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META-ANALYSIS OF THE INFLUENCE OF OBESITY ON THE INCIDENT OF PREECLAMPSIA IN PREGNANT WOMEN

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ABSTRACT

Preeclampsia is the onset of high blood pressure accompanied by proteinuria and edema in pregnancy after 20 weeks of gestation or after the postpartum period. Obesity has been widely studied as a risk factor for preeclampsia. This study aims to estimate and analyze the impact of obesity on the incidence of preeclampsia in pregnant women.This research is a systematic review and meta-analysis research using the PRISMA diagram and using 4 articles from 2015 to 2020. Article searches were carried out based on the PICO Model eligibility criteria. P= Pregnant women; I=Obesity; C= Not obese; O= Preeclampsia. The articles used come from 1 database, namely: Google Scholar. With keywords including "Obesity" AND "Preeclampsia" AND "Pregnant Women" AND "Cross Sectional".Articles were analyzed using the PRISMA diagram and the Review Manager 5.3 application. 4 articles with a cross-sectional study design will be used as a source for meta-analysis influence of obesity on the incidence of preeclampsia in pregnant women. Shows that obesity increases the possibility of preeclampsia in pregnant women. Obese pregnant women have an increased risk of preeclampsia by 2.04 times compared to non-obese pregnant women (aOR= 2.04; 95% CI= 1.90 to 2.19; p=0.001), and the results are statistically significant. Meta-analysis of 4 cross-sectional studies concluded that obesity in pregnant women increases the occurrence of preeclampsia.

Keywords: obesity; pregnant women; preeclampsia

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INTRODUCTION

Preeclampsia is a symptom that occurs in women during pregnancy, childbirth and postpartum, consisting of hypertension, edema and proteinuria that occurs from the 20th week of pregnancy until the end of the first week after giving birth.(Basyiar et al., 2021). Preeclampsia is a serious and very complex problem. The magnitude of this problem is that preeclampsia not only affects mothers during pregnancy and childbirth but also causes postnatal problems due to endothelial dysfunction in various organs (Trisnawati, 2018). Risk of cardiovascular disease and other complications. The World Health Organization (WHO) estimates that cases of preeclampsia occur seven times more often in developing countries than in developed countries(Kurniasari & Arifandini, 2019). Preeclampsia is the onset of high blood pressure accompanied by proteinuria and edema in pregnancy after 20 weeks of gestation or after the postpartum period. The cause of preeclampsia is currently unknown (Ekasari et al., 2019). The Maternal Mortality Rate (MMR) is and is an indicator of women's health status. MMR is one of the targets set in the Millennium Development Goals, namely Goal 5 "Improve maternal health", and the target to be achieved in 2015 is to reduce the risk of maternal death by three quarters. There are two categories of maternal deaths, namely

deaths due to direct obstetric causes, namely deaths caused directly by pregnancy or childbirth, and deaths due to indirect causes, namely deaths not caused by pregnancy or childbirth, deaths of pregnant women caused by disease (Nursal et al., 2017).

Obesity is currently attracting a lot of attention along with the increasing number of obese sufferers, including women of childbearing age. The number of pregnant women suffering from obesity also increased by around 18.5% to 38.3% (Gustri et al., 2016). In 2015, the World Health Organization (WHO) estimated that around 585,000 mothers died each year during pregnancy or childbirth, and 51.1% of these deaths occurred due to increased blood pressure in pregnant women, which is one of the problems faced by mothers. pregnant all over the world (Isnaniar et al., 2019). Gestational obesity is the weight gain of pregnant women that exceeds the normal weight of 12 to 16 kg, which has a very negative impact on the health of pregnant women and can cause high blood pressure, hypercholesterolemia, and high blood sugar (Wahyuni et al., 2019). Pregnant women who are obese require more care than pregnant women with normal weight(Harun, 2018). Obesity increases the risk of high blood pressure in pregnancy, abortion, large baby size, slow labor, shoulder dystocia, and cesarean section (Harun, 2018).

Obesity has been widely studied as a risk factor for preeclampsia. Obesity causes preeclampsia through various mechanisms, namely overlapping triggers of metabolites and other small molecules(Rezeki et al., 2022). The risk of preeclampsia doubles for every 5-7 kg/m2 increase in body weight(Niti, 2018). Additionally, increasing BMI has been shown to increase the risk of preeclampsia. Women with a pre-pregnancy BMI of more than 35 have a four times greater risk of developing preeclampsia than women with a BMI of 19 to 27(Purwanti et al., 2021). Based on the background above and the results of several previous similar studies regarding the influence of obesity on the incidence of preeclampsia in pregnant women. Therefore, researchers are interested in conducting research using systematic reviews and meta-analyses. Meta-analysis uses systematic searches to summarize various results from primary or previous studies, allowing results to be combined to obtain more accurate estimates and draw new conclusions. This study aims to estimate and analyze the impact of obesity on the incidence of preeclampsia in pregnant women.

METHOD

This research is a systematic analysis and meta-analysis using the PRISMA diagram. The success criteria for the PICO Model are as follows: P is pregnant women, I is obese, C is not obese, and O is preeclampsia. The data used is Google Scholar. With key words such as "Obesity", "Preeclampsia", "Pregnant Women", and "Cross Sectional".

Articles were analyzed using the PRISMA diagram and the Review Manager 5.3 application.

Meta analysis is carried out in the following 5 steps:

1) Formulate PICO format research questions (Population, Intervention, Comparison, and Outcome).
2) Search for primary study articles from various electronic and non-electronic databases such as Google Scholar.
3) Carrying out screening determines inclusion and exclusion criteria and carries out critical assessments.
4) Extract primary study results data and synthesize effect estimates using the Revman application.
5) Interpret the results and draw conclusions.

RESULTS

Search for articles in this research through databases including Google Scholar. With keywords including: "Obesity" AND "Preeclampsia" AND "Pregnant Women" AND "Cross Sectional". The review process for related articles can be seen in the PRISMA flow diagram in Figure 1. Research related to the influence of obesity on the incidence of preeclampsia in pregnant women consists of 4 articles from 2015 to 2020. The initial search process yielded 765 articles, after the process of deleting published articles 165 articles were obtained, 100 of which met the requirements for further full text review, 4 articles that met the quality assessment were included in quantitative synthesis using meta analysis. It can be seen in Figure 2 that the research articles come from 4 articles from the Asian continent (Indonesia),

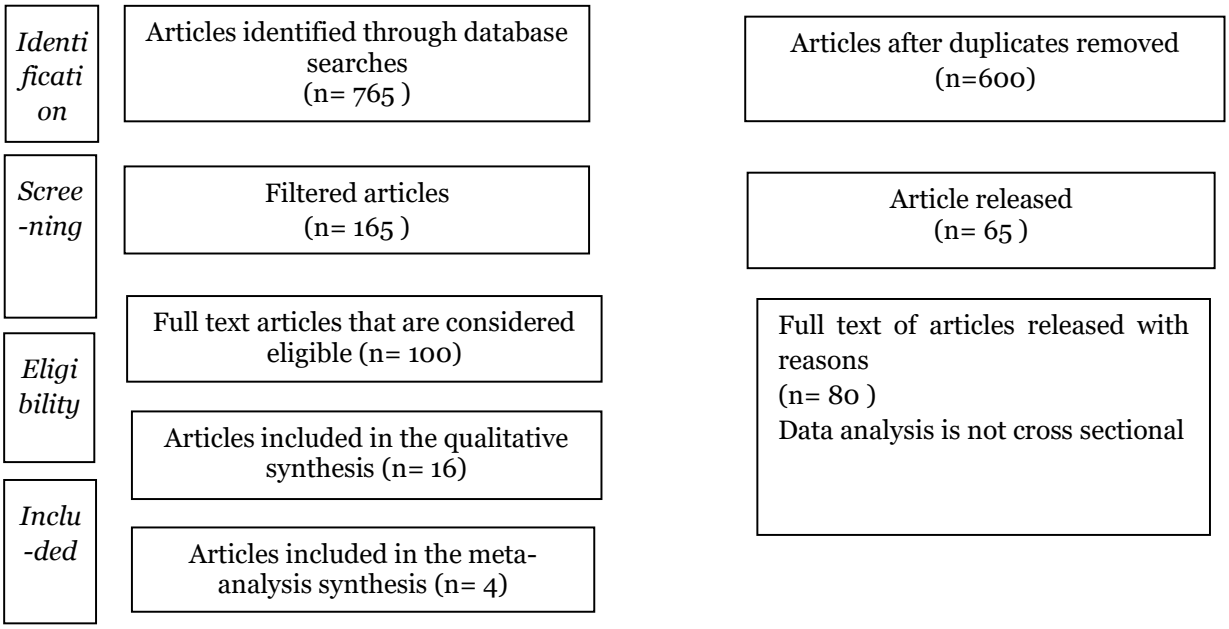

Figure 1. PRISMA Flow Diagram

Figure 2. Regional map

Table 1.
Results of quality assessment of case-control studies

Author (Year)	Question Criteria							Total
	1	2	3	4	5	6	7	
Nursal at al 2015	7	4	4	4	4	4	2	29
Ekasari et al 2019	8	4	4	4	4	4	2	30
Gustri et al 2016	7	4	4	4	4	4	2	29
Wulandara et al 2020	7	4	4	4	4	4	2	29

Answer score Description:

1. If there is a conflict of interest, give a value of "0"
2. If there is no conflict of interest, give a value of "2"
3. If in doubt, rate "1".

Description of question criteria:

1. Formulation of research questions in the acronym PICO
   a. Is the population in the primary study the same as the population in the PICO meta-analysis?
   b. Is the operational definition of exposure/intervention in the primary study the same as the definition intended in the meta-analysis?
   c. Is the comparison used in the primary study the same as that planned in the meta-analysis?
   d. Are the outcome variables examined in the primary study the same as those planned in the meta-analysis?
2. Methods for Selecting Research Subjects
   a. Descriptive cross-sectional study (prevalence): Was the sample randomly selected?
   b. Analytical cross-sectional studies: Was the sample selected randomly or purposively?
3. Methods for measuring comparison (intervention) and outcome variables (outcome)
   a. Are the exposure/intervention and outcome variables measured with the same instruments (measuring tools) in all primary studies?
   b. If the variable is measured on a categorical scale, are the cutoffs or categories used the same across primary studies?
4. Design-related bias
   a. What is the Response Rate?
   b. Is non-response related to outcome?
5. Methods for controlling confusion
   a. Is there any ambiguity in the results/conclusions of primary studies?
   b. Have primary study researchers used appropriate methods to control the influence of confounding?
6. Statistical analysis methods
   a. In cross-sectional studies, is a multivariate analysis performed? Multivariate analysis includes multiple linear regression analysis, multiple logistic regression analysis, and Cox regression analysis.
   b. Whether the primary study reports effect sizes or associations resulting from multivariate analysis (e.g., adjusted OR, adjusted regression coefficient)
7. **7.** Conflict of interest

   Is there a conflict of interest with the research sponsor?

After assessing the quality of the research, four articles with a cross-sectional study approach were collected, which will be used as a source for meta-analysis of the effect of obesity on the incidence of preeclampsia in pregnant women. Next, the articles were extracted and summarized according to the research PICO.

Table 2.
Description of primary studies

Author (Year)	Country	Sample	P	I	C	O
(Nursal et al., 2017)	Indonesia	34	Pregnant mother	Obesity	Not obese	Preeclampsia
(Ekasari et al., 2019)	Indonesia	134	Pregnant mother	Obesity	Not obese	Preeclampsia
(Gustri et al., 2016)	Indonesia	170	Pregnant mother	Obesity	Not obese	Preeclampsia
(Wulandara & Patimah, 2020)	Indonesia	140	Pregnant mother	Obesity	Not obese	Preeclampsia

Table 2, an overview of primary research on the influence of obesity on the incidence of preeclampsia in pregnant women was carried out through a meta-analysis of four articles originating from Indonesia. It was identified that this study had similarities because it was designed as a cross-sectional study, the subjects were pregnant women, and the intervention was given to obese or non-obese. The number of samples in this study is also different; the smallest sample numbered 34, the largest sample numbered 170, and the total was 478.

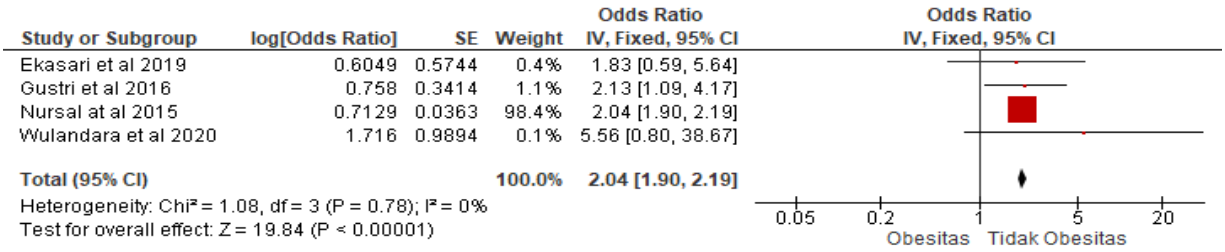

Figure 3. Forest plot

Fores plot Figure 3. showed that obesity increases the likelihood of preeclampsia in pregnant women. Obese pregnant women have an increased risk of 2.04 times greater than non-obese pregnant women (aOR=2.04; 95% CI=1.90–2.19; p=0.001), and the results are statistically significant.

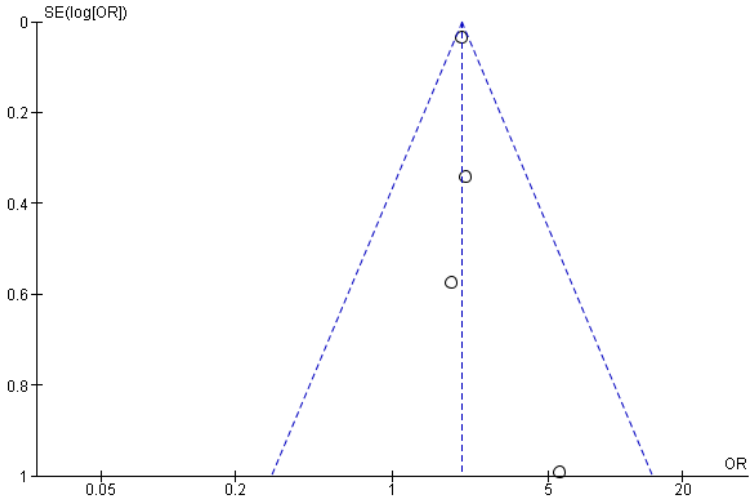

Figure 4. Funnel plot

Funnel plots Figure 4. shows the unequal distribution of effect estimates between studies to the right and left of the vertical line of mean estimates. The image above shows publication bias. Plot 1 on the left side has a standard error between 0 and 0.6, while plot 1 on the right side has a standard error between 0 and 0.1, and both are on the vertical line 2.

DISCUSSION

The influence of obesity on the incidence of preeclampsia in pregnant women

Preeclampsia is a common condition that occurs in pregnancy and can endanger the condition of the mother and fetus(Susanti & Maisaroh, 2023). Many factors are known to influence the development of preeclampsia, including obesity in pregnant women. If your weight increases by 5-7 kg/m2, your risk of developing preeclampsia doubles(Ziarno et al., 2020). Preeclampsia is a condition that can be inherited genetically. This genetic predisposition is

likely the result of the interaction of hundreds of genes inherited from both the mother and father and controlled by many enzymes and metabolic functions throughout the organ system (Manafe et al., 2018). This factor has been proven by several researchers that severe preeclampsia is a disease that is more likely to occur in offspring (daughters or sisters) (Husaidah et al., 2022). This disease occurs more often in daughters of mothers who suffer from preeclampsia or in daughters who have a family history of preeclampsia or eclampsia.(Dumais et al., 2016).

People who are obese work harder to burn excess calories in their bodies. To burn these calories requires sufficient oxygen in the blood (Ekasari et al., 2019). The more calories you burn, the more oxygen there is in your blood. A large blood supply makes the heart work harder, and overweight people tend to have higher blood pressure (Wahyuni et al., 2019). Obesity is caused by a long-term energy imbalance. Energy consumption is smaller than the amount of energy used. Excess energy intake, or a combination of these two factors, shifts the energy balance in a positive direction (Isworo, 2012). Overweight and obesity are not only caused by nutritional deficiencies. The difference in calories in and calories out can be caused by various factors (Isnaniar et al., 2019). These factors include genetic, metabolic, behavioral, and environmental factors (Husaidah et al., 2022).

Obesity and the incidence of preeclampsia in pregnant women. Based on the results of the discussion, there is a relationship between obesity and the incidence of preeclampsia, and pregnant women who are overweight have twice the risk of experiencing preeclampsia (Susanti & Maisaroh, 2023). Pregnant women must pay attention to regular ANC visits, obtain information from health services to minimize the adverse effects of disease and complications during pregnancy and adjust their diet to maintain pregnancy weight (Mutiara et al., 2018). Obesity is caused by many genetic factors, metabolic disorders, and excessive food intake (Dwi Agustin et al., 2020). The heavier a person is, the more blood there is in the body, making it more difficult for the heart to pump. therefore, it may contribute to the development of preeclampsia (Arnani et al., 2022).

Obesity and diet are associated with the incidence of preeclampsia. On the other hand, there was no significant relationship between reported ANC visits and the incidence of preeclampsia. The results showed a significant relationship between obesity (P value = 0.003), eating habits (P value = 0.009), and pre-jaundice syndrome. Apart from that, there was no significant relationship between the level of ANC consultation and the preeclampsia PV score = 1.000 (Wulandari et al., 2022).

CONCLUSION

This meta-analysis research was conducted using 4 articles originating from Indonesia. All of the research was carried out with a cross sectional design. The total sample was 478 pregnant women. *Fores plot*shows that obesity increases the possibility of preeclampsia in pregnant women. Obese pregnant women have an increased risk of preeclampsia by 2.04 times compared to non-obese pregnant women (aOR= 2.04; 95% CI= 1.90 to 2.19; p=0.001), and the results are statistically significant.*Forest plots*It also shows high homogeneity of effect estimates between studies (I2 = 0%; p = 0.001). The funnel plot shows that there is publication bias which tends to exaggerate the true effect (overestimate).

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