

Literature Review: Body Mass Index (BMI) is Associated with Preeclampsia in Pregnancy

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Article Info	Abstract
Article History Submitted, Accepted, Published,	<i>Preeclampsia is the second leading cause of death in pregnancy. Overweight and obesity are risk factors for preeclampsia. This literature review aims to determine the relationship between BMI and the incidence of preeclampsia in pregnant women to prevent maternal mortality. This literature review used a literature review method. A systematic search of relevant articles in Google Scholar, published between 2020 and 2025, was conducted. Only articles with a quantitative design and full text were included in this analysis. Key data were searched using the PICO (Population Intervention Compare Outcome) technique. Based on the analysis of articles, it was found that there is a relationship between BMI and preeclampsia. On average, pregnant women who experience preeclampsia have a high body mass index (BMI) of >25 kg/m². A high BMI causes the body to work twice as hard, and excessive weight gain during pregnancy increases the risk of preeclampsia.</i>
Keywords: BMI, Preeclampsia, Pregnant Women	

Introduction

Preeclampsia is a pregnancy complication that remains a leading cause of maternal morbidity and mortality worldwide. According to a report by the World Health Organization (2025), approximately 5–10% of pregnancies worldwide experience preeclampsia, and this condition contributes to approximately 14% of maternal deaths globally. Preeclampsia is characterized by increased blood pressure and the presence of protein in the urine after 20 weeks of gestation. This condition can progress to eclampsia, a potentially life-threatening condition if not detected and treated promptly. The high incidence indicates that preeclampsia remains a serious global maternal health problem.

Nationally, Indonesia also faces a similar problem. According to the Indonesian Health Survey (2024), the incidence of preeclampsia reached 8.2% of all pregnancies, contributing 25% to maternal mortality in hospitals. Risk factors include maternal age, parity, history of

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hypertension, nutritional status, and Body Mass Index (BMI). The increasing prevalence of obesity and overweight among women of childbearing age in Indonesia also exacerbates this risk. This situation demonstrates that overnutrition plays a significant role in increasing the risk of pregnancy complications, particularly preeclampsia.

Changes in dietary patterns and modern lifestyles have also contributed to the increasing incidence of obesity in pregnant women. According to the Basic Health Research (Riskesdas) (2023), 35% of women of reproductive age in Indonesia are overweight, and 14% are obese before pregnancy. Excess weight gain before and during pregnancy causes metabolic changes, oxidative stress, and inflammation, which can disrupt blood vessel endothelial function, thus triggering preeclampsia. Therefore, monitoring BMI from preconception through pregnancy is a crucial step in preventing pregnancy complications.

Body Mass Index (BMI) is a simple indicator to assess a person's nutritional status based on the ratio of weight to height. In the context of pregnancy, BMI plays a crucial role as a predictor of the risk of complications, including preeclampsia. Pregnant women with a high BMI are at greater risk of increased blood pressure due to hormonal imbalances, systemic inflammation, and insulin resistance, which can impact vascular function. This phenomenon reinforces the importance of research into the relationship between BMI and the incidence of preeclampsia in pregnant women in various regions of Indonesia.

Based on this background and the persistently high incidence of preeclampsia in Indonesia, the author will present a literature review related to BMI and preeclampsia incidence. Early detection efforts include monitoring blood pressure and urine protein levels. BMI is an important risk factor that must be monitored for early prevention.

Methods

This study uses a literature review as a data analysis method to explore the relationship between BMI and the incidence of preeclampsia in pregnancy. A literature review is a secondary study derived from literature reviews, commonly used in medical research. A literature review aims to identify, evaluate, and interpret all available and relevant literature related to the research question. The purpose of a systematic literature review is to summarize existing evidence on a topic, identify, and provide suggestions for further research (Fauzi et al., 2024).

The data collection method in this study was a literature review, searching for research articles through electronic searches, including Google Scholar, from 2020 to 2025. The research articles were selected based on criteria that were in accordance with the research objectives and published between 2020 and 2025. Twenty articles in Indonesian and English were selected, and 10 articles met the criteria after critical assessment using the PICO method. Full-text PDFs were available with keywords such as BMI, preeclampsia, and pregnant women. The steps in conducting a literature review according to Lawrence Machi & McEvoy Brenda (2020) are: Select a topic, Develop tools of argument, Search for articles, Survey the literature, Critique the literature, and write the review.

Results and Discussion

A database search was conducted using the keywords BMI; preeclampsia; and pregnant women. The following 10 journals were found, described in table form.

Table 1 List of Article

No	Researcher	Research Method	Research Results
1	The relationship between Body Mass Index and the incidence of preeclampsia in pregnant women at the Pekapuran Raya	This study used correlational analytical research with a cross-sectional design. The population was 300 pregnant women, with a sample of 171	The research results showed that the p-value of the chi-square test was 0.000 (p-value <0.05), meaning that there was a

Community Health Center, Banjarmasin City in 2025 (Nadia et al., 2025).	pregnant women with a Maternal Body Mass Index (BMI). The research instrument used secondary data with a chi-square test.	significant relationship between Body Mass Index and the incidence of pre-eclampsia at the Pekapuran Raya Community Health Center, Banjarmasin City in 2025.
2 Factors associated with the incidence of severe preeclampsia at H. Damanhuri Barabai Regional Hospital in 2024 (Surtika et al., 2025)	This study used an observational analytical method with a case-control design. The sampling technique was simple random sampling. The sample size in this study was 450 respondents: 225 mothers with severe preeclampsia and 225 mothers without severe preeclampsia. The dependent variables were maternal age, parity, pregnancy spacing, BMI, and history of hypertension, which were taken from secondary data. The statistical analysis used was chi-square and odds ratio (OR).	The results of the study showed that there was a significant relationship between age risk factors and the occurrence of severe preeclampsia (p-value 0.008) and had a risk of 1.951 times, parity (p-value 0.000), and had a risk of 4.969 times, pregnancy spacing (p-value 0.000) and had a risk of 2.815 times, BMI (p-value 0.014) and had a risk of 1.905 times, and a history of hypertension (p-value 0.004) and had a risk of 1.936 times towards the occurrence of severe preeclampsia at H. Damanhuri Barabai Regional Hospital in 2024.
3 The relationship between body mass index and the incidence of preeclampsia in pregnant women at the Kampong Manggis Community Health Center, Bogor Regency (Hayati & Cahyani, 2025).	This study uses an analytical observational research design that describes and explains the relationship between the independent variable, namely body mass index, and the dependent variable, namely the incidence of preeclampsia, using a cross-sectional approach recorded in medical records where measurements of the independent and dependent variables are observed at the most recent time. Data collected from secondary data were 40 samples, using the Chi Square statistical test.	The results of the data analysis between body mass index and the incidence of preeclampsia in pregnant women obtained a test value of 6.320 with a p-value of 0.012. Therefore, a p-value of 0.012 (<0.05) indicates a relationship between body mass index (BMI) and the incidence of preeclampsia.
4 Factors Associated with the Incidence of Preeclampsia in Pregnant Women in Tangerang (Latipah et al., 2023).	This study employed a quantitative research method with a cross-sectional design. A total sample of 93 pregnant women with preeclampsia	The chi-square test results showed a relationship between age, BMI, and parity with the incidence of preeclampsia in

	who underwent examinations from July 2021 to June 2022 at the Obstetrics and Gynecology Clinic at Pakuhaji Regional Hospital, Tangerang Regency was sampled. Secondary data were collected from medical records. Univariate analysis was performed, bivariate analysis using the chi-square test, and multivariate analysis using logistic regression.	pregnant women at Pakuhaji Regional Hospital, Tangerang Regency, with p-values for each factor tested: age (p-value = 0.000), BMI (p-value = 0.002), and parity (p-value = 0.003). Age is the most dominant factor related to the incidence of preeclampsia in pregnant women at Pakuhaji Regional Hospital, Tangerang Regency, based on multiple logistic regression tests conducted with the highest OR value of OR = 7.340, which means that pregnant women with high-risk ages (<20 years and >35 years) have a 7.3-fold risk of experiencing higher or severe preeclampsia.	
5	The Effect of Body Mass Index (BMI) on the Incidence of Gestational Diabetes in Pregnant Women (Akbar & Primaditya, 2024)	This study used a quantitative method with a cross-sectional approach. Data were collected from a number of pregnant women undergoing prenatal checkups at several health facilities. BMI measurements were taken in the first trimester of pregnancy, and the incidence of gestational diabetes was assessed based on blood glucose test results in the second trimester.	The results of a logistic regression study indicated that pregnant women with an overweight BMI had almost a threefold increased risk (odds ratio 2.9, 95% CI: 1.3-6.5, p<0.01) for gestational diabetes, while those with an obese BMI had a more than sixfold increased risk (odds ratio 6.2, 95% CI: 2.7-14.4, p<0.001) compared to pregnant women with a normal BMI.
6	The relationship between body mass index and the incidence of preeclampsia in pregnant women at Trikora Salakan Regional Hospital (Handayani & Nurjanah, 2021).	This descriptive analytical research method employed a retrospective design. The population in this study was all pregnant women with preeclampsia who underwent medical examinations at Trikora Salakan Regional Hospital from January 2020 to September 2020, totaling 41 women. The sampling technique was total sampling. Data analysis used the Spearman Rank Test.	The results of the study showed that respondents with underweight BMI did not experience mild and severe preeclampsia, respondents with normal BMI who experienced mild preeclampsia were 1 person (2.4%) and none experienced severe preeclampsia, respondents with overweight BMI who experienced mild preeclampsia were 21 people (51.2%). Those who experienced severe

		<p>preeclampsia were 9 people (22%), respondents with obese BMI did not experience mild preeclampsia and those who experienced severe preeclampsia were 10 people (24.3%). The results of statistical calculations using the Spearman Rank test obtained the result that the p value was $0.000 < 0.05$. so there is a significant relationship between Body Mass Index (BMI) and the incidence of preeclampsia in pregnant women.</p>
7	<p>The Relationship Between Body Mass Index in Pregnant Women and the Incidence of Preeclampsia at Seririt I Community Health Center in 2021 (Anggreni et al., 2020).</p>	<p>This study employed a quantitative analytical method with a cross-sectional approach. This study utilized secondary data collected from 118 pregnant women registered in the KIA Room Register Book in 2020 at Seririt I Community Health Center. Data were collected using a data collection sheet and then analyzed using a computerized program using univariate and bivariate analysis. Bivariate analysis was conducted to determine the relationship between body mass index (BMI) and the incidence of preeclampsia. This study used a Chi-Square statistical test.</p>
8	<p>he Relationship Between Body Mass Index (BMI) and the Incidence of Preeclampsia in Pregnant Women (Aini et al., 2023).</p>	<p>This study used a quantitative research method with a case-control design. The population was 105 pregnant women with gestational ages >20 weeks. The sampling technique used was total sampling, resulting in a sample size of 105. The statistical test used Chi-Square.</p>
		<p>The results showed that the majority of women with Body Mass Index (BMI) were in the obese category (42 women). The incidence of preeclampsia was 30 women (28.6%). Data analysis using the Chi-Square formula yielded a p-value of 0.041 (p-value < 0.05), indicating a significant relationship between Body Mass Index (BMI) and the incidence of preeclampsia in pregnant women.</p>

9	The relationship between Body Mass Index (BMI) and the incidence of preeclampsia in pregnant women (Azizah et al., 2020).	The study used a correlational analytical research method with a cross-sectional design. The population was 50 pregnant women, with a sample size of 35. The sampling technique used non-probability sampling with purposive sampling. Data collection instruments used questionnaires, data processing using editing, coding, data entry, and tabulation, then tested using the chi-square test.	The results showed that 5 respondents (14.3%) had a BMI below normal, 11 respondents (31.4%), 4 respondents (11.4%) had a BMI above normal, 8 respondents (22.9%), 7 respondents (20%) had obesity I, 24 respondents (68.6%) had no preeclampsia, 9 respondents (25.7%), and 2 respondents (5.7%) had severe preeclampsia. The results of the chi-square test showed significance $p = 0.01$, $p \text{ value} < 0.05$, so H_1 was accepted, meaning there was a relationship between BMI and the incidence of preeclampsia.
10	The relationship between BMI and the incidence of preeclampsia in pregnant women at Bangil Regional Hospital, Pasuruan (Khasanah et al., 2023).	This study used an analytical design with a cross-sectional approach. Data were obtained from the medical records of pregnant women undergoing examinations at Bangil Regional Hospital. The study sample consisted of 84 pregnant women who met the inclusion and exclusion criteria. BMI data was calculated based on the mother's weight and height, while the diagnosis of preeclampsia was determined through a medical examination according to applicable criteria.	The results showed a p-value of 0.003, indicating a significant relationship between BMI and the incidence of preeclampsia in pregnant women. This indicates that pregnant women with a high BMI have a higher risk of developing preeclampsia.

This literature review identified 10 journals from several previous studies examining a significant association between high BMI (overweight or obesity) and an increased risk of preeclampsia in pregnant women. The results of a study by Khafizatul Nadia et al (2025) at the Pekapuran Raya Community Health Center in Banjarmasin City, using a cross-sectional design on 171 respondents, showed a p-value of 0.000 ($p < 0.05$), indicating a significant association between BMI and the incidence of preeclampsia. Similar results were also reported by Surtika et al (2025) at the H. Damanhuri Barabai Regional General Hospital with 450 respondents, who found that women with a BMI $> 26 \text{ kg/m}^2$ had a 1.9-fold greater risk of developing severe preeclampsia ($p = 0.014$).

Research by Hayati and Cahyani (2025) at the Kampung Manggis Community Health Center in Bogor Regency also supports these results, with a p-value of 0.012. This confirms that increased BMI plays a significant role in the development of pregnancy complications such as preeclampsia. Research by Latipah et al (2023) found that age, parity, and BMI were significantly associated with the incidence of preeclampsia (p-value = 0.002). This means that the higher the mother's BMI, the greater the risk of developing high blood

pressure, which can lead to preeclampsia. Research by Handayani and Nurjanah (2021) at Trikora Salakan Regional Hospital also showed consistent results. Mothers with overweight and obese BMIs were more likely to experience severe preeclampsia compared to mothers with normal BMIs, with a p-value of 0.000. Research conducted by Putu Dewi Anggreni et al (2020) at Seririt I Community Health Center used a cross-sectional design with a sample size of 118 pregnant women. Chi-square test results showed a significant association between BMI and preeclampsia. Eleven (42.3%) overweight women and 13 obese women experienced preeclampsia. These results demonstrate that being overweight and obese significantly contribute to increased blood pressure and vascular disorders during pregnancy.

Research by Aini et al (2023) using a case-control design on 105 pregnant women showed a p-value of 0.041 ($p < 0.05$). The majority of respondents had a BMI in the obese category (40%), and 30 respondents (28.6%) experienced preeclampsia. These findings indicate that mothers with a high BMI are at higher risk of developing high blood pressure due to fat accumulation and insulin resistance, which disrupt endothelial function. Research by Azizah et al (2020), which used a cross-sectional design with 35 respondents, also showed a significant association between BMI and the incidence of preeclampsia, with a p-value of 0.01. The study found that mothers with obesity I (22.9%) and obesity II (20%) had higher rates of preeclampsia compared to mothers with a normal BMI. These results reinforce the notion that being overweight before or during pregnancy is a major risk factor for preeclampsia. Furthermore, research by Nurun Khasanah et al (2023) at Bangil Regional Hospital, Pasuruan, using a cross-sectional design and a sample size of 84 pregnant women also yielded similar results. A p-value of 0.003 ($p < 0.05$) indicates a significant association between BMI and preeclampsia. Pregnant women with a high BMI have a greater risk of developing preeclampsia than women with a normal BMI.

These results demonstrate a consistent pattern that obesity and overweight are strong risk factors for preeclampsia. Physiologically, this can be explained through the mechanisms of hyperleptinemia, insulin resistance, systemic inflammation, and oxidative stress, which cause endothelial dysfunction and disrupt the vasodilator-vasoconstrictor balance, ultimately increasing maternal blood pressure. In line with the theories of Roberts et al (2011) obese women have up to a threefold higher risk of developing preeclampsia than women with a normal BMI. Research by Sherbiny et al (2023) further supports this by explaining that a high-fat, low-fiber diet, along with a sedentary lifestyle, contribute to an increased risk of preeclampsia through decreased antioxidants and increased inflammation. A high BMI (overweight/obesity) is associated with preeclampsia because obesity causes chronic inflammation, endothelial dysfunction, and insulin resistance, which can increase blood pressure. Furthermore, fat accumulation affects the placental formation process, resulting in suboptimal blood flow to the placenta. This condition triggers the release of substances that damage blood vessels and trigger preeclampsia. Mothers with a high BMI also experience greater oxidative stress and often have comorbidities such as hypertension and diabetes, which further increase the risk of preeclampsia.

Overall, the research results indicate that increased BMI before or during pregnancy is a significant factor influencing the incidence of preeclampsia. Therefore, monitoring nutritional status and weight control in pregnant women from the preconception period should be a primary focus in preeclampsia prevention efforts.

Conclusion and Suggestion

Based on the results of the literature review of the 10 articles, it can be concluded that BMI is associated with the incidence of preeclampsia in pregnancy, where maternal nutritional status is based on BMI with the incidence of preeclampsia in pregnant women. Based on the results of this study, it is necessary to pay attention to the BMI factor in pregnant women to anticipate the incidence of preeclampsia. And for further research, other risk factors for preeclampsia can be studied to determine the factors that most influence the

incidence of preeclampsia in pregnant women so that prevention efforts can be carried out better.

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