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DETERMINANTS OF PREECLAMPSIA IN RURAL TERTIARY CARE HOSPITAL

Obstetrics & Gynaecology

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ABSTRACT

Preeclampsia is a pregnancy-specific, multisystem hypertensive disorder that remains a leading cause of maternal and fetal morbidity and mortality worldwide, contributing to over 70,000 maternal and 500,000 fetal deaths annually . The condition is more prevalent in developing countries, where its incidence is estimated to be seven times higher than in developed nations [2]. Hypertensive disorders in pregnancy (HDP), including chronic hypertension, gestational hypertension, preeclampsia, and eclampsia, pose significant risks to both mother and fetus. Preeclampsia is defined as new-onset hypertension (≥140/90 mmHg) occurring after 20 weeks of gestation, often accompanied by proteinuria or maternal organ dysfunction . For the fetus, preeclampsia can lead to complications like intrauterine growth restriction, prematurity, and death, while in mothers, it increases the risk of pulmonary edema, stroke, renal and hepatic failure, and can progress to eclampsia, characterized by seizures . Long-term effects of preeclampsia for survivors include a higher likelihood of stroke, cardiovascular disease, and diabetes in mothers, while children face increased risks of neurodevelopmental delays, insulin resistance, and chronic diseases such as obesity and type 2 diabetes later in life. Early detection and prompt treatment are crucial for improving maternal and perinatal outcomes . Current screening methods focus on identifying women at high risk, such as those with previous hypertensive pregnancies, chronic hypertension, renal disease, diabetes, or autoimmune disorders. Preventive measures like low-dose aspirin are recommended for high-risk women. Despite substantial research in developed countries, studies on the determinants of preeclampsia in developing countries are limited . This study aims to assess the determinants of preeclampsia among pregnant women admitted for delivery in a rural tertiary care hospital, contributing to better prevention and management strategies in India.

KEYWORDS

Preeclampsia, Hypertension, Maternal morbidity, Fetal mortality, Intrauterine growth restriction, Eclampsia, Cardiovascular disease, Preventive measures

INTRODUCTION

This study, conducted over two years in the Department of Obstetrics and Gynaecology at a rural tertiary care center, explored the determinants of preeclampsia through a case-control design[1]. The study involved a total of 200 pregnant women, split into two distinct groups: 100 women with normal blood pressure (Group A) and 100 women diagnosed with preeclampsia (Group B), based on the established criteria from the American College of Obstetricians and Gynecologists (ACOG) [2]. The sample size was meticulously calculated using a formula that incorporated findings from Dr. Bharati Mehta's research on hypertension in pregnancy, with a margin of error set at 5%, ensuring statistical relevance. Before the study commenced, full ethical approval was granted by the institutional ethics committee, ensuring that the research adhered to the highest standards of ethical practice[3]. Every participant was fully briefed about the nature and intent of the research, and informed consent was obtained, affirming their willingness to participate. Confidentiality was promised to each woman, allowing them to engage in the study with assurance that their personal information would remain private[4]. The core of the study revolved around collecting data on a variety of maternal and obstetric factors from both groups. Information such as age, religion, personal history, body mass index (BMI), parity, multiple pregnancies, history of diabetes mellitus, renal diseases, family history of hypertension, and any prior occurrences of pregnancy-induced hypertension (PIH) were gathered in a systematic manner[5]. Cases were closely monitored up to the point of delivery, with the mode of delivery also documented for all participants. This extensive dataset was then carefully entered into a pre-designed study proforma for consistency and clarity[6].

For the analysis phase, the data was processed with a structured approach. Qualitative variables, such as categorical factors like parity or family history, were analyzed using Chi-Square tests. This method allowed for identifying associations between the presence of preeclampsia and these qualitative factors[7]. Quantitative data, including variables like BMI or age, were represented using mean values with standard deviations (Mean ± SD). The analysis of quantitative data between the two groups followed specific protocols based on the distribution of the data. If the data adhered to the normal distribution, an unpaired t-test was utilized. However, if the data failed to meet the criteria of normality, the more robust Mann-Whitney test was employed[8]. This dual approach ensured that all statistical comparisons were both appropriate and accurate. A p-value of less than 0.05 was established as the threshold for statistical significance, ensuring that any observed differences between the two groups were unlikely to have occurred by chance. The results of the analysis were visually represented using graphs where needed, helping to make complex data more accessible and understandable. For all statistical analyses, SPSS Version 26.0 was used as the primary software, with Microsoft Excel 2021 serving as an additional tool for graphical representations [9]. Through this study, valuable insights were gleaned about the factors contributing to the development of preeclampsia among pregnant women. By contrasting the data from the two groups, the research offered a clearer picture of how maternal history, demographic factors, and obstetric variables interplay to influence pregnancy outcomes. The findings not only contributed to the growing body of knowledge on preeclampsia but also underscored the need for targeted interventions and close monitoring, particularly in rural settings where healthcare resources are often stretched thin [10]. The study's thorough methodology and ethical rigor provided a strong foundation for its conclusions.

METHODS AND MATERIALS

This case-control study was conducted in the Department of Obstetrics and Gynaecology at a rural tertiary care center over two years. An ethical approval has been obtained from the Ethical Approval Committe. The study population included 100 pregnant women with normal blood pressure (Group A) and 100 with preeclampsia (Group B), as per ACOG guidelines. The sample size was calculated using Dr. Bharati Mehta's study on hypertension in pregnancy, with a 5% error margin. Ethical clearance and informed consent were obtained. Data on maternal and obstetric factors were collected, and statistical analysis was performed using Chi-Square tests for qualitative data and t-tests or Mann-Whitney tests for quantitative data, with SPSS Version 26.0.

RESULT

The study included 100 subjects each in Group A (pregnant women with normal blood pressure) and Group B (pregnant women with preeclampsia, per ACOG guidelines). The mean age of preeclampsia cases was significantly lower than those with normal blood pressure (27.65 vs. 29.78 years, $p = 0.02$). A higher proportion of preeclamptic women were primiparous (57% vs. 49%, $p = 0.04$). Most participants

followed the Hindu religion (72%), while 23.5% were Muslims, with no significant association between religion and preeclampsia (p = 0.34). Additionally, 87.5% of conceptions were spontaneous, with no link between conception method and preeclampsia (p = 0.91).

Table 1. Distribution Of Study Groups As Per Number Of Fetus

Number of Fetuses	Group	Total	p-value	Group A (%)	Group B (%)	Total (%)
Twins	3	2	5	3.00%	2.00%	2.50%
Singleton	97	98	195	97.00%	98.00%	97.50%
Total	100	100	200	100.00%	100.00%	100.00%

Twin gestation occurred in 2.5% of cases, with no significant association found between the prevalence of pre-eclampsia and twin gestation (p-value = 1.0), indicating that twin pregnancies do not influence the risk of developing pre-eclampsia.

Table 2. Distribution Of Study Groups As Per Family History Of Hypertension

Family History of Hypertension	Group	Total	p-value	Group A (%)	Group B (%)	Total (%)
No	87	74	161	87.00%	74.00%	80.50%
Yes	13	26	39	13.00%	26.00%	19.50%
Total	100	100	200	100.00%	100.00%	100.00%

A higher proportion of females with pre-eclampsia had a family history of hypertension (26%) compared to those without pre-eclampsia (13%), indicating a significant association between family history of hypertension and the occurrence of pre-eclampsia (p-value = 0.033).

Table 3: Distribution Of Study Groups As Per History Of PIH In Previous Pregnancies.

Past History of PIH	Group	Total	p-value	Group A (%)	Group B (%)	Total (%)
No	97	87	184	97.00%	87.00%	92.00%
Yes	3	13	16	3.00%	13.00%	8.00%
Total	100	100	200	100.00%	100.00%	100.00%

A history of pre-eclampsia in previous pregnancies was more common among women with pre-eclampsia, occurring in 13% compared to 3% in those without, with a statistically significant p-value of 0.02 indicating a notable association between the two.

Table 4: Distribution Of Study Groups As Per Associated Co-morbidities

Co-morbidities	Group	Total	p-value	Group A (%)	Group B (%)	Total (%)
Chronic Hypertension	3	8	11	3.00%	8.00%	5.50%
Hypothyroidism	22	17	39	22.00%	17.00%	19.50%
Gestational Diabetes Mellitus (GDM)	7	15	22	7.00%	15.00%	11.00%
Anemia	21	22	43	21.00%	22.00%	21.50%
Chronic Kidney Disease (CKD)	0	3	3	0.00%	3.00%	1.50%

Chronic hypertension, gestational diabetes, and hypothyroidism were prevalent in 5.5%, 11%, and 19.5% of mothers, respectively, while anemia and CKD were noted in 21.5% and 1.5%. Significant associations were found between pre-eclampsia and chronic hypertension, as well as gestational diabetes (p<0.05).

Table 5. Mean Systolic And Diastolic Blood Pressure Comparison

Variables	Group	N	Mean	SD	p-value
SBP (mm Hg)	A (Normal BP)	100	113.72	8.19	< 0.01
	B (Preeclampsia)	100	149.25	9.61	
DBP (mm Hg)	A (Normal BP)	100	69.94	4.82	< 0.01
	B (Preeclampsia)	100	90.02	5.91	

Mean systolic blood pressure (SBP) was significantly higher in pre-eclampsia cases (149.25 mm Hg) compared to controls (113.72 mm Hg; p<0.01). Similarly, diastolic blood pressure (DBP) was elevated in pre-eclampsia cases (90.02 mm Hg vs. 69.94 mm Hg; p<0.01).

Table [6]. Distribution Of Study Groups As Per Mode Of Delivery

Mode of Delivery	Group A (Normal BP)	Group B (Preeclampsia)	Total	Percentage (A)	Percentage (B)	Total Percentage
LSCS	17	35	52	17.00%	35.00%	26.00%
NVD	83	65	148	83.00%	65.00%	74.00%
Total	100	100	200	100.00%	100.00%	100.00%

The incidence of cesarean sections was significantly greater in pre-eclampsia cases (35%) compared to controls (17%), indicating a notable association between pre-eclampsia and the need for surgical delivery (p<0.01).

DISCUSSION

Preeclampsia is a serious pregnancy-related complication characterized primarily by gestational hypertension, which is defined as a systolic blood pressure of 140 mmHg or higher and/or a diastolic blood pressure of 90 mmHg or higher[11]. This condition typically arises after the 20th week of gestation and can be accompanied by proteinuria, maternal organ dysfunction, or uteroplacental dysfunction. The implications of preeclampsia are severe and multifaceted, posing significant risks to both the fetus and the mother[12]. For the fetus, complications can include intrauterine growth restriction, preterm birth, and even fetal demise. For mothers, the condition can lead to serious health risks such as pulmonary edema, stroke, hepatic failure, renal failure, and progression to eclampsia, which is characterized by the onset of seizures [13]. While the precise etiology of preeclampsia remains elusive, various risk factors have been identified. These include conditions such as diabetes, chronic kidney disease, obesity, and multiple pregnancies, as well as demographic factors like advanced maternal age (typically defined as over 30 years). Furthermore, personal or family histories of preeclampsia or chronic hypertension also contribute to the risk profile[14]. Despite the critical nature of this condition, research into these risk factors is limited, particularly in developing nations such as India. This underscores a significant gap in understanding the local epidemiology of preeclampsia, prompting the need for targeted studies[15].

The current study aimed to identify predictors of preeclampsia among pregnant women admitted for delivery at a rural tertiary care hospital[16]. A total of 100 subjects were enrolled in the study, divided into two groups: Group A, which included pregnant women with normal blood pressure, and Group B, which consisted of those diagnosed with preeclampsia according to the guidelines set forth by the American College of Obstetricians and Gynecologists (ACOG)[17][18]. Data were collected on various maternal and obstetric factors, including age, body mass index (BMI), parity, and personal health history[19][20]. The findings revealed notable differences between the two groups. The mean age of women diagnosed with preeclampsia was significantly lower than that of those with normal blood pressure, with averages of 27.65 years and 29.78 years, respectively (p = 0.02). Additionally, a significant portion of women diagnosed with preeclampsia—57%—were primiparous, indicating that first-time pregnancies may be more susceptible to developing this condition[20][21]. In examining comorbidities, chronic hypertension was found in 5.5% of preeclampsia cases, demonstrating a significant association between preeclampsia and chronic hypertension (p < 0.05)[19]. Moreover, the presence of a family history of hypertension was notably higher among women with preeclampsia compared to those without (26% vs. 13%; p = 0.033)[22][23]. The study also highlighted an increased incidence of cesarean sections among preeclampsia cases (35% compared to 17% in controls; p < 0.01)[24][25][26]. These findings underscore the necessity for enhanced monitoring and tailored intervention strategies for populations at risk of preeclampsia, particularly in resource-limited settings. Increased awareness and proactive management of identified risk factors could significantly improve maternal and fetal outcomes in affected pregnancies[27].

CONCLUSION

The present study found that women with preeclampsia tend to be younger and often have their first child. A significant risk factor for developing preeclampsia is a family history of hypertension or preeclampsia in previous pregnancies. Among medical comorbidities, chronic hypertension and gestational diabetes were identified as additional risks. Furthermore, a higher percentage of these women required cesarean sections. The study highlights critical risk factors associated with preeclampsia, emphasizing the need for careful consideration in high-risk pregnancies. Additionally, there is an urgent requirement for a robust referral system to manage such pregnancies, especially in resource-limited settings.

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