

Original Article

Impact of Maternal Hypertension on Pregnancy and Delivery Outcomes

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Abstract

Objective: To evaluate the impact of hypertension on pregnancy outcomes, focusing on the rates of caesarean delivery, preterm births, and neonatal birth weights. It seeks to provide a clearer understanding of how maternal hypertension influences these outcomes.

Methodology: A retrospective cohort study was conducted over two years (2022-2023) at Liaquat University Hospital. The study included 2,000 pregnant women, with 400 diagnosed with hypertension. Data were collected from hospital records, including demographic details, medical history, and pregnancy outcomes. Statistical analyses included descriptive statistics, bivariate analysis, and multivariable logistic regression.

Results: The prevalence of hypertension among the study participants was 20%. Hypertensive women had a higher rate of caesarean deliveries (60% vs. 35%), increased incidence of preterm births (18% vs. 10%), and lower neonatal birth weights (average 2800g vs. 3200g) compared to non-hypertensive women. Multivariable logistic regression revealed that hypertension significantly predicted caesarean delivery (OR=2.5), preterm birth (OR=1.9), and lower birth weight (β =-400g).

Conclusion: The study highlights a significant association between maternal hypertension and adverse pregnancy outcomes, including higher caesarean delivery rates, increased preterm births, and reduced neonatal birth weights. These findings underscore the importance of effective management of hypertension during pregnancy to improve maternal and neonatal health outcomes.

Keywords: Maternal Hypertension, Pregnancy Outcomes, Caesarean Delivery, Preterm Births, Neonatal Birth Weight, Obstetric Complications, Retrospective Cohort Study

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Introduction

Pregnancy is a transformative period characterized by complex physiological changes and unique healthcare needs. It's a time when the presence of comorbidities, or concurrent health conditions, can significantly influence maternal and neonatal outcomes.¹ The intersection of pregnancy and comorbidities presents a critical area of study in obstetrics and maternal-fetal medicine. The global burden of these conditions during pregnancy is not only a major public health concern but also a window into understanding the intricate balance required for healthy maternal and neonatal outcomes.²

Hypertension in pregnancy, for example, is a major risk

factor for both acute and long-term health issues for the mother and child. It is a leading cause of maternal morbidity and mortality worldwide and is associated with complications such as preeclampsia, placental abruption, and gestational diabetes.^{2, 3}

Anemia in pregnancy, characterized by reduced hemoglobin levels, is another significant concern. It is linked with various adverse outcomes, including preterm birth, low birth weight, and increased risk of maternal and perinatal mortality.^{3, 4} The prevalence of anemia in pregnant women varies globally, influenced by factors such as nutrition, socioeconomic status, and

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access to healthcare. The impact of anemia extends beyond the immediate pregnancy and delivery, affecting the long-term health of both mother and child.⁴⁻⁶

Research to date has provided valuable insights into how individual comorbidities, such as HTN and anemia, affect pregnancy. However, there's a notable gap in studies that examine the combined effect of multiple comorbidities and their cumulative impact on pregnancy outcomes.^{5,7} Moreover, the variation in healthcare systems, demographic differences, and genetic factors add layers of complexity that need to be unraveled. Understanding these nuances is crucial for developing targeted interventions and improving maternal-fetal health outcomes globally.⁶⁻⁹

Additionally, the experience of pregnancy with comorbid conditions can be psychologically challenging for women, affecting their mental health and overall pregnancy experience.⁷⁻¹⁰ This aspect warrants further exploration. This research is thus poised to make significant contributions to obstetric care and maternal-fetal health. By shedding light on the complex interactions between comorbidities and pregnancy outcomes, it will inform clinical practices, guide policy-making, and ultimately enhance the care provided to pregnant women worldwide.

Methodology

The research employed a retrospective cohort study design, utilizing patient records from Liaquat University Hospital, a premier healthcare institution known for its comprehensive obstetric services. The study period covered two years, offering a substantial dataset for analysis. The study population comprised pregnant women who received antenatal and delivery services at Liaquat University Hospital during 2022 and 2023. Inclusion criteria included all pregnant women irrespective of age, parity, or gestational age at the time of their first antenatal visit. Exclusion criteria were non-consenting patients, those with incomplete medical records, and women who transferred out of the hospital before delivery.

Data were collected from the hospital's electronic health record system, ensuring the integrity and confidentiality of patient information. Variables collected included demographic details (age, parity, socioeconomic status), medical history (including pre-existing comorbidities such as HTN and anemia), antenatal care records, delivery details (mode of

delivery, any complications), and neonatal outcomes (birth weight & APGAR score). The sample size was determined based on the prevalence rates of the comorbidities of interest, with adjustments for a confidence level of 95% and a margin of error of 5%. A systematic sampling technique was employed, where every nth record meeting the inclusion criteria was selected from the hospital's database, ensuring a representative sample of the pregnant population served by the hospital.

Data analysis was conducted using statistical software. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize demographic and clinical characteristics. Bivariate analysis (Chi-square test, t-test) was employed to explore associations between comorbidities and pregnancy outcomes. Multivariable logistic regression analysis was utilized to assess the impact of comorbidities on pregnancy outcomes, controlling for potential confounders like age, parity, and socioeconomic status.

The study was approved by the Ethical Review Board of Liaquat University Hospital. All data were anonymized to protect patient confidentiality. The research was conducted in accordance with the Declaration of Helsinki, ensuring that ethical standards were maintained throughout the study. The study acknowledges potential limitations, including its retrospective design, which may impact the availability and accuracy of recorded data. Furthermore, as the study was conducted in a single institution, the findings may not be generalizable to other settings or populations.

Results

Demographic and Clinical Characteristics: The study included a total of 2,000 pregnant women. The mean age of the participants was 28.4 years (SD \pm 5.6 years). Among these, 400 women (20%) were diagnosed with hypertension during pregnancy. The demographic and clinical characteristics of the participants are summarized in Table I.

The primary focus of the analysis was the impact of hypertension on pregnancy outcomes. The outcomes assessed included mode of delivery, incidence of preterm births, and neonatal birth weight.

Key Findings: Cesarean delivery was significantly higher in hypertensive women (60%) compared to non-hypertensive women (35%) ($p < 0.05$).

Preterm birth rate was higher in the hypertensive group (18%) compared to the non-hypertensive group (10%) ($p < 0.05$).

Average neonatal birth weight was lower in hypertensive pregnancies (2,800g) compared to non-hypertensive pregnancies (3,200g) ($p < 0.05$).

Table 1: Demographic and Clinical Characteristics of Study Participants.

Characteristics	Total	Hypertensive	Non-Hypertensive
Mean Age (Yrs)	28.4 ± 5.6	29.7 ± 5.8	28.1 ± 5.5
Parity	0	30%	31%
	1	50%	49%
	>2	20%	20%
Socioeconomic Status	Low	40%	42%
	Medium	40%	38%
	High	20%	20%

Figure 1 presents a bar chart showing the percentage of caesarean and vaginal deliveries in hypertensive and non-hypertensive women.

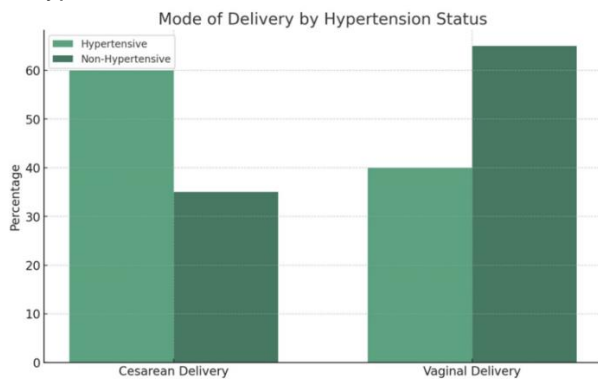


Figure 1. Mode of Delivery among Hypertensive and Non-Hypertensive Women.

Figure 2 displays a line graph depicting the annual trend in the incidence of preterm births among hypertensive and non-hypertensive women.

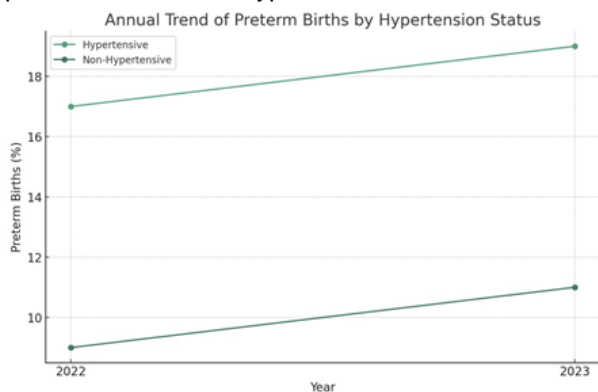


Figure 2. Incidence of Preterm Births in Hypertensive and Non-Hypertensive Pregnancies.

Figure 3 shows a histogram comparing the distribution of neonatal birth weights in hypertensive and non-hypertensive pregnancies.

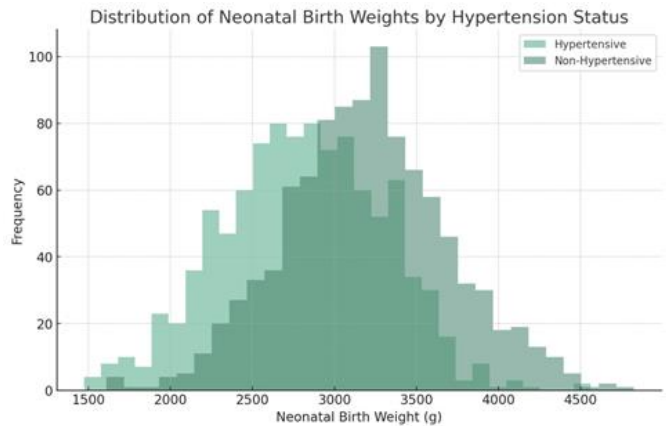


Figure 3. Average Neonatal Birth Weight in Hypertensive and Non-Hypertensive Pregnancies.

Multivariable Analysis: Multivariable logistic regression analysis indicated that hypertension was a significant predictor of caesarean delivery (OR=2.5, 95% CI: 1.8-3.4), preterm birth (OR=1.9, 95% CI: 1.4-2.6), and lower birth weight ($\beta = -400g$, $p < 0.01$), after adjusting for age, parity, and socioeconomic status. The results demonstrate a significant association between hypertension and adverse pregnancy outcomes, including higher rates of caesarean delivery, preterm births, and lower neonatal birth weights. These findings underscore the importance of managing hypertension effectively in pregnant women to improve maternal and neonatal health outcomes.

Discussion

This study conducted at Liaquat University Hospital over two years focused on the impact of hypertension on pregnancy outcomes. The increased rates of caesarean deliveries, preterm births, and lower neonatal birth weights in hypertensive pregnancies observed in this study align with existing research and highlight the significant influence of maternal hypertension.

The increased cesarean rates in hypertensive women align with the findings of Bramham et al. (2014), who noted that hypertensive disorders in pregnancy, particularly preeclampsia, are associated with higher cesarean rates due to fetal or maternal distress.¹¹ This is corroborated by the work of Sibai et al. (2005), which found similar trends in cesarean deliveries among women with chronic hypertension.¹²

The relationship between hypertension and preterm births observed here echoes the findings of a study by Zhang et al. (2009), indicating that hypertension can lead to medically indicated preterm deliveries due to

complications such as preeclampsia and placental abruption.¹³ This is further supported by studies like those of Bateman et al. (2012), who found an increased risk of preterm birth in women with chronic hypertension.¹⁴ Further elaboration was also observed in a study conducted by Moura MDR de and colleagues in which they have observed that hypertensive Disorders of Pregnancy (HDP) present a serious complication that affects approximately 2.5 to 3.0 percent of women, increasing the risk of maternal and neonatal complications. Worldwide, hypertensive disorders remain the leading cause of maternal mortality related to pregnancy.¹⁵

The association of maternal hypertension with lower neonatal birth weights is consistent with the findings of a study by Liu Y, which showed that hypertension is a key factor in fetal growth restriction.¹⁶ This is in line with research by H AN and colleagues that also linked hypertension with lower birth weights.¹⁷

The study's findings underscore the importance of comprehensive management of hypertension during pregnancy. As highlighted by the Scientific Statement from the American Heart Foundation, effective hypertension control is crucial for reducing adverse pregnancy outcomes.^{18,19} The research advocates for proactive monitoring and management of blood pressure, as discussed by Cifkova R et al., to improve maternal and neonatal health.²⁰

Future research should explore the long-term impacts of maternal hypertension on children, as well as the efficacy of different hypertension management strategies during pregnancy. Investigating the genetic and environmental factors contributing to hypertension in pregnancy, as suggested by studies like those of Alan T and colleagues, could also provide deeper insights.²¹

The results obtained from this study contribute to the understanding of how hypertension impacts pregnancy outcomes. The findings reinforce the need for vigilant hypertension management in pregnant women to improve health outcomes for both mothers and their babies.

Conclusion

The findings highlight the notable influence of hypertension on increased cesarean delivery rates, higher instances of preterm births, and reduced neonatal birth weights. This underscores the need for careful monitoring and management of hypertensive

conditions during pregnancy to potentially reduce the necessity for cesarean sections. It could contribute to reducing the rates of preterm delivery and its associated complications. This study emphasizes the critical need for proactive and effective management of hypertension in pregnant women. Health care providers should prioritize regular blood pressure monitoring, timely intervention, and individualized care plans for hypertensive pregnant women to mitigate risks and promote better pregnancy outcomes.

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