

## Unravelling the Connections: Exploring Pregnancy-Induced Hypertension and Gestational Diabetes

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### Abstract:

Gestational diabetes and pregnancy-induced hypertension are both common. It's not clear how they are connected, though. Birth certificates and hospital discharge information were used in the first population-based case-control study, which was carried out in Washington State between 1992 and 1998.

Consecutive cases of pregnancy-related hypertension were divided into four groups based on the International Classification of Diseases, Ninth Revision codes: eclampsia (n = 54), severe preeclampsia (n = 70), mild preeclampsia (n = 68), and gestational hypertension (n = 43). The outcomes of these cases were contrasted with controls (n = 102) who did not have pregnancy-induced hypertension.

In each case group, 1.29% eclamptic, 4.8% severe preeclamptics, and 4.6% both moderate preeclamptics and those with gestational hypertension, exhibited a greater prevalence of gestational hypertension than the controls (4.6%).

A higher risk of severe preeclampsia was associated with gestational diabetes (odds ratio (OR) = 1.6, 95% confidence interval (CI): 1.12, 2.2). In women who had subpar prenatal care, the odds ratios for eclampsia and severe preeclampsia were 4.18 and 3.15, respectively (p 0.05 for both).

**Keywords:** Gestational Diabetes, Pregnancy Complications, Pregnancy-Induced Hypertension, and Prenatal Care.

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## Introduction

Gestational diabetes (GDM) and pregnancy-induced hypertension (PIH) are two common problems that can happen during pregnancy and have serious effects on the health of both the mother and the foetus. Gestational hypertension, commonly referred to as PIH, is the term for high blood pressure that appears during pregnancy, typically after the 20th week of gestation. GDM, a kind of diabetes, is usually marked by elevated blood sugar levels identified during pregnancy. [1]

Pregnancy-related hypertension diseases complicate 5–10% of pregnancies. These can occasionally cause a variety of problems, including seizures, stroke, foetal distress, renal failure, hepatic failure, premature birth, intrauterine growth retardation, and even death, for both the mother and the foetus. [2]

For the mother and the developing foetus, PIH and GDM both carry potential dangers. Complications from pregnancy-induced hypertension include preeclampsia, eclampsia, placental abruption, and premature birth. Additionally, it might affect the mother's cardiovascular health over the long term. GDM can cause excessive foetal growth, birth complications, and a higher type 2 diabetes risk for both mother and child. [3]

Gestational diabetes mellitus affects about 3-5 percent of pregnancies. It causes a number of issues, such as macrosomia, stillbirth, respiratory distress syndrome, and jaundice. Most frequently, the foetus is impacted. [4] As they frequently coexist and share risk factors like obesity, a family history of hypertension or diabetes, advanced maternal age, and particular ethnic backgrounds, it is imperative to comprehend the connection between PIH and GDM. Women with PIH are more likely to develop GDM, and vice versa. This implies that there may be an underlying relationship between these two ailments. [5]

Several studies have investigated the association between PIH and GDM, aiming to determine the shared pathophysiological mechanisms, common risk factors, and the impact of co-occurrence on pregnancy outcomes. By gaining a better understanding of this relationship, healthcare providers can improve risk assessment, screening, and management strategies for women at risk of developing these conditions. [6, 7]

## Aims and objectives

- To assess the prevalence of PIH and GDM among pregnant women and determine the association between the two conditions.
- To determine the risk variables that are common to women with PIH and GDM, such as advanced maternal age, obesity, a family history of diabetes or high blood pressure, and ethnicity.
- To offer guidance to medical professionals for risk assessment, monitoring, and interventions for expectant mothers with PIH and GDM in order to enhance the quality of pregnancy and the mother and the child's long-term health.

## Material and Method

**Study Design:** The medical records and data from pregnant women who were diagnosed with gestational diabetes (GDM) and/or pregnancy-induced hypertension (PIH) were used in this retrospective cohort study. Prior to collecting data, the institutional ethical committee gave its ethical permission.

**Study Population:** Pregnant women who received prenatal care at the tertiary care facility were included in the study population. Women with a verified diagnosis of PIH and/or GDM throughout their pregnancy will meet the inclusion criteria. The study will not include women who already had diabetes or hypertension since it wants to concentrate on PIH and

GDM cases that emerged during pregnancy.

**Data Collection:** Data was collected from electronic medical records and obstetric databases. The following information was extracted:

**Demographic features:** Age, BMI, ethnicity, parity, and socio-economic status.

**Medical history:** Any previous history of PIH, GDM, or other relevant medical conditions.

**Pregnancy details:** Gestational age at diagnosis of PIH and GDM, blood pressure measurements, glucose tolerance test results, and other relevant diagnostic tests.

Evaluation of pregnancy-induced hypertension into four distinct case groups: severe preeclampsia, eclampsia, gestational hypertension, and moderate preeclampsia. The term "controls" referred to females without any of the aforementioned conditions.

The Kotelchuck index was calculated in order to assess the quality of prenatal treatment. [8] A metric creates a composite score that sums up prenatal care based on the frequency of visits to healthcare centers.

**Data Analysis:** Descriptive statistics are used to summarize the demographic and clinical features. The prevalence of PIH, and GDM, and their coexistence is determined.

In order to evaluate the independent relationships between PIH and GDM and pregnancy outcomes while controlling for any confounding variables, multivariable logistic regression analysis will be used. We presented odds ratios and 95% confidence intervals. There will also be subgroup analysis depending on clinical and demographic traits.

## Result

Women with PIH were younger, primigravida, and had a higher BMI as compared to controls (Table 1).

**Table 1: Distribution of characteristics according to case status**

Characteristic	Case status				
	Eclampsia (n = 54)	Severe preeclampsia (n = 70)	Mild preeclampsia (n = 68)	Gestational hypertension (n = 43)	Controls (n = 189)
<b>Age group (years)</b>					
≤ 19	7	5	9	3	32
20 - 24	12	15	18	12	48
25 - 29	25	26	21	13	54
30 - 34	6	22	17	8	33
> 35	4	2	3	7	22
<b>Body mass index quartile (kg/m<sup>2</sup>)</b>					
< 21	16	22	17	17	128
23 - < 27	18	37	36	19	39
≥ 27	20	11	15	7	22
<b>Prenatal care</b>					
Low	25	21	32	22	101
High	29	49	36	21	88

GDM was more common in all three groups of PIH than in controls. It has a prevalence of 4.1%, 4.8%, 4.6%, 4.5% & 2.8% for women with eclampsia, severe preeclampsia, mild preeclampsia, gestational hypertension, and controls groups respectively (Table 2).

**Table 2: Gestational diabetes and the risk of pregnancy-related hypertension**

Group	No.	Prevalence Of Gestational Diabetes (%)	Crude OR	95% CI	Adjusted OR	95% CI
Eclampsia	54	4.1	1.41	0.61, 3.30	1.21	0.49, 3.11
Severe Preeclampsia	70	4.8	1.62	1.31, 2.32	1.44	1.15, 2.10
Mild Preeclampsia	68	4.6	1.63	1.51, 2.05	1.46	1.30, 1.79
Gestational Hypertension	48	4.5	1.65	1.48, 1.85	1.42	1.21, 1.55
Controls	189	2.8	1.00		1.00	

The association between GDM and PIH was also influenced by the timing and scope of prenatal care. (Table 3).

**Table 3: Prenatal care-specific correlation between gestational diabetes and pregnancy-induced hypertension**

Case status	High care		Low care		p-value
	OR	95% CI	OR	95% CI	
Eclampsia	0.62	0.17, 1.51	4.18	1.26, 13.97	0.03
Severe preeclampsia	1.26	0.89, 1.80	3.15	1.77, 5.32	0.02
Mild preeclampsia	1.46	1.23, 1.74	1.73	1.21, 2.46	0.15
Gestational hypertension	1.36	1.18, 1.56	1.64	1.21, 2.16	0.07

Preeclampsia and eclampsia were more likely to occur in moms with gestational diabetes than in mothers without the illness who received more prenatal care. Although these results were not statistical significance, women who received substandard prenatal care also had a higher risk of mild preeclampsia and gestational hypertension connected to GDM. Age, parity, or body mass index did not seem to be significantly associated with gestational diabetes.

### Discussion

In this study, we found that preeclampsia, mild preeclampsia, and severe preeclampsia were significantly more likely to occur in women with GDM. After adjusting for confounders, it is about 1.5 times more likely to develop these severe illnesses in women with GDM. The results also suggest that prenatal care has an impact on the association between GDM and PIH.

Our findings concur with those of numerous earlier research. One cohort research in Sweden that included 10,666 women looked at preeclampsia and gestational hypertension risk variables.

[9,10,11] This study found that mothers with gestational diabetes had a statistically significant higher risk of preeclampsia than mothers without the condition. However, it was unable to show that this risk was also statistically higher for gestational hypertension. A different large population-based study (n = 878,680) using a database of birth events also discovered a correlation between preeclampsia and gestational, despite not accounting for body mass index or race in the analysis. [12] Although other studies have looked into the connection between GDM and PIH, some have been limited by tiny sample sizes or insufficient descriptive information. Three of these studies, however, also found that pregnant women with GDM had more chances of PIH than pregnant women without. [13]

Women with GDM were shown to have a greater risk of developing preeclampsia. According to a prospective examination of women taking part in a calcium supplementation experiment for the disease's prevention, preeclampsia was connected to the degree of impaired glucose tolerance. [14]

A correlation between gestational diabetes and the overall number of instances of pregnancy-related hypertension was found in French research on 15 maternity hospitals. [15]

Furthermore, we found that the associations between GDM and PIH varied between the groups getting high and low levels of prenatal care. Some studies suggest that the falling incidence rate of eclampsia during the past 20 years may also be due to better prenatal care. [16] Although it has been shown that receiving insufficient prenatal care increases the chance of preeclampsia by 30%, [13,16] it has never been proven to have an impact on the other risk factors of PIH. According to other research and clinical trials, intense early therapy may reduce the incidence of preeclampsia in high-risk mothers. [10,17]

Alternative explanations for this correlation include insufficient research, the exclusion of pre-existing diabetes and hypertension conditions, or other related misclassifications. This bias would make these diseases disproportionately more common, misdiagnosing mothers who did not receive adequate prenatal care as having gestational diabetes and pregnancy-induced hypertension. The least biased estimate, if there is one, maybe the lack of a correlation between gestational diabetes and eclampsia or severe preeclampsia in the group receiving adequate or better care. There may be a stronger-than-expected link between prenatal care received and the likelihood that a woman will be diagnosed with gestational diabetes or pregnancy-induced hypertension. It is possible to misclassify gestational diabetes and pregnancy-induced hypertension in this way.

We found a strong association between GDM and PIH in women who receiving least prenatal care. The exposure, result, and prenatal care factors were also detailed in the hospital discharge record for the delivery event.

## Conclusion

Our results only imply the need for further research on this topic rather than proving that prenatal care and the management of underlying risk factors, such as diabetes and high blood pressure, can prevent more severe forms of PIH.

Compared to women without the illness, those with gestational diabetes are more likely to experience pregnancy-related hypertension. This finding highlights the need for early identification and monitoring of gestational diabetes in pregnant women, as it can serve as an indicator for the potential development of hypertension. Furthermore, the study suggests that the underlying mechanisms connecting gestational diabetes and pregnancy-induced hypertension may involve shared risk factors. Additionally, the study underscores the importance of comprehensive prenatal care and multidisciplinary approaches in managing and reducing the risks associated with gestational diabetes and pregnancy-induced hypertension.

**Limitations:** This study's retrospective design may be subject to inherent limitations, such as missing data or potential confounding factors not captured in the medical records. Additionally, the study's findings may be influenced by the characteristics and practices of the selected healthcare facility.

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