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Factors Influencing the Occurrence of Preeclampsia in Pregnant Women: Literature Review

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Abstract

Preeclampsia is a pathological condition characterized by an increase in blood pressure after 20 weeks of gestation, which may be accompanied by proteinuria as well as signs of organ dysfunction such as impaired liver, kidney, nervous system, and hematological function. The method used is a narrative review design of international literature from 2016–2025 obtained from Google Scholar, PubMed, ScienceDirect, ClinicalKey, and Garuda (Garba Rujukan Digital), using the keywords "preeclampsia,""risk factors of preeclampsia," "maternal risk factors," "faktor risiko preeklamsia," and "preeclampsia in pregnancy." The results of the review indicate that preeclampsia is multifactorial, meaning it is not caused by a single factor but rather a combination of biological conditions, medical history, and maternal demographic characteristics. Medical and reproductive factors such as a history of hypertension and preeclampsia where women who previously experienced preeclampsia or have chronic hypertension have the highest risk primigravida (first pregnancy), and comorbidities such as diabetes mellitus, obesity (high BMI), and kidney disease further increase the burden on blood vessels.

Introduction

Preeclampsia is a multifactorial disease, meaning its occurrence is influenced by various interrelated factors (Chang et al., 2023; Alanazi et al., 2022; Woo Kinshella et al., 2026). Several studies have shown that maternal factors such as maternal age, parity, a history of preeclampsia, obesity, and chronic diseases such as hypertension and diabetes mellitus can increase the risk of preeclampsia. These factors can affect blood vessel endothelial function and the placental implantation process, ultimately leading to impaired placental perfusion (Mammaro et al., 2009; Aye et al., 2025; Zhang et al., 2025).

Maternal age is one factor often associated with the incidence of preeclampsia. Pregnant women who are too young (<20 years) or too old (>35 years) are known to have a higher risk of pregnancy complications, including preeclampsia. At a young age, the mother's reproductive system is not yet optimally developed, while at an older age, there is a decline in blood vessel function and an increased risk of chronic diseases that can trigger hypertension in pregnancy (Steegers et al., 2010; Pulatov et al., 2026; Moscucci et al., 2026).

In addition to age, parity is also associated with the incidence of preeclampsia (Hasan et al., 2026; Schrag et al., 2026; Susanti et al., 2024). Several studies have shown that preeclampsia is more common in primigravida or first-time pregnancies. This is thought to be related to the immunological adaptation process between the mother's body and the placental tissue, which

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does not occur optimally during the first pregnancy, increasing the risk of placental perfusion disorders (Riano-Moreno et al., 2025; Burton & Jauniaux, 22023; Türkmen & Akar Inan, 2025).

Another factor contributing to preeclampsia is a history of chronic illness in the mother before pregnancy, such as chronic hypertension, kidney disease, and diabetes mellitus (Shandilya et al., 2023; Gunderson et al., 2025). These conditions can disrupt blood vessel function and increase the risk of endothelial dysfunction, a key mechanism in the pathogenesis of preeclampsia (Redman et al., 2009).

In addition to medical factors, healthcare services also influence the incidence of preeclampsia. Regular antenatal care (ANC) visits by pregnant women are crucial for early detection of signs and symptoms of preeclampsia. Irregular ANC visits can lead to delays in diagnosis and treatment, increasing the risk of complications for both mother and fetus (Staff, 2019).

Various studies have been conducted to identify factors influencing the incidence of preeclampsia in pregnant women (Kholifah et al., 2025; Ameen et al., 2023; Demissie et al., 2022). However, the results of these studies are scattered across various scientific publications, requiring a comprehensive literature review to summarize and analyze the various research findings. A literature review is a research method that can be used to systematically examine the results of previous studies to provide a clearer picture of the factors that contribute to the occurrence of preeclampsia.(Perawati et al., 2022)

Methods

This study employed a systematic literature review to identify and synthesize evidence regarding factors associated with the occurrence of preeclampsia among pregnant women. The literature search was conducted using Google Scholar, PubMed, ScienceDirect, ClinicalKey, and Garuda. The search covered articles published between 2020 and 2025. The keywords used individually and in combination were “preeclampsia,” “risk factors of preeclampsia,” “maternal risk factors,” “faktor risiko preeklamsia,” and “preeclampsia in pregnancy.”

Articles were included when they: (1) examined maternal, medical, reproductive, demographic, or lifestyle factors associated with preeclampsia; (2) involved pregnant or postpartum women with preeclampsia or eclampsia; (3) were published in accredited national or international scientific journals between 2020 and 2025; (4) were written in Indonesian or English; and (5) were available in full-text format. Primary observational and interventional studies, as well as relevant literature reviews that provided evidence on preeclampsia risk factors, were considered eligible.

Articles were excluded when they: (1) did not specifically discuss preeclampsia or its associated factors; (2) involved populations that were not relevant to the review objectives; (3) did not provide sufficient information regarding study methods or findings; (4) were unavailable in full-text format; (5) were published outside the specified period; or (6) were duplicate publications.

The study selection process consisted of identification, title and abstract screening, full-text eligibility assessment, and final inclusion. The initial search identified 615 articles. After title and abstract screening, 406 articles were excluded because they were irrelevant to the research topic, involved inappropriate populations, or did not meet the publication-year criteria. A total of 209 articles were subsequently assessed in full text. Of these, 194 articles were excluded because they did not provide the required data, were not available in full text, or did not meet the eligibility criteria. Finally, 15 articles were included in the literature review.

Data from the selected articles were extracted into a literature review matrix containing the publication year, article title, authors, research design, main findings, conclusions, and database or journal source. The extracted data were analyzed using descriptive narrative synthesis.

Findings from individual studies were compared and grouped according to the main factors associated with preeclampsia, including maternal age, parity, history of hypertension or preeclampsia, body mass index, comorbidities, lifestyle, and antenatal care. The results were subsequently presented in a study-selection diagram, evidence table, and narrative synthesis.

Result and Discussion

Based on the search results, 164 articles were obtained from the keywords preeclampsia, risk factors of preeclampsia, maternal risk factors, risk factors for preeclampsia, and preeclampsia in pregnancy. All journals were included in the search and screening. The researchers then screened the titles and abstracts of the articles. At this screening stage, 1,205 articles were excluded due to research that did not meet the inclusion criteria or was published within the last 10 years. Finally, 20 remaining articles that met the inclusion criteria were obtained and will be used for this literature review.

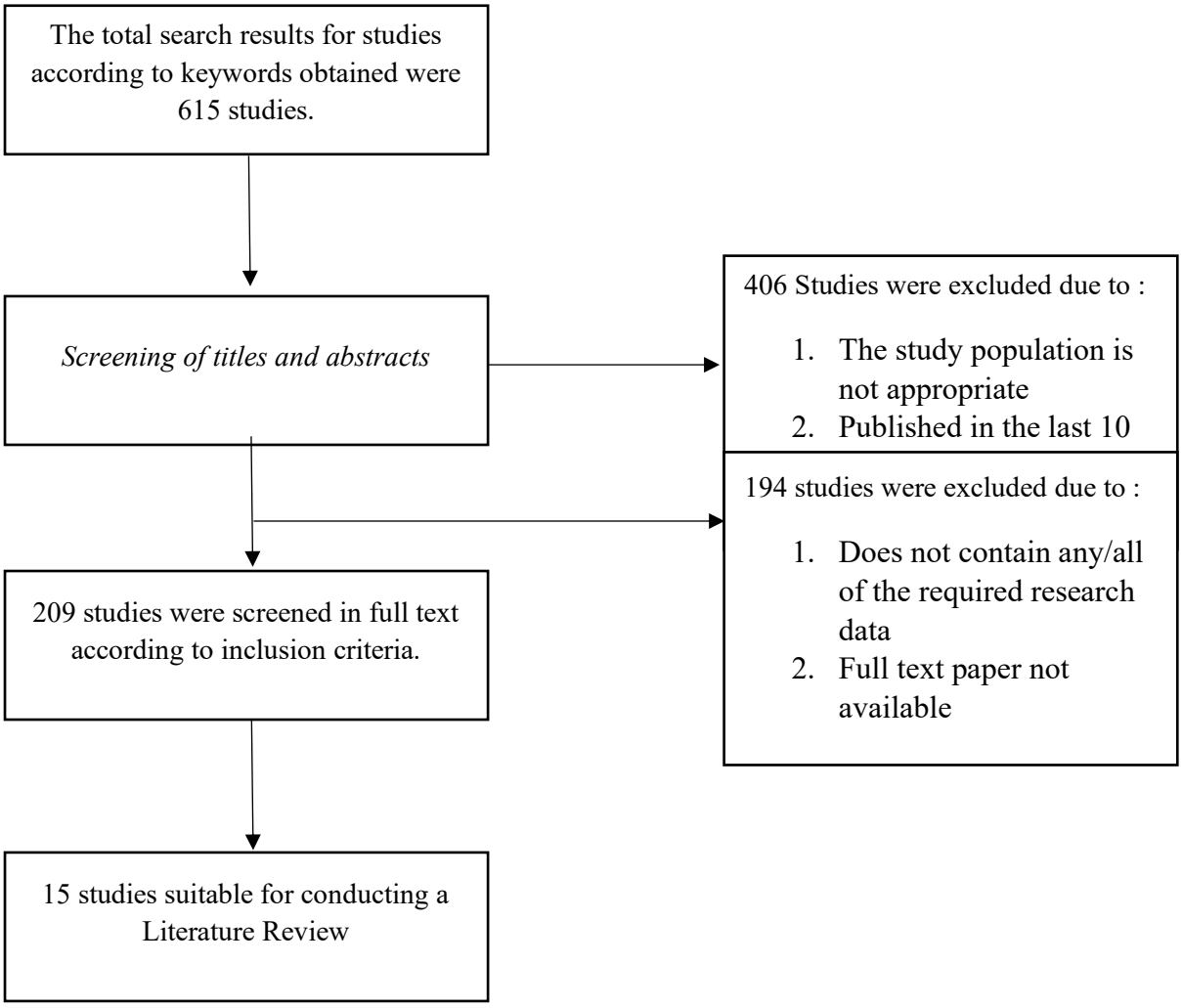

Figure 1. Journal search mechanism for systematic reviews

Table 1. Studies suitable for conducting Literature review

Authors and Year	Study Title	Study Design	Main Findings	Conclusion	Journal/Publication
Andani et al. (2022)	Risk Factors of Preeclampsia at Dupak Public Health	Case-control study	Previous preeclampsia and maternal medical history were	Women with a history of preeclampsia require closer antenatal	EMBRIO: Jurnal Kebidanan, 14(1), 1–8

	Center Surabaya: Case-Control Study		identified as important risk factors for preeclampsia .	monitoring because of their increased risk of recurrence.	
Lestari et al. (2025)	The Relationship Between Preeclampsia Risk Factors and the Incidence of Low Birth Weight Babies at Arun Lhokseumawe Hospital	Cross-sectional study	Preeclampsia and its maternal risk factors were associated with a greater likelihood of low birth weight.	Preeclampsia may adversely affect fetal growth and birth outcomes.	MIHHICo Proceedings, 5(1), 492–496
Amir et al. (2024)	Relationship Between History of Hypertension and the Incidence of Preeclampsia-Eclampsia in Pregnant Women	Narrative literature review	The reviewed evidence consistently indicated that chronic or previous hypertension increases the risk of preeclampsia -eclampsia.	A history of hypertension is an important medical risk factor that should be detected early during antenatal care.	Jurnal EduHealth, 15(4), 319–329
Ungang and Azlina (2025)	Implementation of Foot Massage Therapy on Mrs. F with Preeclampsia During Pregnancy in Sungai Kitano Village, East Martapura District	Case report/pre-experimental intervention	Foot massage was associated with relaxation and a reduction or stabilization of blood pressure in a pregnant woman with preeclampsia .	Foot massage may be used as a complementary intervention, although evidence from a single participant cannot be generalized.	Journal of Health, 4(1), 43–47
Wulandari et al. (2021)	Risk Factors of Preeclampsia with Severe Features and Its Complications	Observational analytic case-control study	Maternal and clinical characteristics were associated with complications among women with severe-feature	Early identification of risk factors is necessary to prevent complications in women with severe preeclampsia.	Indonesian Midwifery and Health Sciences Journal, 5(1), 29–37

			preeclampsia.		
Aqilah et al. (2024)	Profile and Pregnancy Outcome in Preeclampsia with and Without Cardiac Abnormalities Complication	Observational comparative study	Women with preeclampsia accompanied by cardiac abnormalities experienced more complex maternal and pregnancy outcomes.	Cardiac assessment should be included in the clinical management of women with preeclampsia.	Indonesian Journal of Obstetrics & Gynecology Science, 7(3)
Agustin et al. (2025)	Determinants of Preeclampsia in Pregnant Women	Observational study requires confirmation	The article was reported to examine hypertension, body mass index, lifestyle, and maternal characteristics as determinants of preeclampsia.	Preeclampsia is influenced by interacting maternal, medical, and lifestyle factors.	Reported as Journal of Mother and Child Health Concerns; original source must be verified
Silaban and Situmorang (2025)	Faktor Risiko Maternal yang Memengaruhi Kejadian Preeklamsia di RSU Rahmad Hidayah Provinsi Sumatera Utara	Cross-sectional study	Maternal characteristics and previous medical conditions were associated with the occurrence of preeclampsia.	Maternal risk profiling can support the early detection and prevention of preeclampsia.	Indonesian health journal; complete volume and page details must be confirmed
Tonasih and Kumalasary (2020)	Analysis of Determinants Associated with Severe Preeclampsia in Pregnant Women	Observational analytic study	Maternal age, parity, nutritional status, hypertension history, and antenatal characteristics were evaluated as determinants of severe preeclampsia.	Severe preeclampsia results from multiple interacting maternal and obstetric factors.	Jurnal SMART Kebidanan, 7(1)

Permadi et al. (2022)	Profile of Pregnant Women with Preeclampsia and Its Termination Method	Descriptive cross-sectional study	Severe hypertension, proteinuria, and visual disturbances were frequently found, while cesarean section was commonly selected as the mode of delivery.	The severity of preeclampsia influences pregnancy management and the method of pregnancy termination.	Majalah Obstetri & Ginekologi, 30(1), 10–16
Insani et al. (2024)	Education on the Signs and Symptoms of Preeclampsia and Its Prevention in Pregnant Women	Community education/pre-experimental activity	Health education improved pregnant women's understanding of the signs, symptoms, and prevention of preeclampsia.	Education may strengthen awareness and encourage earlier healthcare-seeking behavior among pregnant women.	Natural: Jurnal Pelaksanaan Pengabdian Bergerak Bersama Masyarakat, 2(1), 45–54
Aulia (2025)	Factors Causing Eclampsia in Pregnant Women	Cross-sectional study requires confirmation	Maternal age, body mass index, lifestyle, and previous obstetric conditions were reported as factors associated with eclampsia.	Eclampsia is influenced by maternal and medical risk factors, although the source and study details require verification.	Reported as JKA, 2(2), 306–312; original article must be confirmed
Hatini et al. (2025)	Analisis Faktor Risiko Kejadian Preeklampsia pada Ibu Hamil Trimester III di Faskes Wilayah Kota Palangka Raya	Observational analytic study	Maternal demographic, reproductive, and medical factors were associated with third-trimester preeclampsia.	Antenatal screening should focus on maternal risk factors to support early detection of preeclampsia.	Jurnal Forum Kesehatan, 15(1), 28–41
Fahriani et al. (2025)	Analisis Faktor-Faktor Terjadinya Kasus Preeklamsi	Observational analytic study	Maternal age, parity, hypertension history, nutritional	Primary healthcare services should systematically	Jurnal Surya Medika, 11, 7–18

	pada Ibu Hamil di Wilayah Kerja PKM Perawatan Satui		status, and lifestyle were evaluated as factors associated with preeclampsia .	identify maternal risk factors during antenatal care.	
Aziza et al. (2022)	Hubungan Usia dan Paritas dengan Kejadian Preeklampsia pada Ibu Bersalin	Cross-sectional study	Maternal age and parity were significantly associated with the occurrence of preeclampsia among women giving birth.	Age and parity should be considered in the initial screening of pregnant women at risk of preeclampsia.	Fakumi Medical Journal, 2(4), 280–287

In journal 1, research conducted by Caecaria E, Andani G, Aziz MA, Mose JC (2022) entitled Risk Factors of Preeclampsia at Dupak Public Health Center Surabaya: Case Control Study. The advantage is that by comparing two groups consisting of a case and control group, this will certainly provide a specific picture of the incidence of preeclampsia in pregnant women. While the disadvantages are that the chosen method is susceptible to bias (especially recall bias and selection bias), it is difficult to determine the temporal relationship of cause and effect (retrospective), and is not suitable for rare exposures. This shows that this journal is in accordance with the title the researcher chose in compiling this proposal (Caecaria et al., 2022). In the journal 2 study conducted by Rifka Alkhilyatul Ma'rifat, I Made Suraharta IIJ (2024) entitled "The Relationship Between Preeclampsia Risk Factors and the Incidence of Low Birth Weight (LBW) Babies at Arun Lhokseumawe Hospital," the advantage of this study is that it uses a quantitative approach with a cross-sectional study design to analyze the relationship between preeclampsia risk factors and the incidence of low birth weight (LBW) babies at Arun Lhokseumawe Hospital, thus producing more significant results. However, the disadvantage of this study is that the results cannot confirm whether the exposure occurred before the disease, because they were measured simultaneously. (Rifka Alkhilyatul Ma'rifat & I Made Suraharta Iij, 2024). In the journal 3 study conducted by Azizah N, Amir R, Fujiko M, Handayani K, Studi P, Dokter P, et al. (2024) entitled "Relationship Between History of Hypertension and the Incidence of Preeclampsia-Eclampsia in Pregnant Women," the advantage is that this study is a literature review with a narrative review design. This method is used to identify, study, evaluate, and interpret all available research. Using this method, a systematic review and identification of journals can be conducted, each process following established steps or protocols, and during the research process, there is no need to go into the field. This study also uses the PICO method in literature searches. A weakness in this study is that if there is a misunderstanding of the context of the original source, it can lead to analytical errors (Azizah et al., 2024).

In the fourth study conducted by Ungang RA and Azlina FA (2022), entitled "Implementation of Foot Massage Therapy on Mrs. F with Preeclampsia During Pregnancy in Sungai Kitano Village, East Martapura District," the advantage is that the researchers previously implemented a treatment intervention, resulting in the data obtained being analyzed and explained simply before and after the intervention. Then, they presented it as a diagram. This makes it easier for

others to read the research results and meets the criteria set in this study. However, the previous study has disadvantages, namely the small number of respondents and not all pregnant women are suitable for the chosen method and therapy (Ungang & Azlina, 2022).

In the fifth study conducted by Wulandari ES, Ernawati E, Nuswantoro D (2021), entitled "Risk Factors of Preeclampsia With Severe Features and Its Complications," the advantage is that this study used an observational analytical method with a case-control design. The sampling technique was simple random sampling. The number of samples in this study was 80, with 40 samples in each group. The case group consisted of severe preeclampsia with one complication, and the control group consisted of severe preeclampsia without complications. The statistical analysis used was chi-square and multiple logistic regression analysis, which met the criteria in this study. However, this study has a weakness, namely the tendency to experience biased results; sometimes not all pregnant women with an obese BMI experience preeclampsia (Wulandari et al., 2024).

In the journal 6, a study conducted by Aqilah NS, Pribadi A (2024), entitled "Profile and Pregnancy Outcome in Preeclampsia with and Without Cardiac Abnormalities and Complications," provides crucial insights into how cardiac complications exacerbate preeclampsia and fills a gap in the literature by directly comparing patients with pure preeclampsia with those with additional cardiac abnormalities. The drawback is that in several publications related to this title, the number of patients with heart complications is often very small (for example, only 10 people out of 78 samples) (Aqilah et al., 2024).

In journal 7, research conducted by Agustin NR, Marlina M, Sastri IGAMW, Sari AJ (2025) entitled Determinants of preeclampsia in pregnant women. This research often refers to population-based or clinical studies in a specific region and focuses on the triggering factors for preeclampsia. It successfully determines which factors have the highest Odds Ratio (OR) (for example, a history of hypertension or obesity) and is very helpful in determining screening priorities in primary health care (Puskesmas). However, it also has the disadvantage of not being able to prove a temporal cause-and-effect relationship (whether the determinant appears before preeclampsia or vice versa) and is susceptible to selection bias if sampling is only conducted at one hospital. (Agustin et al., 2025).

In a study conducted by Silaban MA and Situmorang DM (2025), entitled "Maternal Risk Factors Affecting the Incidence of Preeclampsia at Rahmad Hidayah General Hospital, North Sumatra Province," an analysis of the determinants of severe preeclampsia is crucial for reducing maternal mortality (MMR). This type of research typically uses an observational study design, such as a case-control or cross-sectional study. The advantage is that it helps map specific variables (age, obesity, medical history) and provides a baseline for early detection in pregnant women. However, it also has disadvantages: medical records are often incomplete or inconsistent, and hidden variables that influence outcomes are not examined (Permadi et al., 2022).

In a study conducted by Tonasih T and Kumalasary D (2020), a 9-year-old woman, "Analysis of Determinants Associated with Severe Preeclampsia in Pregnant Women," appears to be a misreading of the research. The strength of this study is that it explains the main maternal risk factors influencing the incidence of preeclampsia, including maternal age (too young/too old), parity (especially primiparous), obesity (high BMI), history of hypertension, and adherence to and quality of antenatal care (ANC). This aligns with the established criteria for this study, which describe the factors influencing preeclampsia. However, this study has limitations: studies are often cross-sectional, capturing only a single point in time, making it difficult to determine a definitive cause-and-effect relationship. The use of consecutive sampling or purposive sampling carries the risk of introducing selection bias compared to random sampling (Insani et al., 2024).

In the journal 10, a study conducted by Permadi V, Aditiawarman A, and Lestari P, entitled "Profile of pregnant women with preeclampsia and its termination method" (2022), used a cross-sectional method for descriptive analysis. The total sample consisted of 75 pregnant women with preeclampsia. The sampling technique used was purposive sampling. This study uses additional data in the medical records of preeclamptic mothers who gave birth at Taman Husada Regional Hospital, Bontang, Indonesia, in 2019. This is also in accordance with this study, however, this study also has shortcomings, namely that the data is not standardized, such as variations in filling out medical records by different health workers, which can make data analysis difficult, especially when comparing data over time or between hospitals (Hatini et al., 2025).

In Journal 11, a study conducted by Insani U, Ni'mah J, and Ratnaningsih A (2024) was titled "Education on the Signs and Symptoms of Preeclampsia and Its Prevention in Pregnant Women." The advantage of this community service program is that it aims to increase the knowledge of pregnant women, enabling them to understand the signs and symptoms and prevention of preeclampsia early on. It is hoped that pregnant women can take preventive measures early in pregnancy, ensuring the health of both mother and baby. The method used in this community service program was to provide education/counseling on the signs and symptoms of preeclampsia and its prevention. Participants were pregnant women in the Lebaksiu Kidul area of Tegal Regency. The disadvantage is that not all pregnant women responded well to the education provided, and the number of respondents was limited (Aulia, 2025).

In Journal 12, Hatini wrote, "Analysis of Risk Factors for Preeclampsia in Third Trimester Pregnant Women at Health Facilities in Palangka Raya City." (2022). The advantages are Practical Educational Media: Usually using visual aids such as leaflets or flipcharts, which makes it easier for pregnant women with low educational backgrounds to understand the material. Community Approach: Involving health cadres and the surrounding community, thus creating a support system for pregnant women in the area. The disadvantages are that one-time education is often not enough. Without ongoing support, maternal compliance with antenatal care (ANC) can decline again after the activity is completed. (Fahriani et al., 2025).

In Journal 13, Aulia (2025) research entitled Factors Causing Eclampsia in Pregnant Women. The advantages are that this study focuses on Critical Conditions: Researching eclampsia is very important because the maternal mortality rate (MMR) due to seizures is much higher than that of preeclampsia. The disadvantages are Small Sample Size: Because eclampsia is a late complication, the number of cases is usually fewer than preeclampsia. This limits statistical power in generalizing the data. Lack of Longitudinal Data: Postpartum maternal follow-up is often not followed up, so the long-term impact of eclampsia is poorly understood. (Aziza et al., 2022).

In Journal 14, a study conducted by Fahriani F, Salmarini DD, Hakim AR, Lestari YP (2025) entitled Analysis of Factors Causing Preeclampsia Cases in Pregnant Women in the Satui Community Health Center (PKM) Work Area. The advantages are: Focus on Primary Care: Research in the Community Health Center (PKM) work area is crucial, as this is where early detection of preeclampsia is first carried out to prevent maternal death; and Clear Methodology: Using an analytical study design (such as case-control or cross-sectional) that allows researchers to compare risk factors between mothers who experience preeclampsia and those who do not. The disadvantages are: Limited Medical Record Data: Research at Community Health Centers often relies on complete medical record data. If the recording is incomplete (e.g.: pre-pregnancy weight or height is not recorded), the BMI (Body Mass Index) factor analysis may be inaccurate.

In Journal 15, a study conducted by Aziza Andi NM, Sri Wahyuni Gayatri K, Dwi Pramono S, Isnaini A, Sari Dewi A, Aman A, et al (2022). With the title The Relationship Between Age and Parity with the Incidence of Preeclampsia in Mothers Giving Birth. The advantage is that the method used to measure Preeclampsia is one of the main causes of maternal death in Indonesia. This study provides local data that supports early prevention efforts. And Measured Variables: Using objective "Age" and "Parity" variables, making it easier for health workers to conduct initial screening on pregnant women. And the disadvantage is that as a student journal, this study is most likely conducted within the scope of one hospital or certain region, so generalizing the results to a national scale needs to be done carefully. Limited Variables: The study only focuses on age and parity. Other important risk factors such as obesity (BMI), history of hypertension, and diet are not always discussed in depth as the main variables in one title.

Conclusion

Based on various literature reviews on the factors influencing the occurrence of preeclampsia in pregnant women, the main conclusions can be summarized as follows: Preeclampsia is multifactorial, meaning it is not caused by a single factor, but rather a combination of biological conditions, medical history, and maternal demographic characteristics. Medical and Reproductive Factors (Most Dominant) such as History of Hypertension & Preeclampsia: Mothers who have experienced preeclampsia in a previous pregnancy or have chronic hypertension are at the highest risk. Primigravida (First Pregnancy): A mother's body that has never been exposed to fetal/placental antigens before tends to be more susceptible to immune maladaptation. Comorbidities: Conditions such as Diabetes Mellitus, obesity (high BMI), and kidney disease increase the workload of blood vessels. Demographic Factors such as Age Extremes: Pregnant women aged <20 years (immature reproductive organs) and >35 years (decreased degenerative function of blood vessels) show a significant incidence of preeclampsia. Family History: The presence of genetic factors from a mother or sibling who has had preeclampsia increases susceptibility and Other Supporting Factors such as Multiple Pregnancy (Gemelli): A greater placental burden increases the risk of perfusion disorders and Lifestyle: Lack of physical activity, high stress, and a high sodium/low calcium diet contribute to blood vessel stiffness.

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