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FREQUENCY AND PATTERN OF HYPERTENSION IN PREGNANCY IN A TERTIARY CARE HOSPITAL

Original Research

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ABSTRACT

Background: Hypertensive disorders in pregnancy are a leading cause of maternal and fetal morbidity and mortality, posing significant health challenges globally. Early diagnosis and appropriate management are crucial in reducing complications such as preterm birth, fetal growth restriction, and maternal cardiovascular risks. Despite its clinical significance, there is limited regional data on the burden and patterns of hypertension in pregnancy. This study aimed to determine the frequency and distribution of hypertensive disorders among pregnant women in a local population.

Objective: To assess the prevalence and pattern of hypertensive disorders in pregnancy, including gestational hypertension, chronic hypertension, pre-eclampsia, and eclampsia.

Methods: A cross-sectional study was conducted at the Cardiology Department, Northwest General Hospital, Peshawar, from June 24, 2023, to December 23, 2023. A total of 81 pregnant women aged 20 to 40 years, with a gestational age beyond 20 weeks and a confirmed singleton pregnancy, were enrolled. Blood pressure measurements were recorded on three separate occasions, 24 hours apart. Hypertension was categorized based on standard clinical definitions. Data were analyzed using SPSS version 26, and associations between hypertension patterns and demographic variables were assessed.

Results: The mean age of participants was 29.68 ± 10.24 years, with 51.9% aged 30 years or below. The mean BMI was 23.87 ± 2.66 kg/m², and 59.3% of participants had a BMI above 23.0 kg/m². Pre-eclampsia was the most frequently observed hypertensive disorder, affecting 39.5% (n=32) of patients, followed by chronic hypertension in 25.9% (n=21) and gestational hypertension in 23.5% (n=19). Eclampsia was the least common, recorded in 7.4% (n=6) of cases. No statistically significant association was found between hypertension patterns and age, BMI, parity, or gestational age.

Conclusion: Hypertensive disorders in pregnancy are common, with pre-eclampsia being the predominant condition. Regular blood pressure monitoring and early screening should be emphasized to ensure timely diagnosis and management, reducing adverse maternal and fetal outcomes.

Keywords: Blood Pressure, Chronic Hypertension, Eclampsia, Gestational Hypertension, Hypertensive Disorders, Pregnancy, Pre-Eclampsia.

INTRODUCTION

Hypertension, defined as a resting blood pressure exceeding 140/90 mmHg on at least three occasions measured 24 hours apart, is a significant health concern in pregnancy. It is diagnosed as pregnancy-induced hypertension when blood pressure surpasses this threshold in a pregnant woman beyond 20 weeks of gestation without a prior history of hypertension (1). The physiological and cardiovascular adaptations occurring during pregnancy contribute to fluctuations in blood pressure, leading to a spectrum of hypertensive disorders ranging from chronic hypertension to asymptomatic gestational hypertension and severe complications such as eclampsia (2). Hypertension in pregnancy is a major contributor to adverse maternal and fetal outcomes. Globally, approximately 15% of maternal deaths in industrialized nations are attributed to hypertensive disorders, with an even higher burden in underdeveloped and developing regions (3). The condition is increasingly prevalent, with one in every 1500 pregnancies affected by hypertensive complications (4). The diagnosis is primarily clinical, based on blood pressure measurements using a sphygmomanometer, and is often detected incidentally during routine antenatal visits (5). The severity of complications varies, with laboratory tests required to assess organ dysfunction, except in cases of eclampsia, which presents with neurological manifestations such as seizures (6). Maternal complications range from cardiac and cerebrovascular events to renal failure and placental abruption, while fetal risks include intrauterine growth restriction, preterm delivery, birth asphyxia, and perinatal mortality (7).

Epidemiological studies have demonstrated varying prevalence rates of hypertensive disorders in pregnancy (8). One study reported chronic hypertension in 7.9% of pregnant women, gestational hypertension in 15.2%, pre-eclampsia in 36.4%, and eclampsia in 3.0% (9). Another study documented pregnancy-related hypertensive disorders in 5.56% of cases, with pre-eclampsia and eclampsia being the predominant conditions (10). Despite these insights, there remains a paucity of region-specific data, limiting the applicability of international findings to local populations. Given the increasing incidence and potential severity of hypertensive disorders in pregnancy, this study aims to determine their frequency and patterns in the local population. Understanding the burden of hypertensive disorders in pregnancy will aid in developing targeted interventions to mitigate associated maternal and fetal risks (11).

METHODS

This cross-sectional study was conducted at the Cardiology Department of Northwest General Hospital from June 24, 2023, to December 23, 2023, following approval from the institutional review board. The study aimed to evaluate the frequency and pattern of hypertensive disorders in pregnancy among the local population. Pregnant females aged 20 to 40 years with a gestational age beyond 20 weeks and a confirmed singleton pregnancy on ultrasound were included if they met the diagnostic criteria for hypertension (12,13). Hypertension was defined as a resting blood pressure exceeding 140/90 mmHg on three or more occasions measured at least 24 hours apart. Patients with a known history of chronic kidney disease, congenital or structural cardiac anomalies, ectopic pregnancy, or significant hormonal disorders such as thyroid or adrenal dysfunction were excluded, as these conditions independently influence blood pressure regulation and could confound the primary outcomes of the study. Critically ill patients were also excluded to ensure the reliability of blood pressure measurements and uniformity in data collection (13). The classification of hypertensive disorders in pregnancy was based on established criteria. Gestational hypertension was defined as hypertension occurring after 20 weeks of gestation without prior history and without proteinuria. Pre-eclampsia was identified in cases where hypertension was accompanied by proteinuria, detected as 1+ protein on a urine dipstick test. Eclampsia was diagnosed in cases of pre-eclampsia with the presence of neurological complications such as seizures. Chronic hypertension was defined as hypertension diagnosed before pregnancy.

The sample size was calculated using the WHO sample size calculator, based on a prevalence of 5.56% for hypertensive disorders in pregnancy, a 5% margin of error, and a 95% confidence level (14). A total of 81 patients were enrolled using a non-probability convenient sampling technique. Informed consent was obtained from all participants after explaining the study objectives, procedures, and potential risks. Confidentiality was maintained, and patients had the right to withdraw at any stage. Baseline characteristics, including age, body mass index (BMI), gestational age, and parity, were documented. A detailed medical history and clinical examination were performed. Blood pressure was measured in the supine position after 30 minutes of rest, with the arm positioned at heart level. The palpatory method was used to estimate systolic pressure, followed by auscultatory measurement for both systolic and diastolic values. Three readings were

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obtained at 24-hour intervals using the same protocol, and the final blood pressure value was derived from the average of these readings. Neurological symptoms such as seizures were documented, and a 10 mL urine sample was collected to assess proteinuria using a dipstick test. Although dipstick testing was used for initial assessment, cases requiring further evaluation underwent confirmatory testing through a protein-to-creatinine ratio or 24-hour urinary protein analysis, as recommended in clinical guidelines.

Statistical analysis was performed using IBM SPSS version 26. Categorical variables, including parity and hypertensive disorder subtypes, were presented as frequencies and percentages, while continuous variables, such as age, BMI, and gestational age, were expressed as mean ± standard deviation. The primary outcome, the pattern of hypertension in pregnancy, was stratified based on age, BMI, parity, and gestational age. A post-stratification chi-square test was applied to determine associations, with a p-value of ≤ 0.05 considered statistically significant.

RESULTS

The study included pregnant women aged 20 to 40 years, with a mean age of 29.68 ± 10.24 years. The mean weight was 72.07 ± 6.46 kg, mean height was 170.55 ± 7.88 cm, and mean BMI was recorded as 23.87 ± 2.66 kg/m². The majority of the participants (51.9%) were aged 30 years or below, while 48.1% were older than 30 years. Parity distribution showed that 59.3% of the participants had three or fewer previous pregnancies, whereas 40.7% had more than three. A large proportion of patients (72.8%) had a gestational age of less than 28 weeks at the time of evaluation. BMI greater than 23.0 kg/m² was observed in 59.3% of the cases. Regarding the frequency and distribution of hypertensive disorders, pre-eclampsia was the most commonly observed condition, affecting 39.5% of patients. Chronic hypertension was diagnosed in 25.9%, followed by gestational hypertension in 23.5% of the cohort. Eclampsia was the least common, recorded in 7.4% of cases. Stratification of hypertension patterns based on clinicodemographic characteristics showed that pre-eclampsia was equally distributed among women aged 30 years or below (50.0%) and those older than 30 years (50.0%), with no statistically significant difference ($p = 0.787$). Eclampsia was slightly more common in women older than 30 years (66.7%) compared to those 30 years or younger (33.3%) but was not statistically significant ($p = 0.421$). Chronic hypertension was distributed nearly equally across both age groups, with no significant association ($p = 0.955$). Similarly, gestational hypertension showed no statistically significant association with age ($p = 0.547$).

Analysis of gestational age and hypertension subtypes revealed that pre-eclampsia was more prevalent in women with a gestational age of more than 28 weeks (68.8%), whereas 31.3% of cases were reported in those with a gestational age of 28 weeks or below ($p = 0.504$). Eclampsia was equally distributed (50.0%) in both gestational age groups ($p = 0.337$). Chronic hypertension was more common in pregnancies beyond 28 weeks (85.7%), though statistical significance was not established ($p = 0.160$). Gestational hypertension was observed in 26.3% of women with a gestational age of 28 weeks or below and in 73.7% of those with more than 28 weeks ($p = 1.000$). BMI-based stratification indicated that pre-eclampsia was recorded in 34.4% of participants with a BMI of 23.0 kg/m² or below and in 65.6% of those with a BMI greater than 23.0 kg/m² ($p = 0.346$). Eclampsia was found in 33.3% of women with a BMI of 23.0 kg/m² or below and 66.7% of those with a BMI above this threshold ($p = 1.000$). Chronic hypertension and gestational hypertension showed similar distributions across BMI categories, with no statistically significant associations ($p = 0.819$ and $p = 0.890$, respectively). Parity-based stratification revealed that pre-eclampsia was more common in women with three or fewer previous pregnancies (62.5%) compared to those with more than three pregnancies (37.5%), though the difference was not statistically significant ($p = 0.631$). However, eclampsia showed a highly significant association with parity, occurring exclusively in women with more than three previous pregnancies ($p = 0.003$). Chronic hypertension and gestational hypertension did not show any significant correlation with parity ($p = 0.774$ and $p = 0.693$, respectively).

The analysis of hypertension patterns in pregnancy revealed significant trends based on demographic and clinical factors. Pre-eclampsia was equally distributed among women aged 30 years or below (50.0%) and those older than 30 years (50.0%), while chronic hypertension was also nearly evenly distributed across age groups (52.4% vs. 47.6%). However, eclampsia was more prevalent in women aged more than 30 years (66.7%) than those aged 30 years or below (33.3%). A strong association was noted between eclampsia and parity, as it was exclusively observed in women with more than three previous pregnancies (100.0%, $p = 0.003$), while none of the women with parity of three or below developed eclampsia. Pre-eclampsia was more frequent in women with a lower parity (62.5%), while chronic and gestational hypertension followed similar distributions across parity groups. Regarding gestational age, pre-eclampsia was more common in pregnancies beyond 28 weeks (68.8%), whereas chronic hypertension was predominantly observed in the later gestational period (85.7%). BMI-based stratification indicated that pre-eclampsia was more prevalent in women with a BMI greater than

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23.0 kg/m² (65.6%), while eclampsia was also more common in this subgroup (66.7%). The analysis highlights that parity and gestational age may play significant roles in the severity of hypertensive disorders in pregnancy, particularly in the development of eclampsia, warranting further investigation into underlying risk factors.

Table 1 Mean ± SD of patients according to age, height, weight and BMI (N = 81)

Baseline Demographics and Characteristics	Mean ± Std. Deviation
1. Patient Age (years)	29.68 ± 10.239
2. Patient Height (cm)	170.55 ± 7.883
3. Patient Weight (kg)	72.07 ± 6.463
4. Patient BMI (kg/m^2)	23.865 ± 2.6605

Table 2 Frequency and percentage patients according to baseline clinic-demographic parameters (n = 81)

Parameters	Subgroups	Frequency	Percent
Age (years)	30 years or below	42	51.9
	more than 30	39	48.1
Parity	≤3	48	59.3
	>3	33	40.7
Gestational age (weeks)	≥28 weeks	22	27.2
	<28 weeks	59	72.8
BMI (kg/m^2)	23.0 or below	33	40.7
	More than 23.0	48	59.3

Table 3 Frequency and percentage of patients according to pattern of hypertension in pregnancy (n = 81)

Pattern	Subgroups	Frequency	Percent
Pre-eclampsia	Yes	32	39.5
	No	49	60.5
	Total	81	100.0
Eclampsia	Yes	6	7.4
	No	75	92.6
	Total	81	100.0
Chronic HTN	Yes	21	25.9
	No	60	74.1
	Total	81	100.0
Gestational HTN	Yes	19	23.5

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Pattern	Subgroups	Frequency	Percent
	No	62	76.5
	Total	81	100.0

Table 4 Stratification of Hypertensive Disorders in Pregnancy

Parameter	Pre-eclampsia (%)	Eclampsia (%)	Chronic Hypertension (%)	Gestational Hypertension (%)	P-value
Age ≤ 30 years	16 (50.0%)	2 (33.3%)	11 (52.4%)	11 (57.9%)	0.787
Age > 30 years	16 (50.0%)	4 (66.7%)	10 (47.6%)	8 (42.1%)	0.787
Gestational Age ≤ 28 weeks	10 (31.3%)	3 (50.0%)	3 (14.3%)	5 (26.3%)	0.504
Gestational Age > 28 weeks	22 (68.8%)	3 (50.0%)	18 (85.7%)	14 (73.7%)	0.504
BMI ≤ 23	11 (34.4%)	2 (33.3%)	9 (42.9%)	8 (42.1%)	0.346
BMI > 23	21 (65.6%)	4 (66.7%)	12 (57.1%)	11 (57.9%)	0.346
Parity ≤ 3	20 (62.5%)	0 (0.0%)	13 (61.9%)	12 (63.2%)	0.631
Parity > 3	12 (37.5%)	6 (100.0%)	8 (38.1%)	7 (36.8%)	0.631

Table 5 Hypertension Analysis by Risk Factors

Parameter	Pre-eclampsia (%)	Eclampsia (%)	Chronic HTN (%)	Gestational HTN (%)
Age ≤ 30 years	50	33.3	52.4	57.9
Age > 30 years	50	66.7	47.6	42.1
Parity ≤ 3	62.5	0	61.9	63.2
Parity > 3	37.5	100	38.1	36.8
Gestational age ≤ 28 weeks	31.3	50	14.3	26.3
Gestational age > 28 weeks	68.8	50	85.7	73.7
BMI ≤ 23	34.4	33.3	42.9	42.1
BMI > 23	65.6	66.7	57.1	57.9

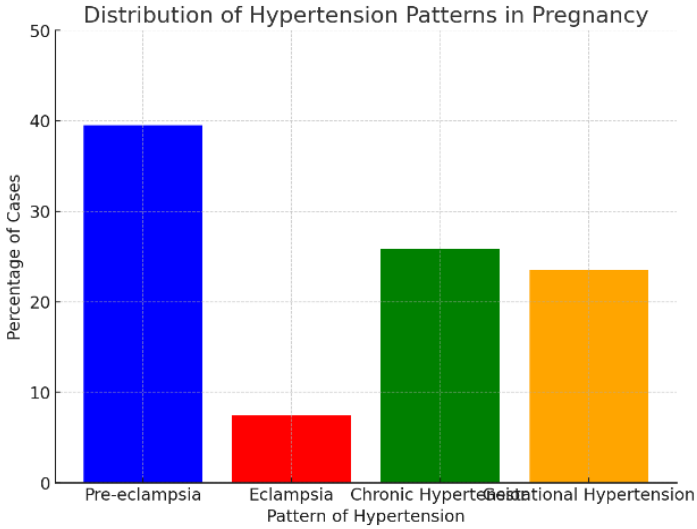

Figure 1 Distributive of Hypertension patterns in Pregnancy

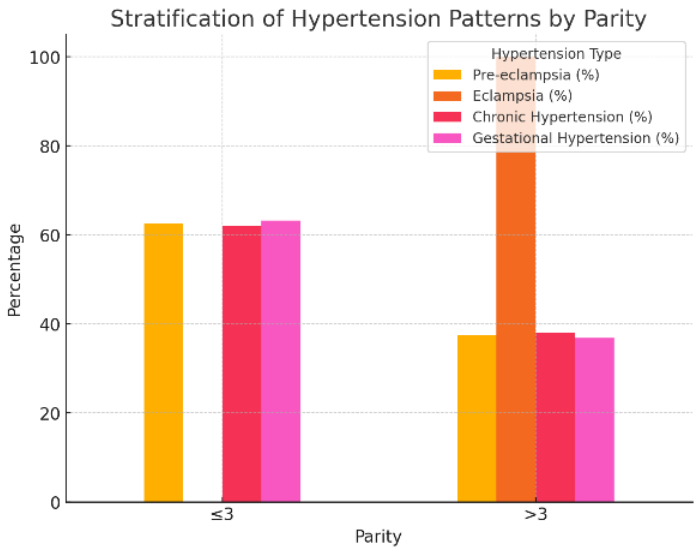

Figure 2 Stratification of Hypertension Patterns by Parity

DISCUSSION

The findings of this study indicate that hypertensive disorders in pregnancy are a significant concern, with pre-eclampsia emerging as the most prevalent condition, followed by chronic hypertension, gestational hypertension, and eclampsia. The mean age of participants was 29.68 ± 10.24 years, with the majority aged 30 years or below (15). These findings align with prior studies, which have reported similar age distributions among pregnant women diagnosed with hypertension. However, some studies have documented a slightly younger mean age, suggesting possible regional and demographic variations in the onset of hypertensive disorders during pregnancy (5,16). Multiparity was observed in most of the participants, which is in contrast to some studies that reported a higher proportion of primiparous women with hypertensive disorders. However, other research supports the current findings, indicating a greater burden of hypertension among multiparous women (6,17). The discrepancy in findings across different studies may be attributed to variations in population demographics, socioeconomic factors, and antenatal care practices. Gestational age was also a crucial factor, with a higher proportion of cases identified before 28 weeks, emphasizing the need for early detection and monitoring to prevent complications (9,18).

Pre-eclampsia was the most frequently diagnosed hypertensive disorder in this study, which is consistent with findings from several prior studies. However, some studies have reported gestational hypertension as the predominant condition, with lower rates of pre-eclampsia and eclampsia (19). The differences in prevalence may be influenced by variations in diagnostic criteria, healthcare access, and the implementation of screening programs. Additionally, a higher proportion of pregnant women in this study exhibited proteinuria, reinforcing the burden of hypertensive disorders in pregnancy and the risk of severe complications (20). The strengths of this study lie in its systematic data collection and the stratification of hypertensive disorders based on key clinicodemographic parameters. The study provides valuable insights into the prevalence and patterns of hypertensive disorders in pregnancy within the local population, contributing to the existing body of knowledge. However, certain limitations must be acknowledged. The study was conducted in a single healthcare facility, which may limit its generalizability to the broader population. The reliance on urine dipstick testing for proteinuria, although a practical approach, may not provide the most accurate assessment of renal involvement compared to quantitative methods. Additionally, potential confounding factors such as socioeconomic status, dietary habits, and pre-existing metabolic conditions were not extensively explored, which could have influenced the findings.

Future research should focus on multi-center studies with larger sample sizes to enhance the generalizability of findings. Incorporating advanced diagnostic techniques, including biochemical markers for endothelial dysfunction and placental health, would provide a more comprehensive understanding of hypertensive disorders in pregnancy. Investigating potential risk factors such as obesity, gestational diabetes, and genetic predisposition would further strengthen the understanding of hypertensive disorders and inform targeted preventive

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strategies. The strong association between eclampsia and higher parity observed in this study warrants further exploration to determine the underlying pathophysiological mechanisms and identify high-risk populations requiring early intervention.

CONCLUSION

Hypertensive disorders remain a prevalent concern among pregnant women in the studied population, with pre-eclampsia emerging as the most frequently observed condition, followed by chronic hypertension and gestational hypertension, while eclampsia was less commonly reported. The findings highlight the clinical burden of hypertensive disorders in pregnancy, emphasizing the need for early detection and vigilant management to prevent complications. No significant association was found between the pattern of hypertensive disorders and key demographic or clinical parameters, suggesting that these conditions may arise independently of common risk factors. This underscores the importance of routine antenatal screening and individualized care strategies to mitigate maternal and fetal risks associated with hypertension in pregnancy.

Author Contribution

Author	Contribution
Amjad Ali	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Ahmad Fawad	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Salman Hasan	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Ikram Ullah	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Zarmina Aslam	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published

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