	1,115	680	Student age >18 years old	Nutritional activity, obesity, depression, hyperthyroidism, economic status, alcohol, smoking, family planning	Low physical activity	Premenstrual syndrome	1.92 (0. 93 to 1.93)
Sahin et al. (2012)	Turket	Cross sectional	1,008	159	Student age >18 years old	Physical activity, family history, coffee consumption, salty food, junk food, place of residence,	Low physical activity	Premenstrual syndrome	1.71 (1.28 to 2.29)
Seedhom et al. (2013)	Egypt	Cross sectional	253	65	18-25 years old student	Physical activity, consumption of sweet, salty, coffee, fast food, obesity	Low physical activity	Premenstrual syndrome	0.42 (0.30 to 0.59)

Table 2. Description of the primary study of obesity on premenstrual syndrome included in the meta-analysis study

Author (year)	Country	Study Design	Sample Size		P (Population)	I (Intervention)	C (Comparison)	O (Outcome)	aOR (95% CI)
			Total	Obesity (%)					
Badrasawi et al. (2021)	Palestine	Cross sectional	289	32	18-25 years old student	Sociodemography, lifestyle, BMI (obesity)	Not obese	Premenstrual syndrome	1.06 (0.98 to 1.15)
Costanian et al. (2018)	Lebanese	Cross sectional	1321	104	Student age 17 – 29 years	Age, BMI (obesity), family income, education level, caffeine consumption, drugs/kb	Not obese	Premenstrual syndrome	1.92 (1.20 to 3.07)
Hashim et al. (2019)	Arab	Cross sectional	300		18-24 years old student	BMI (obesity), physical activity, smoking	Not obese	Premenstrual syndrome	0.99 (0.89 to 1.09)
Daniartama et al. (2021)	Indonesia	Cross sectional	77	20	Mahasiswi usia 18 – 25 tahun	Obesity, percent body fat, waist circumference	Not obese	Premenstrual syndrome	3.94 (1.09 to 14.26)
Rezende et al. (2022)	Brazil	Cross sectional	1,115	36	Student age >18 years old	Obesity (obesity), physical inactivity, depression, economic status, hyperthyroidism, alcohol, smoking, birth control	Not obese	Premenstrual syndrome	1.09 (0.78 to 1.520
Seedhom et al. (2013)	Egypt	Cross sectional	253	22	18-25 years old student	Physical activity, obesity (obesity), consumption of sweet, salty, coffee, fast food	Not obese	Premenstrual syndrome	0.94 (0.84 to 1.05)
Taheri et al. (2020)	Iran	Cross sectional	217	41	Women aged 18 – 45 years	Obesity (obesity), economic status, consumption of carbohydrates, fats, proteins	Not obese	Premenstrual syndrome	1.86 (0.64 to 5.41)
Takeda et al. (2020)	Japan	Cross sectional	879	19.6%	15-17 years old student	Obesity (obesity), age of menarche, insomnia	Not obese	Premenstrual syndrome	1.00 (0.96 to 1.04)

Table 3. Critical Appraisal of Physical Activity Checklist for Premenstrual Syndrome

No	Questions	Author and Year							
		Altamimi et al. (2021)	Alwafa et al. (2021)	Amjadian et al. (201[illegible])	Hashim et al. [illegible])	Morino et al. (2016)	Rezende et al. (2022)	Sahin et al. (2012)	Seedhom et al. (2013)
1	Do these objectives clearly address the focus of the research problem?	2	2	2		2	2	2	2
2	Are cross-sectional research methods suitable to answer the research question?	2	2	2	2	2	2	2	2
3	Is the research subject selection method clearly written?	2	2	2	2	2	2	2	2
4	Does the sampling method not introduce bias (selection)?	2	2	2	2	2	2	2	2
5	Does the research sample taken represent the designated population?	2	2	2	2	2	2	2	2
6	Was the sample size based on pre-study considerations?	2	2	2	2	2	2	2	2
7	Was a satisfactory response achieved?	2	2	2	2	2	2	2	2
8	Are the research instruments valid and reliable?	2	2	2	2	2	2	2	2
9	Was statistical significance assessed?	2	2	2	2	2	2	2	2
10	Was a confidence interval given for the main outcome?	2	2	2	2	2	2	2	2
11	Has the author identified all the confounding factors?	2	2	2	2	2	2	2	2
12	Are the results applicable to your research?	2	2	2	2	2	2	2	2
	Total	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**24**

Answer 2=Yes; 1=Hesitant; 0=No

Table 4. Critical Appraisal Obesity Checklist for Premenstrual Syndrome

No	Questions	Author and Year							
		Badrasawi et al. (2021)	Costanian et al. (2018)	Hashim et al. (2019)	Eldeeb et al. (2020)	Rezende et al. (2022)	Seedhom et al. (2013)	Taheri et al. (2020)	Takeda et al. (2020)
1	Do these objectives clearly address the focus of the research problem?	2	2	2	2	2	2	2	2
2	Are cross-sectional research methods suitable to answer the research question?	2	2	2	2	2	2	2	2
3	Is the research subject selection method clearly written?	2	2	2	2	2	2	2	2
4	Does the sampling method not introduce bias (selection)?	2	2	2	2	2	2	2	2
5	Does the research sample taken represent the designated population?	2	2	2	2	2	2	2	2
6	Was the sample size based on pre-study considerations?	2	2	2	2	2	2	2	2
7	Was a satisfactory response achieved?	2	2	2	2	2	2	2	2
8	Are the research instruments valid and reliable?	2	2	2	2	2	2	2	2
9	Was statistical significance assessed?	2	2	2	2	2	2	2	2
10	Was a confidence interval given for the main outcome?	2	2	2	2	2	2	2	2
11	Has the author identified all the confounding factors?	2	2	2	2	2	2	2	2
12	Are the results applicable to your research?	2	2	2	2	2	2	2	2
	Total	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**24**

Answer 2=Yes; 1=Hesitant; 0=No

Figure 2. Map of study

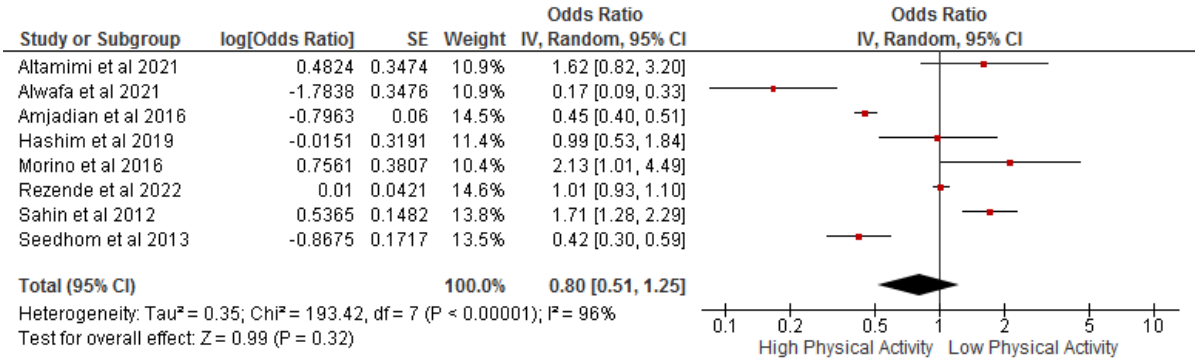

Figure 3. Forest plot of the effect of physical activity on premenstrual syndrome

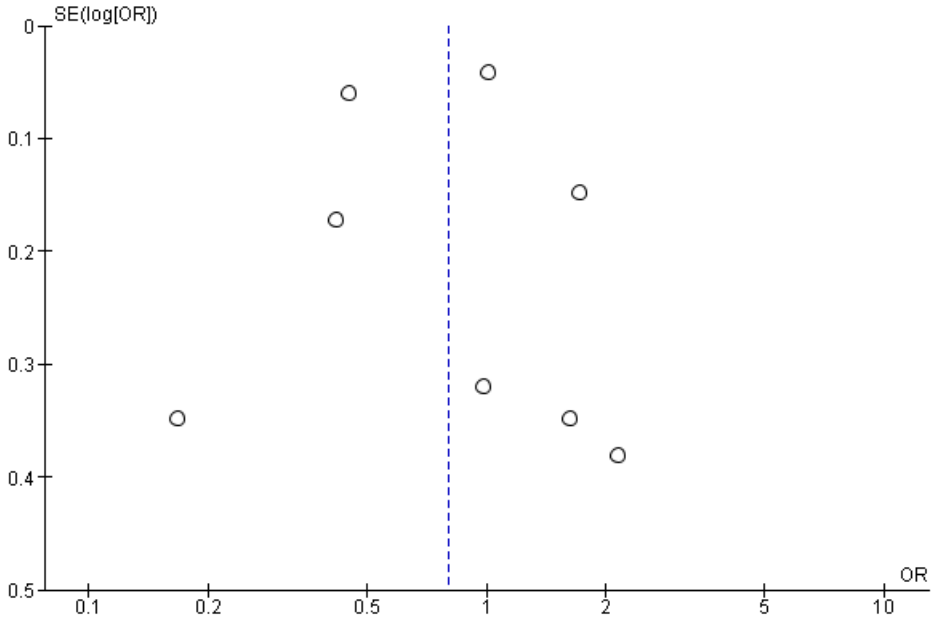

Figure 4. Funnel plot of the effect of physical activity on premenstrual syndrome

1. Physical activity

a. Forest plot

The forest plot in Figure 3 shows that there is an effect of physical activity on the incidence of premenstrual syndrome in women. Women who did a lot of physical activity had a risk of developing premenstrual syndrome as much as 0.80 times compared to women who did less physical activity (aOR= 0.80; 95% CI= 0.51 to 1.25; p<0.001), and the results were statistically significant. The inter-study effect estimates in this meta-analysis showed high heterogeneity (I^2= 96%). Thus, the calculation of the average effect estimate in this meta-analysis is carried out using a random effects model approach.

b. Funnel plot

The funnel plot in Figure 4. shows an asymmetric distribution of the estimated effects, there are 5 plots on the right and 3 plots on the left of the average vertical line of effect estimates. Thus this funnel plot indicates publication bias.

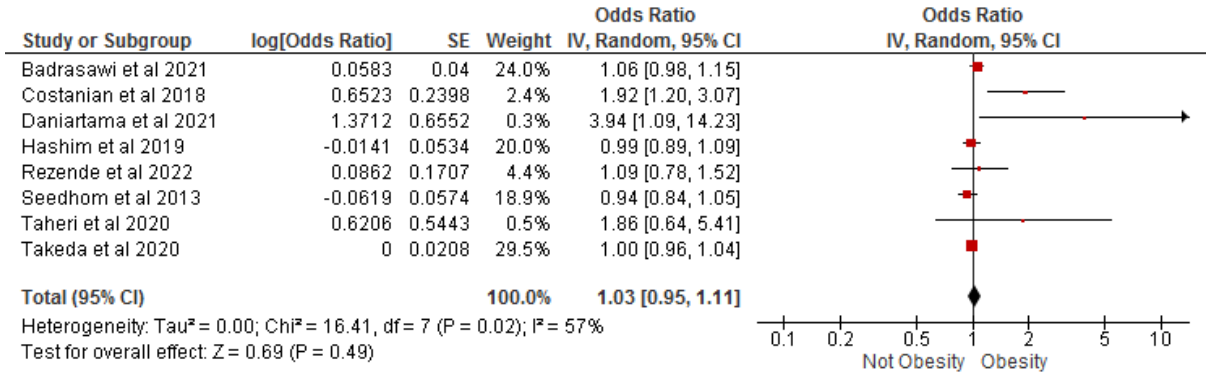

Figure 5. Forest plot of the effect of obesity on premenstrual syndrome

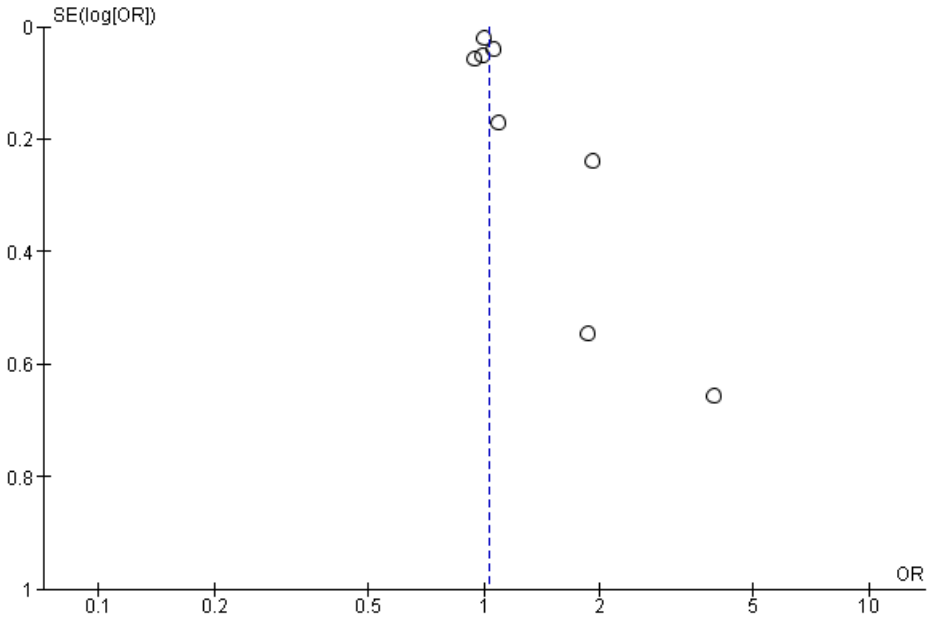

Figure 6. Funnel plot of the effect of obesity on premenstrual syndrome

2. Obesity

a. Forest plot

The forest plot in Figure 5. shows the effect of obesity on the incidence of premenstrual syndrome in women. Obese women had a risk of developing premenstrual syndrome as much as 1.03 times compared with women who lacked physical activity (aOR= 1.03; CI 95%= 0.95 hingga 1.11; p= 0.02), and the results were not statistically significant. The inter-study effect estimates in this meta-analysis showed high heterogeneity (I^2= 61%). Thus, the calculation of the average effect estimate in this meta-analysis is carried out using a random effects model approach.

b. Funnel plot

The funnel plot in Figure 6 shows an asymmetric distribution of the estimated effects. There are 5 plots on the right, 1 plot on the left line, and 2 plots on the average vertical line of the estimated effect. Thus this funnel plot indicates publication bias.

DISCUSSION

This systematic study and meta-analysis raised the theme of the relationship between physical activity and obesity on the incidence of premenstrual syndrome. This study discusses data on physical activity and obesity. The number of relevant research published and accessible is still small and also has data access problems (data duplication) (Murti, 2018).

Confounding factors affect the relationship or effect of exposure to the occurrence of the disease estimated (estimated) by the study not the same as the relationship or effect that actually occurs in the target population (target population), the study results are invalid (incorrect) (Murti, 2018). This systematic review and meta-analysis research uses research that controls confounding factors which can be seen from the inclusion requirements of the study, namely using multivariate analysis and the statistical results reported are adjusted odd ratio (aOR).

The combined estimate of the association of each risk factor with the incidence of premenstrual syndrome was processed using the RevMan 5.3 application using the generic inverse-variance method. This method is used to analyze data in the form of rate, time to event (time-to-event), hazard ratio, ordinal scale, adjusted estimate, average difference (difference of mean) or average ratio (ratio of mean).

The results of the systematic study and meta-analysis are presented in the form of forest plots and funnel plots. The forest plot shows an overview of information from each of the studies examined in the meta-analysis, and estimates of the overall results (Murti, 2018). Forest plots show visually the magnitude of variation (heterogeneity) between study results (Akobeng in Murti, 2018).

A funnel plot is a diagram in a meta-analysis that is used to demonstrate possible publication bias. The funnel plot shows the relationship between the effect size of the study and the sample size or standard error of the effect size of the various studies studied (Murti, 2018). The funnel plot shows the relationship between the study effect size and the sample size of the various studies studied, which can be measured in different ways (Murti, 2018).

1. Physical Activity

The forest plot results show that women who do a lot of physical activity can reduce the incidence of premenstrual syndrome by 0.78 times compared to women who do less physical activity.

Research conducted by Morino et al. (2016) stated that moderate physical activity has the effect of increasing some of the symptoms of premenstrual syndrome, including mood disorders, fatigue, cognitive

dysfunction, and bloating which are usually experienced by women suffering from premenstrual syndrome. In addition, repeated contractions in aerobic exercise help return venous blood and help prevent or reduce back pain and discomfort in the pelvis and abdomen, a symptom of premenstrual syndrome, by lowering local concentrations of prostaglandins and inflammatory substances. The lack of this effect in women with low physical activity may explain the increased prevalence of premenstrual syndrome in women with low levels of physical activity compared to those with regular physical activity.

This study is in line with the research of Putri et al. (2020) which states that 19 (57.6%) respondents routinely do physical activity and experience mild premenstrual syndrome. Meanwhile, there were 36 (67.9%) respondents who did not do physical activity regularly and had severe premenstrual syndrome.

The incidence of premenstrual syndrome will increase with lack of physical activity during menstruation and lack of exercise, this can cause blood circulation and oxygen to decrease. The impact on the uterus is reduced blood flow and oxygen circulation and causes pain. This is because when doing sports the body will produce endorphins. Endorphin hormones produced in the brain and spinal cord function as a natural sedative produced by the brain so that it can cause a sense of comfort.

2. Obesity

The results of the forest plot show that obese women increase the incidence of premenstrual syndrome by 1.01 times compared to non-obese women. This study is in line with the study of Taheri et al (2020) which highlighted the importance of the problem that dysmenorrhea, abnormal bleeding, irregular menstruation, and premenstrual syndrome were significantly exacerbated by obesity (BMI > 30). Excessive calorie intake can affect menstrual disorders. It is known that women who experience irregular menstrual cycles are overweight or obese.

Being overweight can cause premenstrual syndrome, because in the body of people who are overweight there is excessive fat tissue which can lead to hyperplasia of blood vessels (pushing blood vessels by fatty tissue) in the female reproductive organs so that the blood that should flow during the menstrual process is disrupted. and dysmenorrhea occurs (Widjanarko 2006).

AUTHORS CONTRIBUTION

Erza Husna as the main character of the research actor who chooses the topic, conducts searches and collects data. Bhisma Murti and Rita Benya Adriani were instrumental in leading data analysis and reviewing document research.

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This study is self-funded.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

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