

THE EFFECT OF OBESITY ON INCIDENCE OF PREECLAMPSIA ON PREGNANCY: A Systematic Literature Review

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Abstract

Preeclampsia is a complication that is very dangerous and can influence 2-8% of pregnancy. Globally, more than 287,000 women die every year due to complications in pregnancy. 10-15% of them are caused by preeclampsia. Preeclampsia remains a significant problem in threatening health in developed and developing countries. However, the impact of preeclampsia is more severe in developing countries, where treatment may be ineffective because of the delay of treatment. Obesity is the most common problem in midwifery that affects maternal and child health since it may cause short-term and long-term problems for mothers, such as increasing the risk of gestational diabetes and preeclampsia. The purpose of this systematic literature review is to conclude and explore the literature related to obesity and the incidence of preeclampsia in pregnant women. Systematic literature review utilized Pubmed, Proquest and Ebsco databases from 2008 to 2018. From the 1646 initial articles identified, this study analyzed 7 articles that fulfilled the criteria. The study found that the factors affecting the occurrence of eclampsia were maternal age, primiparas, maternal obesity, history of preeclampsia, and maternal education. It was found that the high BMI of a mother before pregnancy (Pre-pregnancy) is a risk factor for the occurrence of preeclampsia. Besides, overweight and obese during pregnancy can cause preeclampsia, and these factors can also cause severe preeclampsia.

Keywords: obesity, preeclampsia, pregnancy

1. INTRODUCTION

Preeclampsia is a complication that is very dangerous and can affect 2-8% in pregnancy. Globally, more than 287,000 women die every year due to complications in pregnancy. Among them, 10-15% are caused by preeclampsia. Maternal mortality is most common in developing countries. Given the high maternal mortality rate in low-income countries caused by preeclampsia, the management of prevention of preeclampsia must be done optimally to reduce maternal mortality. It has remained a significant public health threat in both developed and developing countries and contributes to maternal and perinatal morbidity and mortality globally. [1][2]. Although the etiology of preeclampsia remains largely unclear, evidence suggests that several factors, including, but not limited to, age, body size and maternal diet play a role in the etiology of preeclampsia [3][4].

World Health Organization (WHO) estimates the incidence of preeclampsia to occur seven times higher in developing countries (2.8% of live births) than in developed countries (0.4%). Preeclampsia can increase the risk of maternal and fetal complications such as antepartum and postpartum bleeding, impaired kidney function, liver failure, and placental abruption. Preeclampsia remains a significant problem in threatening health in developed and developing countries. but the impact of preeclampsia is more severe in developing countries, where treatment may be ineffective because of the delay in treatment in this case. Although pre-eclampsia cannot be completely prevented, early detection and appropriate treatment can prevent the severity that occurs [2].

Preeclampsia is defined as the onset of hypertension at a minimum blood pressure of 140/90 mmHg which is measured on two different occasions, at least four hours after the previous

measurement and accompanied by proteinuria which occurs at more than 20 weeks' gestation. Preeclampsia is categorized as mild if blood pressure lower than 160/110 mmHg and preeclampsia is categorized as severe if blood. pressure exceeds 160/110 mmHg. Preeclampsia is defined as hypertension accompanied by proteinuria first detected after 20 weeks of gestation with or without generalized edema [1][5]. Preeclampsia is characterized by metabolic disturbances similar to those found in cardiovascular diseases and type diabetes mellitus (T2DM), including endothelial dysfunction, inflammation, oxidative stress, insulin resistance and dyslipidemia [3].

Obesity is the most common problem in midwifery that affects maternal and child health because it can cause short-term and long-term problems for the mother, such as increasing the risk of gestational diabetes and pre-eclampsia. this is because obese women are more likely to have excessive pregnancy weight, this increases the risk of developing metabolic syndrome later in life and can cause their offspring to experience an increased risk of obstetric morbidity and mortality [6]. Obesity at a young age was found to be a risk factor for preeclampsia while compliance with folate supplement and adequate fruit consumption were found to be protective against preeclampsia. Promoting a healthy lifestyle, including bodyweight control, consumption of fruits and vegetables, and folate supplementation should be promoted to reduce the risk of preeclampsia [5]. The aim of making Systematic quantitative literature review is to conclude and examine the literature relating to Obesity to the incidence of preeclampsia in pregnant women.

2. MATERIAL AND METHODS

The author filters 1646 literature from three databases namely Pubmed, Proquest, and Ebsqo for review. All selected articles use quantitative research methodologies. The preparation of the Systematic Literature Review is adapted to the steps of the Systematic Literature Review. The steps for preparing a systematic literature review are 1) identification of problems, 2) prioritizing problems and questions, 3) using the framework, 4) literature searching using databases, manual searching, and gray literature, 5) selecting papers based on inclusion and exclusion criteria, 6) perform critical appraisal, 7) extract data from the selected paper, 8) collect data and make maps to answer questions.

This review specifically aims to find out: what factors influence obesity in the incidence of preeclampsia in pregnant women? And how much influence does obesity have on the incidence of preeclampsia in pregnant women? .The framework used in this review is PICO (Population, Intervention, Comparison, and Outcomes).

Table.1

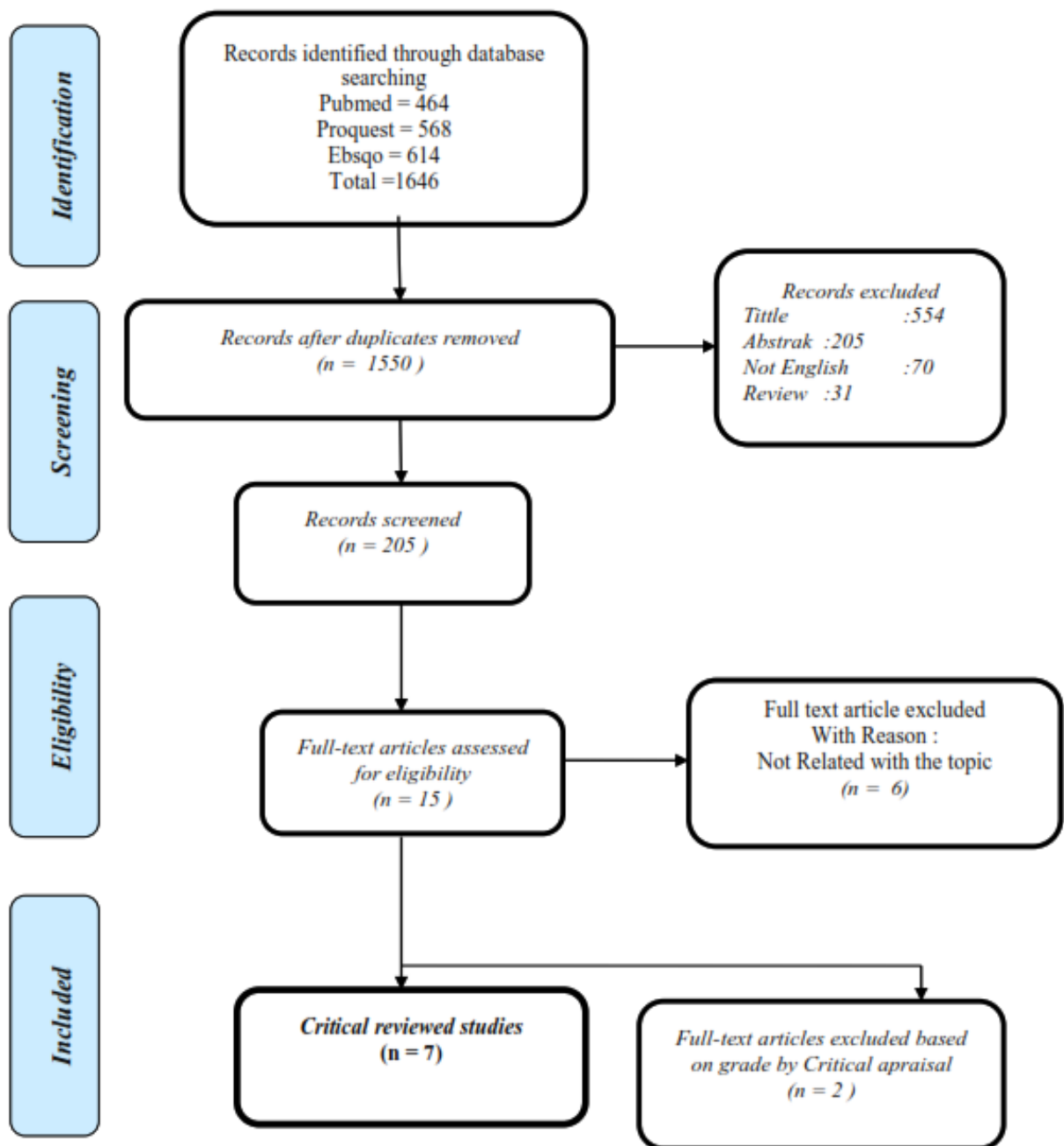
Element	Inclusion	Exclusion
Population	Pregnant Pregnancy	Species
Intervention	Obesity	
Comparison	Non obesity	
Outcomes	Preeclampsia	

Three steps in search strategy are used. The first step is to search on a limited scope on Google Scholar, which allows analyzing the words contained in the title and abstract. The search terms included are "Pregnancy", "Preeclampsia" and "Obesity". The second step is to use all the identified keywords. All these keywords have been searched in Pubmed, Proquest, and Ebsco. The third step is a list of references from all identified reports and articles traced for additional

studies. In search of 3 databases and reference lists, there were 1646 articles, after filtering for relevance, 15 articles were obtained. Then a further article was filtered to find the right and complete reference on the effect of obesity on the incidence of preeclampsia in pregnant women and found 7 articles.

The author conducts critical appraisal using the checklist Joanna Briggs. After conducting selected critical appraisal 9 articles based on the author's assessment have good quality and are by the topic, then extraction of data to include key criteria such as title, author, year of article publication, research location, research objectives, methodology, research population, and results or significant conclusions

Tabel .2
PRISMA Flow Diagram



Tabel 3. EKSTRAKSI DATA

NO	TITLE / AUTHOR / YEAR / LEVEL / STATE / JOURNAL	AIM	RESEARCH DESIGN	SAMPLE / SIZE	RESULT
1	Risk Factor Assessment for Preeclampsia: A Case Control Study	The aim of this study was to assess and compare the socio-demographic profile of women with and without preeclampsia and to determine the risk factors associated with preeclampsia	Case Control	The study sample was carried out in 180 cases of preeclampsia and 180 control subjects at Mahila	The results of this study found that preeclampsia was significantly associated with mothers living in rural areas with a value of $p = 0.033$, Living with family with a value of $p = 0.025$, a mother with low education $p = 0.007$, age of menarce (11-12 years) obtained a relationship which is significant with the results of $p < 0.001$ and primiparous mothers with p values < 0.001 , family history of preeclampsia with a value of $p < 0.001$
2	Increasing maternal percentage body fat in early second trimester: a risk factor for preeclampsia	This study aims to determine whether the percentage of maternal body fat (PBF) or fat-free mass (FFM) at the beginning of the second trimester of pregnancy affects the development of preeclampsia.	Case Control	The sample in this study was 210 samples (70 cases plus 140 controls) at the beginning second trimester	The results of this study found that pre-pregnancy body mass index can cause preeclampsia with a value of $p = 0.001$
3	Higher prepregnancy body mass index is a risk factor for developing preeclampsia in MayaMestizo women: a cohort study	The aim of this study was to analyze a prospective relationship between pregnant BMI and the development of preeclampsia in Maya-Mestizo women.	Cohort Study	Six hundred forty-two pregnant women attended routine prenatal care visits at the Materno-Infantil Hospital of Secretaria de Salud, 2009-2011, were invited to participate in research and women were selected because they arrived at the hospital (no-probabilistic cases in a row)	From this study, it was found that the risk of preeclampsia can occur four-fold in obese women compared to women with normal weight, with RR values = 4.23; 95% CI: 2.07 - 8.61; and P value = 0.001
4	An RGS2 3'UTR polymorphism is associated with preeclampsia in overweight women	The aim of this study is to investigate whether RGS2 protein is associated with preeclampsia. In the case of the Cohort Study in Finland, focusing on the potential impact of BMI on pregnant women.	Case Control	Samples and data were collected during 2008 - 2011 in five Finnish university hospitals. And there is a sample of 1339 preeclamptic women and 697 women without preeclampsia from Finnish Genetics	There was no association between RGS2 Protein and preeclampsia with the odds ratio, 1.64; 95% confidence interval
5	The association between pre pregnancy body mass index and risk of preeclampsia: a registry based study from Tanzania	This study aimed to find out the relationship between BMI in pregnant women and the risk of preeclampsia at Tanzania	Cross Sectional	Data was collected from the Christian Medical Center (KCMC). Data was collected from July 2000 to May 2013. And there were 17,738 samples.	From the results of this study it was found that there was a relationship between an increase in BMI and an increased risk of preeclampsia with a p value of 5 0.05
6	Role of dyslipidemia in preeclamptic overweight pregnant women	The aim of this study was to determine the role of hypertriglyceridemia associated with BMI before pregnancy with a high level of risk of preeclampsia	Case Control	case-control of 42 preeclampsia and 41 female respondents with Obesity before becoming pregnant	From the results of this study it was found that serum triglycerides and high cholesterol levels can increase the incidence of preeclampsia, this was proved significantly with a p value < 0.05 .
7	An Obesity-Related FTO Variant and the Risk of Preeclampsia in a Finnish Study Population	This study aims to investigate whether the FTO gene is associated with the risk of preeclampsia	Case Control	The sample in this study amounted to 449 women who gave birth. And 226 cases with a single pregnancy and met the criteria for Preeclampsia.	In this study the researchers found no evidence of an association between the FTO gene and preeclampsia with a value ($P = 0.199$).

3. RESULT AND DISCUSSIONS

Factors that influence the occurrence of preeclampsia Journal with the title "Risk Factor Assessment for Pre-eclampsia",

Researchers Manoj Kumar Verma, Priyanka Kapoor, Rajeev Yadav and Ravindra Kumar Manohar, this study provides an explanation of the risk factors for preeclampsia. The results showed that the causes of preeclampsia, namely the results of the analysis found that preeclampsia was significantly associated with mothers living in rural areas and with mothers living with parents

/ in-laws, education of low family heads, mothers with primipara, young age at the time menarche (11-12years), anemia, family history of preeclampsia and mothers with hypertension [7]

The journal entitled "Increasing maternal body percentage fat in early second trimester", Researcher Yanxia Wang, Jie Qiu, Min Zhou, Youji Wang, and Yukai Du. This study provides an explanation of the risk factors for preeclampsia. Here the researcher explains that the factors that cause preeclampsia. The results of the study show that the causes of preeclampsia include maternal age, maternal education, gestational age, maternal occupation, habit of staying up, eating habits, smoking, consuming alcohol, and BMI (Body Mass Index) pregnancy period. The results of the analysis found that preeclampsia was significantly associated with BMI (Body Mass Index) of pregnant women, where a BMI > 30 kg was categorized as obesity can cause preeclampsia [8]

The journal entitled "Higher Pregnancy body mass index is a risk factor for developing preeclampsia", Researchers Thelma Canto-Centina, Ramon Mauricio, David Rajano, Agustin Coronel and Patricia Canto. This study provides an explanation of the effect of obesity on pregnant women with preeclampsia. Here the researcher explains that obesity is one of the causes of preeclampsia.

Journal with the title "An RGS2 3'UTR polymorphism associated with preeclampsia in overweight women", Researcher Tina Karppanen, Tea Kartokalo, Mira M.Klemetti, Seppo Heinonen, Eero Kajantie, Juha Kare, Katja Kivinen, Anneli Pouta, Anne Cathrine Staff and Hannele Laivouri. This study provides an explanation of the effect of obesity on pregnant women with preeclampsia. Here the researcher explains that obesity is one of the causes of preeclampsia.

Journal with the title "The Body's Association between Pre Pregnancy Mass Index and Risk of Preeclampsia", Dorah Mrema Researchers, Rolv Terje Lie, Truls Ostbye, Michael Johnson Mahande and Anne Kjersti Daltveit. This study provides an explanation of the effect of obesity on pregnant women with preeclampsia. Here the researcher explained that the causes of preeclampsia include maternal age, nulliparous, chronic hypertension, being overweight or obese, diabetes history of preeclampsia, history of preeclampsia in the family, distance between pregnancy and multiple pregnancies.

Journal with the title "Role of dyslipidemia in preeclamptic overweight pregnant women", Researchers Seyede Hajar Sharami, Azita Tangestani, Roya Faraji, Ziba Zahri, and Azam Amiri. This study provides an explanation of the effect of obesity on pregnant women with preeclampsia. Here the researcher explains that women with a history of preeclampsia can experience an increase in the cardiovascular system in the future where these risk factors can affect the occurrence of preeclampsia.

Journal with the title "An Obesity Related FTO variant and the risk of preeclampsia in a Finnish study population", Researcher Miira Klemetti, Leena M Hitunen, Sanna Heino, Seppo Heinen, Eero Kajantie and Hannele Laivouri. This study provides an explanation of the effect of obesity on pregnant women with preeclampsia. Here the researchers analyzed that the increase in BMI in primiparous mothers, diabetes mellitus, hypertension in pregnant women, mothers with preeclampsia.

Effect of Obesity on preeclampsia Journal with the title "Risk Factor Assessment for Preeclampsia",

Researchers Manoj Kumar Verma, Priyanka Kapoor, Rajeev Yadav and Ravindra Kumar Manohar, this study provides an explanation of the risk factors for preeclampsia. The results showed that the causes of preeclampsia, namely the results of the analysis found that preeclampsia was significantly associated with mothers living in rural areas and with mothers living with parents / in-laws, education of low family heads, mothers with primipara, young age at the time menarche (11-12years), anemia, family history of preeclampsia and mothers with hypertension. The journal entitled "Increasing maternal body percentage fat in early second trimester", Researcher Yanxia Wang, Jie Qiu, Min Zhou, Youji Wang, and Yukai Du.

This study provides an explanation of the risk factors for preeclampsia. Here the researcher explains that the factors that cause preeclampsia. The results of the study show that the causes of preeclampsia include maternal age, maternal education, gestational age, maternal occupation, habit

of staying up, eating habits, smoking, consuming alcohol, and BMI (Body Pre Index pregnancy period The journal entitled "Higher Pregregnancy body mass index is a risk factor for developing preeclampsia", Researchers Thelma Canto-Centina, Ramon Mauricio, David Rajano, Agustin Coronel and Patricia Canto. This study provides an explanation of the effect of obesity on pregnant women with preeclampsia. Here the researcher explains that obesity is one of the causes of preeclampsia. The results show that being overweight or obese can double preeclampsia compared to normal-weight mothers. Researchers also found that pregnant women with obesity were categorized according to age <20 years and> 20-34 years, and that significant results could affect the occurrence of preeclampsia to be six-fold, in addition researchers also found that maternal age, family history of preeclampsia, hypertension, pregnancy diabetes, multiple pregnancies, socioeconomic status and level of education were found to be insignificant [6].

Journal with the title "An RGS2 3'UTR polymorphism associated with preeclampsia in overweight women", Researcher Tina Karppanen, Tea Kartokalo, Mira M.Klemetti, Seppo Heinonen, Eero Kajantie, Juha Kare, Katja Kivinen, Anneli Pouta, Anne Cathrine Staff and Hannele Laivouri. This study provides an explanation of the effect of obesity on pregnant women with preeclampsia. Here the researcher explains that obesity is one of the causes of preeclampsia. The results showed that women with preeclampsia had a higher risk factor for mothers with high levels of BMI (Body Mass Index) and in mothers with gestational disease. Women with preeclampsia can also affect maternal pregnancies such as shrinking placenta, low birth weight (LBW) and preterm [9]

Journal with the title "The Body's Association between Pre Pregnancy Mass Index and Risk of Preeclampsia", Dorah Mrema Researchers, Rolv Terje Lie, Truls Ostbye, Michael Johnson Mahande and Anne Kjersti Daltveit. This study provides an explanation of the effect of obesity on pregnant women with preeclampsia. Here the researcher explained that the causes of preeclampsia include maternal age, nulliparous, chronic hypertension, being overweight or obese, diabetes history of preeclampsia, history of preeclampsia in the family, distance between pregnancy and multiple pregnancies. Associated obesity can affect two to four times the occurrence of preeclampsia [1]

Journal with the title "Role of dyslipidemia in preeclamptic overweight pregnant women", Researchers Seyede Hajar Sharami, Azita Tangestani, Roya Faraji, Ziba Zahri, and Azam Amiri. This study provides an explanation of the effect of obesity on pregnant women with preeclampsia. Here the researcher explains that women with a history of preeclampsia can experience an increase in the cardiovascular system in the future where these risk factors can affect the occurrence of preeclampsia including maternal age factors (> 35 years and <15 years), obesity, diabetes mellitus and a history of kidney disease and hypertension pregnancy [10].

Journal with the title "An Obesity Related FTO variant and the risk of preeclampsia in a finnish study population", Researcher Miira Klemetti, Leena M Hitunen, Sanna Heino, seppo Heinen, Eero Kajantie and Hannele Laivouri. This study provides an explanation of the effect of obesity on pregnant women with preeclampsia. Here the researchers analyzed that the increase in BMI in primiparous mothers, diabetes mellitus, hypertension in pregnant women, mothers with preeclampsia. And there is a significant result that an increase in BMI or obese mothers and mothers with hypertension during pregnancy can cause the risk of preeclampsia [11]

Factors that affect Preeclampsia in pregnant women Based on the research of Verma, et al. (2017)

It is explained that hypertensive disorders in pregnancy can cause health problems in the mother and fetus and can cause death. Knowledge, identification of sociodemography, and clinical factors that cause preeclampsia will help predict the risk of preeclampsia. In this study the researchers found that Usa under 12 years of age can cause preeclampsia. This can also be attributed to the occurrence of CVD (Cerebro Vascular Disease) in pregnant women. In this study it was also found that mothers > 30 years old, mothers with pre-obesity, obesity in pregnant women, primiparity, age of menses <12 years, residence in rural areas were significant predictors of the incidence of preeclampsia. According to Wang's research, et al. (2014) stated that midwifery

literatures have shown a profile of risk factors for preeclampsia, namely psychosomatic factors, smoking, maternal obesity and pre-pregnancy BMI and these factors are potential targets aimed at reducing the risk of hypertensive disorders in pregnancy. Weight gain including increase in body fat mass (FM), fat-free mass (FFM) is one way to measure obesity in pregnant women conducted in the early trimester in order to reduce the risk of preeclampsia, but some studies have difficulties in measuring body fat composition during pregnancy because it is complicated by the presence of hypertensive disorders. Based on the Canto-Cetina study, et al. (2017) states that obesity during pregnancy can increase the risk of medical complications, including preeclampsia. This is also known to be a disease that is closely related to preeclampsia, but the mechanism is not yet certain. Obesity is associated with insulin resistance, dyslipidemia, oxidative stress and impaired blood vessel function, where these factors also cause preeclampsia.

Based on Karpanen Research, et al (2016) preeclampsia was associated with an increased risk of cardiovascular and cerebrovascular disease. Besides being overweight or obese is a factor in the predisposition of cardiovascular disease. This shows that this condition can affect the risk of preeclampsia. One of the genes involved in the regulation of blood pressure, namely the G-protein gene (RGS2) which is new, is associated with preeclampsia and can cause chronic hypertension after pregnancy. Based on Research by Mrema et al. (2018), shows clinical evidence that maternal obesity increases the risk of preeclampsia. The etiology of preeclampsia is still unclear, but the mechanisms associated with preeclampsia include placenta, genes, immune response, insulin resistance, and vascular disease. Risk factors that can cause preeclampsia include nulliparous, advanced maternal age, being overweight / obese, chronic hypertension, diabetes, a history of previous preeclampsia, a history of family preeclampsia, the distance of previous pregnancies, and multiple pregnancies. In a study conducted by Sharami, et al. (2012), it was explained that women with a history of preeclampsia can lead to cardiovascular disease in the future. In addition, the risk factors for preeclampsia include maternal age, obesity, diabetes mellitus, a history of kidney disease and hypertension in pregnancy. High maternal or obese BMI is a risk factor for preeclampsia. In the Klemetti study, et al [11].

It was found that significant increases in BMI or obese mothers and mothers with hypertension during pregnancy were found to cause the risk of preeclampsia. Fatigue or obesity affects various types of pregnancy complications. Like preeclampsia. Preeclampsia is a potentially life-threatening syndrome accompanied by hypertension and proteinuria. The conclusion of the results of the above study shows that the risk factors for preeclampsia are maternal age, menarche age <12 years, primipara and obesity in pregnant women which can cause three times the risk of preeclampsia. Preeclampsia is also associated with an increased risk of cardio and cerebrovascular disease. In addition, being overweight is also a predisposing factor for cardiovascular disease where this condition is also a risk factor for preeclampsia.

Effect of Obesity on the incidence of preeclampsia

Based on the research of Verma, et al. (2017), it is explained that hypertensive disorders in pregnancy can cause health problems in the mother and fetus and can cause death. Knowledge, identification of sociodemography, and clinical factors that cause preeclampsia will help predict the risk of preeclampsia. According to Wang's research, et al. (2014) stated that midwifery literatures have shown a profile of risk factors for preeclampsia, namely psychosomatic factors, smoking, maternal obesity and pre-pregnancy BMI and these factors are potential targets aimed at reducing the risk of hypertensive disorders in pregnancy.

Based on the Canto-Cetina study, et al. (2017) states that obesity during pregnancy can increase the risk of medical complications, including preeclampsia. This is also known to be a disease that is closely related to preeclampsia, but the mechanism is not yet certain. Obesity is associated with insulin resistance, dyslipidemia, oxidative stress and impaired blood vessel function, where these factors also cause preeclampsia. Estimated risk in the BMI increase category > 30 which is closely related to the incidence of preeclampsia and a four-fold high risk factor compared to normal weight women. The researcher conducted a category distribution of preeclampsia based on BMI, where women with mild preeclampsia had a BMI of 27.2, women

with severe preeclampsia had a BMI of 29.6. In this study it was found that the higher the increase in BMI before pregnancy, the higher the risk factors that can cause preeclampsia. Based on Karpanen Research, et al (2016) Preeclampsia was associated with an increased risk of cardiovascular and cerebrovascular disease. Besides being overweight or obese is a factor in the predisposition of cardiovascular disease. This shows that this condition can affect the risk of preeclampsia. One of the genes involved in the regulation of blood pressure, namely the G-protein gene (RGS2) which is new, is associated with preeclampsia and can cause chronic hypertension after pregnancy. However, in this study no significant association was found between the G-protein gene (RGS2) and preeclampsia, but in this study the researchers established a significant relationship between BMI and Preeclampsia.

Based on Research by Mrema et al. (2018). Shows clinical evidence that maternal obesity increases the risk of preeclampsia. The etiology of preeclampsia is still unclear, but the mechanisms associated with preeclampsia include placenta, genes, immune response, insulin resistance, and vascular disease. Risk factors that can cause preeclampsia include nulliparous, advanced maternal age, being overweight / obese, chronic hypertension, diabetes, a history of previous preeclampsia, a history of family preeclampsia, the distance of previous pregnancies, and multiple pregnancies. Obesity has been associated with 2-4 times the increased risk of preeclampsia. and there have been many studies that prove that the Body Period Index (BMI) at the time of pregnancy is also a risk factor for preeclampsia ... The BMI category according to the World Health Organization WHO is underweight <18.5, normal weight 18.5-24.9, overweight 25.0-29.9, and obesity ≥ 30 .

In a study conducted by Sharami, et al. (2012), it was explained that women with a history of preeclampsia can lead to cardiovascular disease in the future. In addition, the risk factors for preeclampsia include maternal age, obesity, diabetes mellitus, a history of kidney disease and hypertension in pregnancy. High maternal or obese BMI is a risk factor for preeclampsia. This risk can be increased in pregnancies with increases in BMI 15 to 35 compared to increases in BMI 21 to 26 and a threefold increase in BMI > 30. And the results of this study indicate that dyslipidemia is an independent risk factor for preeclampsia.

In the Klemetti study, et al. (2011), it was found that significant increases in BMI or obese mothers and mothers with hypertension during pregnancy were found to cause the risk of preeclampsia. Fatigue or obesity affects various types of pregnancy complications. Like preeclampsia. Preeclampsia is a potentially life-threatening syndrome accompanied by hypertension and proteinuria. The cause is still unknown but both genetic and environmental factors seem to influence the incidence of preeclampsia.

4. CONCLUSION

In this finding it was found that the higher the BMI of the mother before pregnancy (Pre-pregnancy) is a risk factor for the occurrence of preeclampsia. and all of them also that being overweight and obese during pregnancy can cause preeclampsia, and these factors can also cause severe preeclampsia. All of these effects can cause increasing maternal and infant morbidity. Therefore, because obesity is one of the factors that can increase the incidence of preeclampsia, it is recommended for all women, especially in developing countries to have a healthy weight before becoming pregnant.

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REFERENCES

- [1] Mrema D, Lie RT, Østbye T, Mahande MJ, Daltveit AK. The association between pre pregnancy body mass index and risk of preeclampsia: a registry based study from

- Tanzania. BMC Pregnancy Childbirth [Internet]. Desember 2018 [dikutip 2 Mei 2019];18(1). Tersedia pada: <https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/s12884-018-1687-3>
- [2] World Health Organization. WHO recommendations for prevention and treatment of pre-eclampsia and eclampsia. [Internet]. 2011 [dikutip 3 Mei 2019]. Tersedia pada: http://whqlibdoc.who.int/publications/2011/9789241548335_eng.pdf
- [3] Meltzer SJ. Treatment of gestational diabetes. BMJ Br Med J Online [Internet]. 1 April 2010;340. Tersedia pada: <https://search.proquest.com/docview/1778016122?accountid=188397>
- [4] Fang R, Dawson A, Lohsoonthorn V, Williams MA. Risk Factors of Early and Late Onset Preeclampsia among Thai Women. Asian Biomed. 2011;11.
- [5] Sidani M, Siddik-Sayyid SM. PREECLAMPSIA, A NEW PERSPECTIVE IN 201. 2011;10.
- [6] Catalano PM, Shankar K. Obesity and pregnancy: mechanisms of short term and long term adverse consequences for mother and child. BMJ Br Med J Online [Internet]. 8 Februari 2017;356. Tersedia pada: <https://search.proquest.com/docview/1866028862?accountid=188397>
- [7] Verma MK, Kapoor P, Yadav R, Manohar RK. Risk Factor Assessment for Pre-eclampsia: A Case Control Study. Int J Med Public Health. Juli 2017;7(3):172.
- [8] Wang Y, Qiu J, Zhou M, Wang Y, Du Y. Increasing maternal percentage body fat in early second trimester: a risk factor for preeclampsia. J Matern-Fetal Neonatal Med Off J Eur Assoc Perinat Med Fed Asia Ocean Perinat Soc Int Soc Perinat Obstet. Februari 2015;28(3):293–6.
- [9] Karppanen T, Kaartokallio T, Klemetti MM, Heinonen S, Kajantie E, Kere J, dkk. An RGS2 3'UTR polymorphism is associated with preeclampsia in overweight women. BMC Genet. 24 2016;17(1):121.
- [10] Sharami SH MD, Tangestani A MD, Faraji R MD, Zahiri Z MD, Amiri A MD. Role of dyslipidemia in preeclamptic overweight pregnant women. Iran J Reprod Med. Maret 2012;10(2):105–12.
- [11] Klemetti M, Hiltunen LM, Heino S, Heinonen S, Kajantie E, Laivuori H. An obesity-related FTO variant and the risk of preeclampsia in a Finnish study population. J Pregnancy. 2011;2011:251470.