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The correlation between anemia, body mass index, parity, family history of preeclampsia with the onset of preeclampsia literature review analysis

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ARTICLE INFO	ABSTRACT
<i>Article history:</i> Received Sep 8, 2024 Revised Sep 11, 2024 Accepted Sep 17, 2024 <i>Keywords:</i> Anemia Body Mass Index Parity Family History Of Preeclampsia Onset Of Preeclampsia	Introduction: preeclampsia is a common problem that is feared by pregnant women. Preeclampsia is one of the highest causes of maternal mortality in Indonesia. In the last 2 decades, there has been no significant decrease in the incidence of preeclampsia in Indonesia. Of all these cases, several risk factors were found, such as anemia (26%), obesity (10%), and chronic hypertension (8%), parity and family history of preeclampsia. Objective: a literature review study to determine the relationship between anemia, BMI, parity and family history of preeclampsia with the incidence of preeclampsia. Method: Literature review study for collecting scientific data, anemia, body mass index, family history of eclampsia and parity with the onset of preeclampsia. Data collection was carried out through a search of the Google Scholar Database, Crossref, Researchgate with keywords, anemia *OR* body mass index *OR* family history of eclampsia *OR* parity *OR* incidence of preeclampsia. Inclusion criteria in data collection include articles published in journals in 2021-2024, national and international journals, population and sample are pregnant women with preeclampsia. The flow of scientific article selection is depicted in the form of a PRISMA Diagram. Results: Based on the results of the database search, 30 out of 1937 articles were obtained from 3 Google Scholar databases, Crossref, researchgate, as many as 4 international articles and as many as 26 national articles, with the number of each factor, namely parity as many as 16 articles, body mass index (BMI) as many as 12 articles, anemia as many as 6 articles and family history of preeclampsia as many as 2 articles. Conclusion: Anemia, Body Mass Index, Parity and Family History of Preeclampsia are significant factors in the occurrence of preeclampsia in pregnant women. <i>This is an open access article under the CC BY-NC license.</i> 

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INTRODUCTION

Pregnancy is something that is highly anticipated by couples in a household, even for some people, pregnancy is an indicator of success in a household. During the pregnancy process, not all mothers have good pregnancy conditions, pregnancy has risks for both the fetus and the mother herself. One of the risks of pregnancy that can occur is preeclampsia. According to WHO, preeclampsia is one of the leading causes of maternal and perinatal mortality and morbidity in the world. Preeclampsia is one of the most prominent hypertensive disorders because of its impact on maternal and newborn health. Preeclampsia is common in the 20–29 year age group, those who have completed basic education, have informal jobs, are multigravida, and multipara (Anto et al., 2023). This disease accounts for 2% to 8% of pregnancy-related complications, more than 50,000 maternal deaths, and more than 500,000 fetal deaths worldwide (Karrar SA, Martingano DJ, Hong PL. Preeclampsia. [Updated February 25, 2024]. Hypertensive disorders of pregnancy affect approximately 10% of all pregnant women worldwide. In 2020, approximately 287,000 women died during and after pregnancy and childbirth and as many as 800 women die every day related to pregnancy and childbirth with a ratio of 1 per 100,000 live births. Approximately 95% of all maternal deaths occur in low- and lower-middle-income countries (WHO, 2024).

Preeclampsia is one of the highest causes of maternal mortality in Indonesia. The incidence of preeclampsia in Indonesia is 128,273 cases per year or approximately 5.3% of all pregnant women (POGI, 2016). In the last 2 decades, no there is a significant decrease in the incidence of preeclampsia in Indonesia. Epidemiological data on preeclampsia in Indonesia is also widely known through research in major hospitals throughout Indonesia. A retrospective cohort study in 2016 in seven referral hospitals in Medan, Bandung, Semarang, Solo, Surabaya, Bali, and Manado found 1,232 cases of preeclampsia in 1 year. Of all these cases, several risk factors were found such as anemia (26%), obesity (10%), and chronic hypertension (8%). Maternal death was reported in 2.2% of cases, while the perinatal mortality rate reached 12%.

RESEARCH METHOD

This study uses a literature review method to collect scientific data, anemia, body mass index, family history of eclampsia and parity with the onset of preeclampsia. Data sources obtained from secondary data from journals and relevant scientific research. Data collection was carried out through a search of the Google Scholar Database, Crossref, Researchgate with keywords, anemia *OR* body mass index *OR* family history of eclampsia *OR* parity *OR* incidence of preeclampsia. Inclusion criteria in data collection include articles published in journals in 2021–2024, national and international journals, the population and sample are pregnant women with preeclampsia. The flow of selecting scientific articles is depicted in the form of a PRISMA Diagram in Figure 1 below.

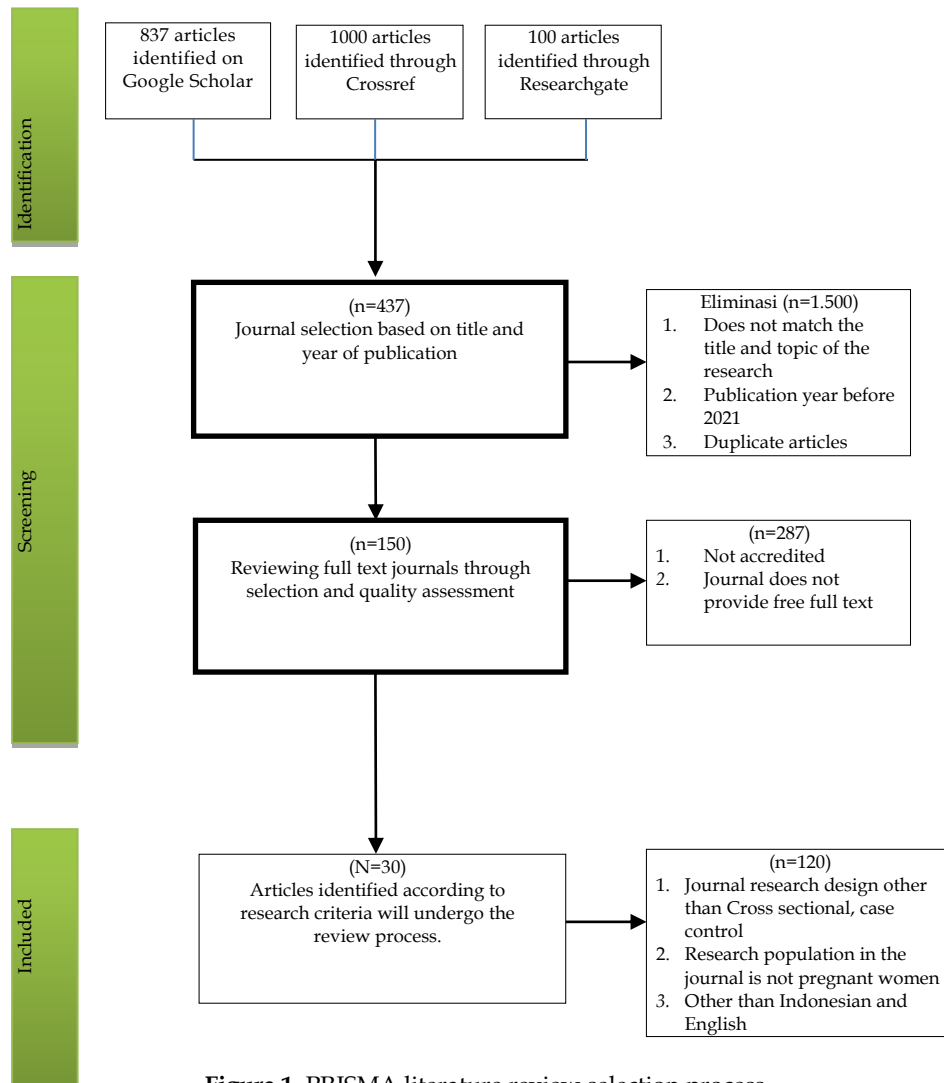


Figura 1. PRISMA literature review selection process

RESULTS AND DISCUSSIONS

Based on the results of the Google Scholar database search, 10 articles were found that met the inclusion criteria from 837 articles that appeared according to the specified search keywords. The results of the Crossref database search found 15 articles that met the inclusion criteria from 1000 articles that matched the search keywords. The search results using the researchgate database obtained 5 articles that met the criteria from 100 articles that appeared according to the search keywords. The number of articles received according to the inclusion criteria was 30 journal articles, 4 international articles and 26 national articles, with the number of each factor, namely parity as many as 16 articles, body mass index (BMI) as many as 12 articles, anemia as many as 6 articles and family history of preeclampsia as many as 2 article.

Table 1. Journal review

No	Author, Year, Journal	Methods, Samples, Statistical Test	Research Result	Conclusion
1	- (Erisa Yuniardiningsih,	- Quantitative method, analytical observation with	-The results of BMI with the incidence of preeclampsia	- There is a relationship

No	Author, Year, Journal	Methods, Samples, Statistical Test	Research Result	Conclusion
	2022) - Medical Journal Of Al-Qodiri Jurnal Keperawatan Dan Kebidanan	case control design. - Sample size of 33 people - Chi square test analysis	showed a sig p value of 0.08 > 0.05.	between BMI and the incidence of preeclampsia.
2	- (Purnama et al., 2021) - Jkm (Jurnal Kebidanan Malahayati)	- Quantitative research, analytical survey research design, and cross-sectional approach, - Population and sample of pregnant women at the Korpri Health Center in 2019 - Data analysis using chi-square	- The results of the chi square test obtained a p-value = 0.000 (< 0.05).	- There is a relationship between weight gain in pregnant women and the incidence of preeclampsia.
3	- (Dasarie et al., 2023) - Jurnal Ilmiah Universitas Batanghari Jambi	- Analytical survey method with a cross-sectional approach with a population of 1624 and a sample of 94 pregnant women. - Chi square data analysis with p value ≤ α value (0.05)	- Age p value = 0.031, from - parity p value = 0.032, - obesity p value = 0.000.	- There is a relationship between parity, obesity and the incidence of preeclampsia.
4	- (Latipah et al., 2023) - Jurnal Ilmiah Keperawatan Indonesia (JIKI)	- Quantitative research type with cross sectional design. Research sample of 93 taken using - Analysis using chi square test, and multivariate using logistic regression	- Chi-square test results with p-values for age (p-value=0.000), BMI (p-value=0.002), and Parity (p-value=0.003).	- There is a relationship between age, BMI, and parity with the incidence of preeclampsia in pregnant women.
5	- (Pramesti et al., 2024) - Jurnal Sehat Indonesia	- Quantitative analytical observational research design with a sample size of 107 respondents. - Data analysis using ChiSquare	- parity (p=0.000), - history of hypertension (p=0.000), - body mass index (p=0.034)	- There is a relationship between parity, history of HT and BMI with the incidence of preeclampsia.
6	- (Rezeki et al., 2022) - Prepotif : Jurnal Kesehatan Masyarakat	- Quantitative research type with analytical survey method and cross sectional approach, with a sample size of 99 respondents.	- The results of the chi-square statistical test for the obesity variable obtained a ρ value (0.05<0.001)	- There is a significant relationship between diabetes mellitus, obesity and history of hypertension with the incidence of preeclampsia.
7	- (Novia Rita Putri, Eka Fitri Amir, 2023) - Jurnal Menara Medika	- The research design is comparative with systematic random sampling technique. - The sample in this study was pregnant women with preeclampsia as many as 100 samples who met the inclusion criteria.	- Chi Square sig P value 0.000 < 0.05 - The average hemoglobin level of pregnant women with preeclampsia is 12.21 g/dL, and severe preeclampsia reaches 13.83 g/dL.	There is a difference in hemoglobin levels with the incidence of preeclampsia, the higher the hemoglobin level, the higher the incidence of preeclampsia.
8	- (Amelia & Herlina, 2022) - JOurnal Of Midwifery Science	- Analytical survey research with a cross-sectional approach. The number of samples is 111 people. - Analysis using the chi square	- BMI (Body Mass Index) results with p-value = 0.000 - Pregnancy interval (p-	There is a significant relationship between BMI, pregnancy interval and history of HT with the incidence

No	Author, Year, Journal	Methods, Samples, Statistical Test	Research Result	Conclusion
		test at a 95% confidence level ($\alpha = 0.05$)	value = 0.02), History of hypertension (p value = 0.017)	of preeclampsia.
9	- (Suryatini et al., 2022) - Journal Of Public Health Inovation	- Descriptive analytical research method with Cross Sectional design. The subjects of the study were 313 pregnant women respondents using purposive sampling techniques. - Analysis using (Chi-Square) and (Logistic Regression).	- parity obtained p value 0.593 > 0.05. - age (p value of 0.023 < 0.05) - Education (p value 0.041 < 0.05) - pregnancy spacing (p value 0.027 < 0.05). - multiple pregnancy p value 0.137 > 0.05)	There is no relationship between parity, multiple pregnancy and history of preeclampsia with the incidence of preeclampsia in pregnant women.
10	- (Komalasari et al., 2021) - Jurnal: Jurnal Aisyah: Jurnal Ilmu Kesehatan	- Quantitative research type with cross sectional approach. The subjects of the study were pregnant women who were treated in the hospital in the period of 2019, as many as 513 people and a sample of 225 - Chi square analysis	- - age (p-value = 0.000 : OR 3.880), and parity (p-value = 0.000 : OR 3.848)	There is a relationship between age, parity and the incidence of preeclampsia.
11	- (Kuswandari, 2022) - Jurnal Ilmiah Kebidanan (<i>Scientific Journal of Midwifery</i>)	- This type of research is a cross-sectional survey. The population is all pregnant women who experience preeclampsia at the Sukodono Health Center, Lumajang Regency. - Multiple linear regression analysis	- The calculated T value of the pregnant mother's age is 3.448 > T table 2.051. - The calculated T value of parity is 2.380 > 2.051 - The regression coefficient is 0.413 4 1.3% while 58.7%	There is a significant relationship between parity and age with the incidence of preeclampsia.
12	- (Restiana et al., 2023) - Jurnal: Jurnal Ilmiah Ilmu Kesehatan	- Observational analytics with prospective design. The population of preeclampsia and normal pregnant women in August-November 2021 was 36 respondents in the case group and 36 respondents in the control group taken using purposive sampling technique. - Chi-Square statistical test.	- Hemoglobin results with preeclampsia p = 0.326 > 0.05. - Parity with preeclampsia p = 0.629 > 0.05	There is no influence between parity, hemoglobin levels and the incidence of preeclampsia.
13	- (Dewi Eka Maharani & Ocvita, 2023) - Jurnal Ilmiah Permas: Jurnal Ilmiah Stikes Kendal	- Type of observational analytical research with case control research design. The sample size was 100 pregnant women (50 cases and 50 controls) taken randomly (simple random sampling). - Data analysis using the Chi-Square test	- The statistical test results obtained age p-value 0.000, maternal medical history p-value 0.000, and history of hormonal contraceptive use p-value = 0.012, parity p-value = 0.656 with the occurrence of preeclampsia.	- There is a relationship between age, medical history, and history of hormonal contraceptive use with the incidence of preeclampsia, - There is no relationship between parity and the incidence of

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				preeclampsia in pregnant women.
14	-(Ramadona et al., 2022) -Jurnal: Jurnal Ilmiah Universitas Batanghari Jambi	- Quantitative research design with analytical survey method and cross-sectional approach. The research population in January-May 2021 was 718 mothers with a sample of 88 mothers taken randomly. - Univariate and bivariate analysis.	- Results of maternal age (Pvalue = 0.035), - parity (Pvalue = 0.035) and - gestational age (Pvalue = 0.004)	- There is a relationship between age, parity, and gestational age with the incidence of preeclampsia.
15	-(Rifaldi Rayi Dzikrulloh et al., 2023) -Jurnal: Medical Science	- Purposive sampling sampling technique, with 399 samples. - Research method with cross-sectional approach.	- The results of the analysis obtained a p value <0.05.	- There is a relationship between parity, parity interval, and maternal age with the incidence of preeclampsia.
16	-(Yuningsih, 2021) -Jurnal : ARTERI : Jurnal Ilmu Kesehatan	- Analytical research design with a cross-sectional approach. The population is all mothers giving birth in the delivery room of RSD Balung Jember amounting to 3594 in 2019. The number of samples is 97 respondents. - Data were analyzed using multiple logistic regression.	- age 0.019 and p value = 0.000 < 0.05 and - parity 0.019 and p value = 0.000 < 0.05	- There is a relationship between age and parity with preeclampsia.
17	-(Tarigan & Yulia, 2021) -Jurnal: Journal Of Health	- Analytical research design with cross sectional design. Sample of 88 respondents.	- parity value 0.015 < α 0.05.	There is a relationship between parity and the incidence of preeclampsia
18	- (Saputri Mayang Sari, 2021) - Jurnal: Cendekia Medika	- Analytical Research, Cross Sectional approach with a population of 1712 people. The number of samples is 324 respondents.	- The results obtained p value 0.000	There is a relationship between parity and the incidence of preeclampsia
19	- (Das et al., 2024) - Jurnal: Plos Global Public Health	- A cross-sectional observational study was conducted using NFHS-5 data (2019-21). Sample A total of 190,797 ever-married women aged 15-49 years who gave birth to a live baby in the last five years. - Analysis using logistic regression	- the prevalence of preeclampsia or eclampsia is significantly higher in pregnant women who do not have an adequate diet and do not consume iron tablets or syrup for at least 90 days during pregnancy. around 71.8% - 60% experience anemia (mild-40.9%, moderate-15.8% and severe-1.4%)	There is a correlation between consuming iron tablets in pregnant women as a trigger for preeclampsia/eclampsia.
20	-(English et al., 2015) - Jurnal: Jurnal Bidang Ilmu Kesehatan	- The type of research is case control. - The population is 1,896. The number of control samples is 272 mothers who experienced preeclampsia	- The results of the study showed that the parity factor that was at risk in the case group was 40.1% and in the control group 31.6%. The results of the chi square test obtained a p value of 0.049.	- There is a relationship between age, parity, education, history of preeclampsia and history of hypertension with the incidence of preeclampsia.
21	-(Kusuma &	- This study uses a cross-sectional	- There were 107 cases of	Age, parity, history of

No	Author, Year, Journal	Methods, Samples, Statistical Test	Research Result	Conclusion
	- Hidayat, 2023) - Jurnal: Jurnal Medika Malahayati	research design, descriptively with a non-random sampling research method.	preeclampsia, the prevalence of early onset preeclampsia cases was 90 cases (86%) and late onset preeclampsia cases were 15 cases (14%). The highest number of parities was in multipara, namely EOPE (85.5%) and LOPE (14.5%). A history of hypertension also occurred in cases of EOPE (86.4%) and LOPE (13.6%).	hypertension, history of preeclampsia, and history of antenatal care are risk factors for early onset preeclampsia.
22	- (Kusuma & Hidayat, 2023) - Jurnal: BMC Public Health	- Data of 180 respondents were collected prospectively from the Preeclampsia ward of Dhaka Medical College Hospital (DMCH), Bangladesh. - Chi-square test and Logistic regression (LR)	- results ($p < 0.05$)	Anemia is associated with the occurrence of preeclampsia
23	- (Nugraha et al., 2021) - Indones J Obstet Gynecol	- Methods: Case report. A case of a 23-year-old pregnant woman who experienced moderate anemia with severe preeclampsia at 38 weeks, evidenced by increased blood pressure, decreased hemoglobin, and proteinuria on urinalysis.	- Increased blood pressure 60/110 mmHg - decreased hemoglobin at level 7.3 g/dl - qualitative proteinuria test showing +4	- Anemia as a predisposing factor to the occurrence of preeclampsia.
24	- (Purwanti et al., 2021) - Jurnal Ilmiah Universitas Batanghari Jambi,	- This study uses a quantitative analytical survey research design with a Cross-sectional approach. - The population of the study was all pregnant women and the number of samples was 60 respondents.	- Chi-Square Hemoglobin p value 0.025 - Obesity p-value 0.025	- There is a significant relationship between hemoglobin levels, obesity and the incidence of preeclampsia in pregnant women.
25	- (Hinele et al., 2022) - Jurnal Ilmu Kedokteran Dan Kesehatan	- Observational analytical method, with a case control study design. - A sample of 61 people and 61 normal patients without preeclampsia and visited in 2020. - Analysis using the odds ratio test.	- Body Mass Index results with an odd ratio value of 5.784, - previous history of preeclampsia with an odd ratio value of 4.735, - maternal age with an odd ratio value of 2.751, - parity with an odds ratio of 1.550 (OR>1).	- Body mass index, previous history of preeclampsia, maternal age and parity are risk factors for preeclampsia.
26	- (Monalisa et al., 2022) - Jurnal Kesehatan Masyarakat	- The research is observational analytical with a cross-sectional approach. The number of samples is 82 respondents.	- Obesity results p value = 0.025, - primigravida p value = 0.019	The results of this study explain that there is a significant relationship between obesity, primigravida and maternal age with

No	Author, Year, Journal	Methods, Samples, Statistical Test	Research Result	Conclusion
		- The sampling technique is non-probability sampling with purposive sampling technique.	- age obtained p value = 0.015 smaller than α = 0.05.	the incidence of preeclampsia.
27	- (Peratama et al., 2023) - Jurnal Penelitian Perawat Profesional	- quantitative method with cross-sectional research design. - Sample of 98 respondents. - Data were analyzed using the chi-square test	- Age Results p-value = 0.000 - knowledge value p-value = 0.000. - attitude value p-value = 0.72 - obesity p-value = 0.007	There is a relationship between obesity, age, and knowledge with the incidence of preeclampsia.
28	- (Elga Caecaria Grahardika Andani et al., 2022) - EMBRIO: Jurnal Kebidanan	- Design with case control using primary data through google form. - Sample is mothers who have given birth at Dupak Health Center Surabaya totaling 75 people. - Chi square analysis and logistic regression	- chronic hypertension (AOR 5.12) - obesity (AOR 5.05) - previous history of preeclampsia (AOR 7.56) - family history of preeclampsia (AOR 5.19) - twin pregnancy (AOR 3.89)	History of preeclampsia, HT obesity is a factor of preeclampsia
29	- (Lady Aqnes Kurniawati, Muhammad Ilham Aldika Akbar, Budi Utomo, 2021) - Indian Journal of Forensic Medicine & Toxicology	- Analytical-observational study with a case-control approach. A total of 165 pregnant women. - Data were analyzed using logistic regression $p < 0.05$	- Family history of hypertension ($p = 0.000$), (OR: 3.374), - age ($p = 0.004$), (OR: 2.885), - BMI ($p = 0.000$) (OR: 2.590)	There is a relationship between history of HT, BMI, pregnancy interval and the incidence of preeclampsia.
30	- (Wu et al., 2021) - Jurnal: Int J Cardiol Hypertens	- The study used the Taiwan National Health Insurance Database from 1999 to 2013 collected. Preeclampsia was identified based on the diagnosis of index delivery in the hospital. The family aggregation pattern of preeclampsia was assessed and analyzed using the relationship recorded in the database with patients.	- A total of 768 preeclampsia events in mothers with a history of sororal preeclampsia ($n = 20,704$), which includes 1.3% of all preeclampsia events ($n = 60,314$). - Mothers with a history of sororal preeclampsia have a relative risk (RR) of 2.6, for preeclampsia - RR for gestational hypertension is 2.79	Family history of preeclampsia is a strong risk factor for maternal preeclampsia in Taiwan.

Anemia with Preeclampsia

According to WHO, 2022 In 2019, the global prevalence of anemia was 29.9% in women of reproductive age, equivalent to more than half a billion women aged 15-49 years. The prevalence

was 29.6% in women of reproductive age who were not pregnant, and 36.5% in pregnant women. In Indonesia, the prevalence of anemia in pregnant women is 44.2%. According to the results of the study (Mkama et al., 2024) Of the 435 pregnant women, 24.6% experienced anemia (1 in 4 pregnant women) and the causative factors were Not working (AOR = 2.45;), not married (AOR = 1.23), low wealth index (AOR = 9.19), difficulty accessing the nearest health facility (AOR = 5.40), and normal body mass index (AOR = 3.33) have a higher chance of experiencing anemia. However, not consuming iron supplements (AOR = 0.16), not being exposed to television (AOR = 0.35) coming from the southern region (AOR = 0.14), and low husband/partner education (AOR = 0.08) had a lower chance of experiencing anemia.

Based on the results of a literature review of 6 research journal articles, the results of 2 articles (Novia Rita Putri, Eka Fitri Amir, 2023; Restiana et al., 2023) with research results that anemia did not correlate with the incidence of preeclampsia and the results of research according to (Ali et al., 2024; Purwanti et al., 2021; Nugraha et al., 2021; Das et al., 2024) had a significant relationship between anemia and the incidence of preeclampsia. Anemia is related to the occurrence of preeclampsia, this occurs because the reproductive organs of mothers who are often pregnant and give birth will weaken and lose their flexibility, causing the blood flowing to the placenta to decrease and endothelial dysfunction occurs and causes preeclampsia. Hemoglobin levels in normal pregnant women are 11 g/dL in the first trimester and will decrease in the second trimester or mid-pregnancy. In the second trimester, the mother's hemoglobin levels drop below 10.5 g/dL. In the results of the study (Restiana et al., 2023) there were more respondents with hemoglobin values > 12-13 g/dl or did not experience anemia. This is an effort by the body's defense system to create an intravascular system with low viscosity that allows optimal circulation of red blood cells in the slow-speed placental circulation and a low-resistance system for the mother's left ventricle so as not to produce vasoconstriction.

Body Mass Index with Preeclampsia

Weight Gain according to Trimester of Pregnancy Trimester I (0-12 Weeks) between 0.7-1.4 kg. Trimester II (up to 28 weeks of pregnancy) between 6.7-7.4 kg. Trimester III (up to 40 weeks of pregnancy) 12.7-13.4 kg. The mother's weight before pregnancy and weight gain during pregnancy is less (underweight) or more (overweight) than normal will make the pregnancy risky. A mother who is underweight will be at risk of giving birth to a baby with a low birth weight or Low Birth Weight (LBW). While the mother's weight is excessive or very fast also risks bleeding or could be an early indication of pregnancy poisoning (preeclampsia) or diabetes. At first overweight, then high blood pressure, swollen feet, kidney problems, finally pregnancy poisoning. Based on the results of a literature review of Body Mass Index (BMI) from 12 research journal articles (Amelia & Herlina, 2022; Dasarie et al., 2023; Elga Caecaria Grahardika Andani et al., 2022; Erisa Yuniardiningsih, 2022; Kurnaesih, 2021; Latipah et al., 2023; Monalisa et al., 2022; Peratama et al., 2023; Pramesti et al., 2024; Purnama et al., 2021; Purwanti et al., 2021; Rezeki et al., 2022) the results of the study explain that there is a relationship between Body Mass Index and the incidence of preeclampsia. Increased BMI is associated with a tendency to develop hypertension, insulin resistance, diabetes mellitus, and affects chronic inflammatory conditions. Two-thirds of obese people are estimated to have insulin resistance, and obesity is also at risk for cardiovascular disease and type 2 diabetes mellitus. In general, obese women have a risk of developing preeclampsia three times higher than mothers who are of ideal weight and thin. Obesity is the accumulation of excess fat in the body. Obesity in pregnancy is associated with increased morbidity in mothers and babies and is at risk of developing preeclampsia. This is influenced by the mother's excessive diet which can cause pressure on the sympathetic nerves, causing increased blood pressure, obesity is one of the inhibiting factors in the kidneys to reabsorb sodium by the sympathetic renovascular nerves and mechanisms that can increase sodium and shift natriuresis pressure to the right so that the arteries must release higher salt intake which can cause high blood pressure.

Parity With Preeclampsia Incidence

Parity refers to the number of times a woman has delivered a baby of viable gestational age or fetal weight, regardless of the birth outcome (stillbirth or live birth). The parity of a nulliparous woman is a woman who has never given birth, although she may have had a miscarriage or pregnancy loss before 20 weeks of gestation. A woman who has given birth once before is primiparous, while a woman who has given birth twice or more previously is multiparous. Parity can act as an independent risk factor for obstetric complications including preeclampsia (Chambers et al., 2020).

Based on the results of the literature review of parity with the incidence of preeclampsia, 16 research journal articles were obtained, 14 articles were obtained with research results showing a significant relationship between parity and the incidence of preeclampsia (Dasarie et al., 2023; Dewi Eka Maharani & Ocvita, 2023; Komalasari et al., 2021; Kusuma & Hidayat, 2023; Kuswandari, 2022; Latipah et al., 2023; Monalisa et al., 2022; Pramesti et al., 2024; Ramadona et al., 2022; Rifaldi Rayi Dzikrulloh et al., 2023; Saputri Mayang Sari, 2021; Tarigan & Yulia, 2021; Yuningsih, 2021). There are 2 articles with research results that there is no relationship or influence between parity and the incidence of preeclampsia (Suryatini et al., 2022; Restiana et al., 2023). According to the immunological theory, hypertension occurs because blocking antibodies against placental antigens formed in the first pregnancy cause hypertension and pregnancy poisoning. In the majority of primigravida, pregnancy from 28 to 32 weeks shows an increase in diastolic pressure of at least 20 mmHg which can lead to preeclampsia in pregnancy.

Family History of Preeclampsia with Preeclampsia Incidence

Mothers who have a history of preeclampsia are 2 times more likely to experience preeclampsia than mothers who do not have a history of preeclampsia. Mothers with a family history of preeclampsia have a 3.692 times greater risk of developing preeclampsia than mothers without a family history of preeclampsia.

Based on the results of a literature review of 2 articles (Elga Caecaria Grahardika Andani et al., 2022; Rismawati et al., 2021) it is explained that there is a significant relationship between family history of preeclampsia and the incidence of preeclampsia. The results of this study are in line with research (Rahayu, 2019) explaining that there is a significant relationship between family history of preeclampsia and preeclampsia pregnancy with an OR of 2.59. and according to (Lalita, 2019) family history has a 3.8 times greater risk of preeclampsia. according to research results (Wu et al., 2021) Genetic problems affecting endothelial function and angiogenesis may be hereditary factors in the development of preeclampsia. Genetic polymorphisms that may be associated with preeclampsia. The most studied genes are those encoding angiotensinogen, angiotensin-converting enzyme, angiotensin II type I receptor, and endothelial nitric oxide synthase. No direct causative genetic defects have been associated with preeclampsia or eclampsia. Common environmental factors among family members may contribute to the familial aggregation pattern of preeclampsia and gestational hypertension. Sisters may have similar lifestyles in terms of activities, such as cooking, eating, hobbies, and sports, because these habits develop in childhood and can persist into adulthood even though the sisters no longer live together. Maternal age is an established risk factor for preeclampsia. the group with a positive sororal history was younger but had a 2.6-fold higher risk of preeclampsia compared to those with a negative sororal history. These findings suggest that although maternal age influences the risk of preeclampsia, it does not influence the pattern of familial aggregation. Women with a sororal history of preeclampsia are at higher risk of developing preeclampsia at all ages. Mothers without a sororal history are more likely to live in urban areas and less likely to live in suburban and rural areas, which may be a shared environmental factor associated with preeclampsia. Urban living may involve greater exposure to stress, pollution, and factors that prevent healthy sleep, all of which may contribute to more sporadic cases of preeclampsia. Women in suburban and rural areas are more likely to live with their parents and siblings. Therefore, sisters in these groups may tend to have similar habits and

lifestyles, and thus, this cohabitation effect may contribute to the incidence of preeclampsia in families.

CONCLUSION

Based on the results of the literature review, the factors of anemia, body mass index, parity and family history of preeclampsia are factors related to the occurrence of preeclampsia in pregnant women. The most dominant factor obtained from the results of the literature review is the parity factor of 16 journal articles, 14 journals with research results explaining that there is a relationship, 2 articles explaining that there is no relationship between parity and the occurrence of preeclampsia. The BMI factor of 12 journal articles with research results is related to the occurrence of preeclampsia.

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