

**RISK FACTORS OF PREECLAMPSIA AMONG PREGNANT WOMEN ATTENDING AL-BATOOL AND AL-KANSAA TEACHING HOSPITALS IN MOSUL CITY. A CASE CONTROL STUDY**<sup>1\*</sup>Dr. Amina Mamon Akram Alsawaf, <sup>2</sup>Dr. Nadia Tareq Zaidan, <sup>3</sup>Dr. Rakan A. Hamed<sup>1</sup>M.B.Ch.B/ F.A.B.H.S.<sup>2</sup>M.B.Ch.B/ F.A.B.H.S.<sup>3</sup>M.B.Ch.B/ F.I.C.M.S/ FM.

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**ABSTRACT**

**Background:** Preeclampsia is a multisystem hypertensive disorder of pregnancy and a major cause of maternal and perinatal morbidity and mortality worldwide. Identification of risk factors is essential for early detection and prevention, particularly in low-resource settings. **Objectives:** To identify the risk factors of preeclampsia among pregnant women attending Al-Batool and Al-Kansaa Teaching Hospitals in Mosul city. **Methods:** A hospital-based case-control study was conducted over six months from October 2023 to April 2024. A total of 200 pregnant women beyond 20 weeks of gestation were included, comprising 100 cases diagnosed with preeclampsia and 100 controls without the condition. Data were collected using a structured questionnaire covering sociodemographic, obstetric, and medical variables. Statistical analysis was performed using SPSS version 26, with odds ratios (OR) and 95% confidence intervals (CI) calculated. A p-value  $\leq 0.05$  was considered statistically significant. **Results:** Significant risk factors for preeclampsia included previous history of preeclampsia (OR = 137.05), followed by long interpregnancy interval (OR = 29.61) and chronic hypertension (OR = 14.52). Advanced maternal age (35–39 years) also showed a strong association (OR = 15.54), while positive family history of preeclampsia (OR = 8.43) and hypertension (OR = 4.29) were significant contributing factors. Nulliparity (OR = 5.27) and grand multiparity (OR = 3.98) were also significantly associated with preeclampsia. Younger maternal age (14–19 years) showed a moderate but significant risk (OR = 3.85). In contrast, short interpregnancy intervals (<2 years) demonstrated a protective effect. No significant associations were observed with occupation, diabetes mellitus, renal disease, multiple pregnancy, or gestational diabetes. **Conclusions:** Preeclampsia is a multifactorial condition associated with several identifiable risk factors. Early identification of high-risk women and strengthening antenatal care services are essential to reduce maternal and perinatal complications.

**KEYWORDS:** Chronic hypertension, Interpregnancy interval, Mosul, Parity, Preeclampsia, Pregnancy, Risk factors.

**1- INTRODUCTION**

Preeclampsia is a pregnancy-related multisystem hypertensive condition characterized by the start of hypertension after 20 weeks of gestation, along with proteinuria and/or maternal organ failure.<sup>[1]</sup> It remains one of the most dangerous pregnancy problems, accounting for a considerable proportion of maternal and perinatal morbidity and mortality globally.<sup>[2,3]</sup>

Preeclampsia affects roughly 2-8% of all pregnancies worldwide and accounts for a significant proportion of maternal mortality, particularly in low- and middle-income countries.<sup>[4]</sup>

Despite advances in obstetric care, the specific cause of preeclampsia is not fully understood. It is commonly recognized as a complex disorder that includes abnormal

placentation, endothelial dysfunction, and systemic inflammatory responses.<sup>[5]</sup> The placenta plays an important part in the pathogenesis, with poor trophoblastic invasion leading to decreased uteroplacental perfusion and consequent maternal vascular dysfunction.<sup>[6]</sup> In addition, endometrial cancer accounts for 92% of uterine cancer cases and is the most often diagnosed malignancy in women. More than 90% of postmenopausal women diagnosed with endometrial cancer have postmenopausal bleeding (PMB).<sup>[7]</sup>

Identifying risk factors is critical for early detection, prevention, and effective preeclampsia care. Several maternal, fetal, and environmental variables have been consistently linked to higher risk.<sup>[8]</sup> Maternal risk factors include primigravidity, advanced maternal age ( $\geq 35$  years), obesity, and a family history of preeclampsia. Pre-existing medical problems, such as chronic hypertension, diabetes, renal disease, and autoimmune disorders, considerably enhance susceptibility.<sup>[9]</sup>

Multiple pregnancy, history of preeclampsia, and long inter-pregnancy intervals are all strongly associated with recurrence and increased disease severity.<sup>[10]</sup> In addition, socioeconomic and lifestyle factors play an important effect, especially in emerging countries.<sup>[11]</sup> Limited access to maternity care, low socioeconomic position, poor nutrition, and elevated psychological stress have all been related to a higher risk of preeclampsia.<sup>[12]</sup> Emerging data also reveals links with environmental and inflammatory diseases, highlighting the complex nature of the condition.<sup>[13]</sup> Given the serious complications associated with preeclampsia, such as eclampsia, HELLP syndrome, premature birth, and fetal development restriction, early detection of high-risk women is critical. Case-control studies are especially useful for identifying and quantifying these risk factors in specific populations where demographic and healthcare variables might differ.<sup>[14]</sup>

In Iraq, particularly in Mosul, data on the epidemiology and risk factors of preeclampsia are limited. Local hospital-based studies are critical for understanding regional drivers and developing population-specific preventive measures. Therefore, this study aims to investigate the risk factors of preeclampsia among pregnant women attending Al-Batool and Al-Kansaa Teaching Hospitals in Mosul city using a case-control design.

## 2-PATIENTS AND METHODS

This is case control study conducted in 2 main maternity hospital in Mosul city at Al- Batool and Al- Kansaa Teaching Hospital during six months period from 1<sup>st</sup> of October 2023 to the 1<sup>st</sup> of April 2024.

The study include 200 pregnant women who passed 20 weeks of gestation attend Al-Batool & Al- Kansaa Teaching Hospital, 100 of them were diagnosed as a

cases of preeclampsia (cases diagnosed by gynecologist according to blood pressure & proteinuria). The other 100 pregnant women were control subjects, in whom evaluation proved not to have preeclampsia.

A questionnaire form was specially prepared in order to collect all the relevant information related to the study sample including; Patients' age, occupation, education (illiterate- primary- secondary- intermediate & high), gravida, parity & abortion, last menstrual period, weeks of gestation according to LMP/early ultrasound result, medical history of hypertension, chronic renal disease, DM, gestational diabetes, rheumatoid arthritis and antiphospholipid syndrome, inter pregnancy interval, presence of multiple gestation, age at which 1<sup>st</sup> pregnancy occur, past history of preeclampsia & PIH with family history of hypertension and/ or preeclampsia, and smoking, examination & investigations were fundal height, blood pressure, and protein in urine.

Data analysis were carried out using of Microsoft Office Excel software programs. Data analysis was conducted using the Statistical Package for Social Sciences (SPSS) version 26. Continuous variables were presented as mean  $\pm$  standard deviation, while categorical variables were reported as frequencies and percentages. Relevant statistical tests were applied as appropriate, with a p-value of  $\leq 0.05$  considered indicative of statistical significance. Odds ratio (OR) was calculated by using two by two table, the interpretation of the value of odds ratio was as following, if OR =1 it means that the exposure is not related to the disease. when OR > 1, then this indicates that the exposure is positively related to disease. If OR < 1, it means that the exposure is negatively related to the disease or protective, with 95% confidence interval (CI) for the results.

An official agreement was obtained from the MOH and DOH in Mosul before conduction of the present study. A verbal consent was taken from the patients who included in the study.

## 3-RESULTS

During the six months period spent for data collection, a total sample of 200 pregnant women were collected, 100 women for each sample of cases and controls.

Characteristics related to occupation, level of education are shown in table (3.1). The majority of study population were housewives (79% for cases and 89% for controls) with no significant difference between cases and controls. Primary level of education (OR= 2.17, 95% CI = 1.14- 4.15, P= 0.170) associated with preeclampsia with no significant risk.

**Table (3.1) Back ground of study population.**

Variable	Cases (n=100)		Controls (n=100)		OR	95% CI	P*-value
<b>Occupation</b>							
House wife	79	79	89	89	0.46	0.19-1.09	0.054
Worker	21	21	11	11			
<b>Level of education</b>							
No formal education	22	22	25	25	0.84	0.41-1.71	0.617
Primary	42	42	25	25	2.17	1.14-4.15	0.170
Secondary	12	12	24	24	0.43	0.19-0.97	0.027
Intermediate	3	3	13	13	0.21	0.04-0.81	0.019
High	21	21	13	13	1.78	0.78-4.65	0.132

The study sample was grouped into six age strata that covered the women's age in the collected sample of the study population. This is shown in Table (3.2).

**Table 3.2: Distribution of study population according to age.**

Age groups (years)	Cases (n=100)		Controls (n=100)		OR	95% CI	P*-Value
	No.	%	No.	%			
14-19	30	30	10	10	3.85	1.67-9.09	0.001
20-24	5	5	38	38	0.08	0.03-0.24	0.000
25-29	6	6	40	40	0.09	0.03-0.25	0.000
30-34	9	9	5	5	1.88	0.54-6.73	0.268
35-39	45	45	5	5	15.54	5.48-47.53	0.000
≥ 40	5	5	2	2	2.58	0.43-19.72	0.248

\*  $\chi^2$ -test was used.

Very young age (14-19 years) carried a significant risk when compared with other young groups (20- 34 years), while older age of reproductive life span (35-39 years) carried a higher risk when compared with other age groups with significant risk (OR=15.54, 95% CI=5.48-47.53, P= 0.000).

Table (3.3) shows that nulliparity is associated with the occurrence of preeclampsia (OR = 5.27) with a significant risk (P= 0.000), as well as for multipara of Para 5 and more which showed a significant association with preeclampsia (OR= 3.98, P= 0.001).

**Table 3.3: Distribution of study population according to parity.**

Parity	Cases (n=100)		Controls (n=100)		OR	95% CI	P*-Value
	No.	%	No.	%			
0	50	50	15	15	5.27	2.75-11.80	0.000
1	5	5	42	42	0.07	0.02-0.20	0.000
2	9	9	20	20	0.39	0.15-0.98	0.027
3	5	5	10	10	0.47	0.13-1.58	0.179
4	3	3	5	5	0.95	0.11-2.92	0.470
5+	28	28	8	8	3.98	1.60-10.19	0.001

\*  $\chi^2$ -test was used.

Regarding the medical history of pregnant women, chronic hypertension showed a higher significant association with preeclampsia (OR= 14.52, 95% CI= 4.02-62.23, P= 0.000). Chronic renal disease and antiphospholipid syndrome showed anon significant association with (OR=2.02, P= 0.561), (OR= 4.12, P= 0.174) respectively. No significant association with P= 0.352 for diabetes mellitus. These results are showed in Table (3.4).

**Table 3.4: Distribution of study population according to medical history.**

Medical History	Cases (n=100)		Controls (n=100)		OR	95% CI	P*-Value
	No.	%	No.	%			
No Medical History	55	55	89	89	0.15	0.06-0.33	0.000
Hypertension	31	31	3	3	14.52	4.02-62.23	0.000
Chronic Renal Disease	2	2	1	1	2.02	0.14-57.25	0.561
Diabetes Mellitus	7	7	4	4	1.81	0.45-7.63	0.352
Rheumatoid Arthritis	1	1	2	2	0.49	0.01-7.10	0.561
Antiphospholi--pid Syndrome	4	4	1	1	4.12	0.42-98.72	0.174

\*  $\chi^2$ -test was used.

Effects of last birth intervals is shown in table (3.5); short birth interval of (<1 year) and that of (1-2 years) showed a significant protection against preeclampsia (OR= 0.24, 95% CI= 0.07- 0.7, P= 0.004), (OR= 0.08, 95% CI= 0.02-0.29, P= 001) respectively, while long

pregnancy interval of (4-5 years) showed a significant association with the occurrence of preeclampsia as well as that of 5 years and more which showed a highest operational risk for the occurrence of preeclampsia (OR=29.61, 95% CI= 7.587-135.34, P= 0.001).

**Table 3.5: Distribution of study population according to inter pregnancy interval\***

Inter Pregnancy Interval	Cases (n=100)		Controls (n=100)		OR	95% CI	P*-Value
	No.	%	No.	%			
< 1 year	5	10	27	31.76	0.24	0.07-0.72	0.004
1-2 year	3	6	38	44.71	0.08	0.02-0.29	0.001
2-3 years	4	8	7	8.24	0.97	0.22-3.97	0.962
3-4 years	4	8	6	7.06	1.15	0.26-4.91	0.840
4-5 years	8	16	4	4.71	3.86	0.98-16.33	0.026
≥ 5 years	26	52	3	3.52	29.61	7.58-135.34	0.001
Total	50	-	85	-	-	-	-

\* Excluding primigravidas.

\*\*  $\chi^2$ -test was used.

No previous history of preeclampsia nor pregnancy induced hypertension had a very highly significant protection against preeclampsia in the future pregnancies (OR= 0.005, 95% CI= 0.001-0.024, P=0.001). Previous history of preeclampsia carried the highest significant risk for the recurrence of preeclampsia in future pregnancies (OR= 137.05, 95% CI= 17.93-28670.92, P=

0.001), previous history of pregnancy induced hypertension showed a non-significant association with preeclampsia if presented alone, but the association will be highly significant if accompanied with a previous history of preeclampsia (OR=14.40, 95% CI=2.61-453.71, P=0.001).Table (3.6).

**Table 3.6: Distribution of study population according to past obstetric history\***

Past Obstetric History	Cases (n=100)		Controls (n=100)		OR	95% CI	P*-Value
	No.	%	No.	%			
a. preeclampsia	31	62	1	1.18	137.05	17.93-2867.92	0.001
b. pregnancy induced hypertension	5	10	3	3.53	3.04	0.59-16.96	0.124
a and b	10	20	1	1.18	14.40	2.61-453.71	0.001
Non	4	16	80	94.12	0.005	0.001-0.024	0.001
Total	50	-	85	-	-	-	-

\* Excluding primigravidas.

\*\*  $\chi^2$ -test was used.

Negative family history of preeclampsia and hypertension carried a significant protection against the occurrence of preeclampsia (OR= 0.021, 95% CI= 0.01-0.04, P= 0.000). On the other hand, positive family history of preeclampsia and hypertension increase the

risk of developing preeclampsia in a very high significant way whether presented alone or presented with each other (P= 0.000, P= 0.000, P= 0.020) respectively, as showed in table (3.7).

**Table 3.7: Distribution of study population according to family history.**

Family History	Cases (n=100)		Controls (n=100)		OR	95% CI	P*-Value
	No.	%	No.	%			
a. preeclampsia	35	35	7	7	8.43	2.46-16.29	0.000
b. hypertension	45	45	16	16	4.29	2.11-8.83	0.000
a and b	14	14	2	2	7.97	1.66-52.37	0.020
No family history	6	6	16	16	0.02	0.01-0.04	0.000

\*  $\chi^2$ -test was used

Table (3.8) shows distribution of study population according to the presence or absence of risk variables of present pregnancy, multiple pregnancy and gestational

diabetes are risk variables that seem to be operational in the development of preeclampsia (OR= 2.02) for both of them) but not to a significant level (P= 0.561).

**Table 3.8: Distribution of study population according to history of current pregnancy.**

Risk value of current pregnancy	Cases (n=100)		Controls (n=100)		OR	95% CI	P*-Value
	No.	%	No.	%			
Multiple pregnancy	2	2	1	1	2.02	0.14-57.26	0.561
Gestational diabetes	2	2	1	1	2.02	0.14-57.26	0.561
No risk	96	96	98	98	0.49	0.06-3.20	0.407

\*  $\chi^2$ -test was used.

#### 4- DISCUSSION

The current study demonstrated no statistically significant association between patients' occupation and preeclampsia, despite the fact that the majority of the study participants in both groups were housewives. This is consistent with prior and recent study, which found that occupation is not an independent risk factor but may reflect underlying socioeconomic problems.<sup>[15]</sup> In terms of educational level, primary education had a higher odds ratio, although it was not statistically significant. According to recent study, low educational levels have an indirect association with preeclampsia due to limited access to antenatal care and poor health awareness, rather than direct causation.<sup>[16]</sup>

This study found that both very young maternal age (14–19 years) and advanced maternal age (35–39 years) are strongly associated with preeclampsia. These findings are highly validated by recent study. showing extreme maternal age remains a significant predictor of hypertensive disorders of pregnancy due to vascular immaturity in younger women and endothelial dysfunction in older women.<sup>[17]</sup> Furthermore, a 2025 study found that increased maternal age considerably increases the chance of severe preeclampsia.<sup>[18]</sup>

Nulliparity was shown to be a high risk factor (OR = 5.27), while grand multiparity ( $\geq 5$ ) indicated a significant association. These results are consistent with both classical and recent literature. A thorough meta-analysis and more recent studies (2024-2025) demonstrate that primigravidity is a strong predictor of preeclampsia caused by immunological maladaptation.<sup>[19-20]</sup>

The association with grand multiparity observed in this study is also supported by recent evidence suggesting

cumulative vascular and metabolic stress as contributing mechanisms.<sup>[20]</sup>

Chronic hypertension was the most significant medical risk factor found in this analysis (OR = 14.52). This finding is highly confirmed by recent studies. According to a 2024 cohort research, persistent hypertension raises the incidence of preeclampsia by more than five times and is a major contributor to catastrophic maternal outcomes.<sup>[21]</sup>

Chronic hypertension was a significant medical risk factor (OR = 14.52). This finding is highly confirmed by recent studies. According to a 2024 cohort research, persistent hypertension raises the incidence of preeclampsia by more than five times and is a major contributor to catastrophic maternal outcomes. In contrast, this study found no significant association between diabetes mellitus and renal disease. However, recent study continues to indicate their involvement as contributory variables, particularly when linked to metabolic syndrome or poor glycemic control.<sup>[20]</sup> The comparatively small sample size may explain the study's lack of significance.

Long interpregnancy intervals were associated to a significantly higher risk of preeclampsia, while shorter intervals were protective. This finding is in line with recent pathophysiology findings supporting the immunological tolerance concept, suggesting that extended intervals may result in a lack of maternal immunological adaptability, increasing vulnerability to abnormal placentation and preeclampsia.<sup>[22]</sup>

Previous preeclampsia was the strongest predictor in this study (OR = 137.05), indicating a high probability of recurrence. According to a 2024-2025 review, women

who have previously had preeclampsia have a much higher chance of recurrence, especially if the disease was diagnosed early or was severe.<sup>[23]</sup> The combination of preeclampsia and pregnancy-induced hypertension raised the risk, highlighting the necessity of a thorough obstetric history in risk assessment.

Positive family history of preeclampsia and hypertension was found to be strongly related with an increased risk in this study. This is consistent with recent genetic and epidemiological study, which emphasizes the importance of hereditary susceptibility.<sup>[22]</sup>

Although multiple pregnancy and gestational diabetes had higher odds ratios, they were not statistically significant in this analysis. However, recent studies consistently identifies multiple pregnancy as a risk factor, due to increased placental mass and enhanced antiangiogenic hormones.<sup>[17]</sup> Similarly, gestational diabetes and preeclampsia are linked via common metabolic and endothelial dysfunction mechanisms.<sup>[20]</sup>

This study has many limitations that must be addressed when evaluating the results. First, the limited sample size may restrict the statistical ability to detect significant association between less prevalent risk variables like renal disease and autoimmune illnesses. Second, because this is a hospital-based case-control study, there is a risk of selection bias, which may limit the data's applicability to the larger Mosul population. Third, recall bias cannot be ruled out, especially for variables related to previous obstetric and family history. Furthermore, some potential confounding variables, such as body mass index, nutritional status, and comprehensive socioeconomic indicators, were not thoroughly examined.

## 5- CONCLUSION AND RECOMMENDATION

This study shows that preeclampsia is a complex condition caused by a combination of maternal, obstetric, and family factors. Significant risk factors discovered include extreme maternal age, nulliparity and grand multiparity, chronic hypertension, a history of preeclampsia, a positive family history, and a long interpregnancy interval. These findings are consistent with previous global studies, emphasizing the need of early detection of high-risk women. Improving antenatal care services and focusing on risk-based screening can significantly reduce maternal and perinatal problems associated with preeclampsia. Early screening programs for preeclampsia should be improved, with a focus on high-risk groups such as women with a history of preeclampsia or chronic hypertension. Improving the quality and accessibility of prenatal care services is critical to ensuring early detection and management. Health education activities should be established to raise knowledge about risk factors and the significance of frequent pregnancy checkups. More large-scale, multicenter study are needed to better understand region-specific risk variables and validate these findings.

## REFERENCES

1. Chang KJ, Seow KM, Chen KH. Preeclampsia: recent advances in predicting, preventing, and managing the maternal and fetal life-threatening condition. *International journal of environmental research and public health*, 2023 Feb 8; 20(4): 2994.
2. Kurjak A, Stanojević M, Dudenhausen J. Why maternal mortality in the world remains tragedy in low-income countries and shame for high-income ones: will sustainable development goals (SDG) help?. *Journal of perinatal medicine*, 2023 Feb 23; 51(2): 170-81.
3. Kumsa H, Mislou E, Yimer NB. A systematic review and meta-analysis of the globally reported International Classification of Diseases to Perinatal Mortality (ICD-PM). *Frontiers in medicine*, 2024 Sep 23; 11: 1434380.
4. Vera-Ponce VJ, Loayza-Castro JA, Ballena-Caicedo J, Valladolid-Sandoval LA, Zuzunaga-Montoya FE, Gutierrez De Carrillo CI. Global prevalence of preeclampsia, eclampsia, and HELLP syndrome: a systematic review and meta-analysis. *Frontiers in reproductive health*, 2025 Nov 10; 7: 1706009.
5. Yang M, Wang M, Li N. Advances in pathogenesis of preeclampsia. *Archives of Gynecology and Obstetrics*, 2024 May; 309(5): 1815-23.
6. Ortega MA, Fraile-Martinez O, García-Montero C, Saez MA, Álvarez-Mon MA, Torres-Carranza D, Álvarez-Mon M, Bujan J, García-Honduvilla N, Bravo C, Guijarro LG. The pivotal role of the placenta in normal and pathological pregnancies: a focus on preeclampsia, fetal growth restriction, and maternal chronic venous disease. *Cells*, 2022 Feb 6; 11(3): 568.
7. Hurtado S, Shetty MK. Post-menopausal bleeding: role of imaging. In *Seminars in Ultrasound, CT and MRI* 2023 Dec 1 (Vol. 44, No. 6, pp. 519-527). WB Saunders.
8. Bildirici AE, Karalök MH, Akbay A. Genetic factors in the risk assessment of preeclampsia: a review of recent findings. *Molecular Biology Reports*, 2026 Dec; 53(1): 85.
9. Birungi L. Risk Factors and Obstetrical Outcomes of Preeclampsia Among Omani Women: A Case-Control Study. Sultan Qaboos University (Oman); 2024.
10. Wang Y, Zeng C, Chen Y, Yang L, Tian D, Liu X, Lin Y. Short interpregnancy interval can lead to adverse pregnancy outcomes: a meta-analysis. *Frontiers in Medicine*, 2022 Nov 30; 9: 922053.
11. Mattsson K, Juárez S, Malmqvist E. Influence of socio-economic factors and region of birth on the risk of preeclampsia in Sweden. *International Journal of Environmental Research and Public Health*, 2022 Mar 30; 19(7): 4080.
12. Conklin MB, Wells BM, Doe EM, Strother AM, Tarasiewicz ME, Via ER, Conrad LB, Farias-Eisner R. Understanding health disparities in preeclampsia: a literature review. *American Journal of Perinatology*, 2024 May; 41(S 01): e1291-300.

13. Chiang YT, Seow KM, Chen KH. The pathophysiological, genetic, and hormonal changes in preeclampsia: a systematic review of the molecular mechanisms. *International Journal of Molecular Sciences*, 2024 Apr 20; 25(8): 4532.
14. da Cruz Naddeo ML. Challenges in Diagnosis and Risk Factors of Preeclampsia and HELLP Syndrome. *International Healthcare Review* (online), 2022.
15. Duckitt K, Harrington D. Risk factors for preeclampsia. *BMJ*, 2005; 330: 565.
16. Fondjo LA, et al. Maternal risk factors for hypertensive disorders. *BMC Pregnancy Childbirth*, 2019; 19: 48.
17. Chang KJ, et al. Preeclampsia: prediction and management, 2023.
18. Nandagopal P, et al. Determinants of severe preeclampsia, 2025.
19. Bartsch E, et al. Risk threshold for preeclampsia. *BMJ*, 2016; 353: i1753.
20. Nie X, et al. Risk factors of preeclampsia. *BMC Pregnancy Childbirth*, 2024.
21. Wu P, et al. Chronic hypertension and pregnancy outcomes. *Circulation*, 2024.
22. Wu H, et al. Genetic causal risk factors for preeclampsia, 2025.
23. Dasari H, et al. Recurrence and predictors of preeclampsia. *BMJ Open*, 2025.