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Association Between Hypertensive Disorder in Pregnancy and Postpartum Depression

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ABSTRACT

Gestational hypertension, preeclampsia, and eclampsia are suspected of spontaneously developing and being particularly critical for maternal and infant health. New research indicates that these disorders may also elevate the probability of developing Postpartum Depression (PPD), which remains one of the serious mental health challenges in new mothers. **Objective:** To evaluate the prevalence of PPD in women with hypertensive disorders during pregnancy and to examine further the association of PPD with hypertensive disorders of pregnancy. **Methods:** This comparative cross-sectional study was conducted at the Obstetrics and Gynaecology Department, LMH, Kohat. A total of 155 postnatal women between the ages of 15 and 40 between 2-6 weeks postpartum were included. PPD was evaluated using the Urdu translation of Edinburgh Postnatal Depression Scale (EPDS), with depression indicated by scores >10. SPSS version 25 for statistical analysis, Chi-square tests ($p < 0.05$) were performed. **Results:** Women suffering from hypertensive disorders showed significantly higher EPDS scores (mean value of 11.85 ± 3.00) in comparison to those of normotensive women (mean value of 8.71 ± 2.03, $p = 0.001$). Emotional neglect ($p = 0.001$) and previous depression ($p = 0.001$) as risk factors were significantly related to PPD. Hypertensive pregnancies were also linked to adverse neonatal outcomes, including lower birth weights ($p = 0.001$) and increased neonatal admissions ($p = 0.001$). **Conclusions:** Hypertensive disorders in pregnancy significantly increase the risk of PPD. Integrating mental health support into prenatal and postnatal care for hypertensive women may improve maternal psychological well-being and neonatal health outcomes.

INTRODUCTION

Pregnancy induces significant physiological and psychological changes. Many complications can result in hypertensive disorders which are dangerous to the health of both the mother and the fetus. Among the many challenges in maternal care that exist throughout the world, hypertensive disorders during pregnancy, including gestational hypertension, preeclampsia and eclampsia remain most often linked with negative outcomes for the mother and the fetus [1]. However, little attention has been paid to the mental health effects of these hypertensive disorders in the postpartum period, especially those related to PPD [2, 3]. PPD is one of the most widespread mental health conditions that affects women within twelve months after delivery [4]. Together, these factors impede a mother's ability to care for herself and her infant, as she may experience prolonged feelings of sadness, anxiousness, and fatigue. Studies indicated that 15% of women are possibly affected, indicating that PPD is considered comparatively common in certain populations [5, 6]. A combination of hormonal changes, family history, psychological stressors, and sociocultural factors can contribute to PPD. Complications of pregnancy, including hypertensive disorders, are linked to higher risks of Postpartum Depression (PPD) [7]. Such emotional disorders are often associated with other psychosomatic disorders like placental abruption and fetal growth restriction, along with more severe ones like preterm birth. Collectively, these pose a greater physical, emotional and psychological burden on women suffering from these disorders [8]. There is a notable increase in the risk of

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developing PPD after childbirth in women suffering from hypertension and pregnancy complications. These forms of hypertension have been linked to several complications including placental abruption, fetal growth restriction and preterm birth which adds severe emotional and psychological stress to the burdened women. In PPD, stress and anxiety management during pregnancy is shown in research to contribute to the development of hypertension causing depression after childbirth [9]. Pregnancy related hypertension and systemic inflammation as well as oxidative stress accompanying it could establish a link between PPD and hypertension. The link between hypertensive disorders and PPD is still unclear, especially with some research indicating that the management of stress and anxiety during pregnancy can lead to hypertension, which then aids in the manifestation of depressive tendencies postpartum. In addition, It has been suggested that systemic inflammation and oxidative stress that often accompany pregnancy hypertension may contribute to linking hypertension with PPD. Despite growing evidence, the association between various hypertensive disorders and PPD risk remain unclear. This research examines the prevalence of PPD in pregnant women with hypertensive disorders and compares these findings with normotensive pregnant women to fill the existing knowledge gap. The primary objective of this study is to evaluate the prevalence and correlation of hypertensive disorders during pregnancy with the onset of PPD. This research investigates how psychological and social stressors combined with a lack of emotional support and a history of mental health problems raise the PPD risk for women who have hypertension.

The research evaluated how hypertensive disorders affect neonatal outcomes such as birth weight and neonatal hospital admissions while examining their influence on maternal mental health.

METHODS

The comparative cross-sectional study was conducted at the LMH Kohat obstetrics and gynaecology department over a period of three months. The aim of the study was to determine the incidence of PPD in women suffering from hypertensive disorders in pregnancy and its relationship with the neonatal outcomes. Employing the WHO software, the sample size has been estimated with 95% confidence level, and expecting proportion of PPD among women with hypertensive disorders to be 27%, and absolute precision set at 7%, resulting in a total sample size of 155 participants [10]. The recruitment of participants was achieved using a non-probability sampling and consecutive sampling strategy. This strategy is suited to a clinical context and permits comprehensive participation of all appropriate patients during the specified time period. Inclusion of participants was done in a systematic manner, reducing selection bias while remaining simplistic in a hospital-based environment. The study was granted approval by two ethical review boards: The College of Physicians and Surgeons Pakistan (CPSP), Reference No: CPSP/REU/OBG-2021-303-10565. This study was conducted according to the ethical standards of the National Bioethics Committee (NBC) in Pakistan regarding human subject's participation. All provided their written informed consent to participate in the study and their anonymity was preserved. Women who were diagnosed with PPD were referred for therapy. The study included women aged 15 to 40 years who were 2–6 weeks postpartum and had hypertensive disorders during pregnancy (gestational hypertension, preeclampsia, or eclampsia). The study excluded women with obstetric complications diabetes, epilepsy, or psychiatric illnesses before or during pregnancy. Women who delivered babies with congenital malformations, experienced stillbirth, or perinatal death. To minimize confounding variables, the study considered: Socioeconomic status, education level, age, and prior mental health history. Stratified analyses for variables like mode of delivery, neonatal admission, and birth weight to assess their independent impact on PPD. Exclusion of participants with known psychiatric disorders or unrelated obstetric complications. Chi-square tests and stratified subgroup analyses were performed to control confounders during statistical analysis. Data were collected via face-to-face interviews using a pre-designed questionnaire to document demographic details (age, residence, education, profession, and socioeconomic status). PPD was assessed using the Urdu version of the Edinburgh Postnatal Depression Scale (EPDS), where a score of >10 indicated depressions. This threshold aligns with validated cut-offs for PPD screening. Data were entered and analysed using IBM SPSS version 25. Quantitative variables (age, baby birth weight, depression score, BMI, haemoglobin levels) were tested for normality using the Kolmogorov-Smirnov test. Mean ± Standard Deviation (SD) was used for normally distributed variables, while median (IQR) was applied for skewed data. Categorical variables (marital status, education, hypertensive disorder type, neonatal admissions, EPDS scores) were expressed as frequencies and percentages. The association between hypertensive disorders and PPD was analysed using the Chi-square test or Fisher's exact test, with a p-value <0.05 considered statistically significant. The study divided participants into two groups based on their hypertensive status during pregnancy: women diagnosed with gestational hypertension, preeclampsia, or eclampsia were categorized as the hypertensive group, while those with normal blood pressure throughout pregnancy formed the normotensive group. This division aimed to assess the association between hypertensive disorders and the prevalence of

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postpartum depression (PPD) as well as adverse neonatal outcomes. The logic behind this grouping was to determine whether hypertensive pregnancies contribute to a higher risk of PPD, measured using the Edinburgh Postnatal Depression Scale (EPDS), and poor neonatal health, including low birth weight and increased neonatal admissions. By employing statistical analyses such as the Chi-square test and stratified subgroup analyses, the study ensured that confounding factors—such as socioeconomic status, education level, and prior mental health history—were accounted for. This structured comparison allowed for a clearer understanding of the psychological and neonatal risks associated with hypertensive disorders in pregnancy.

RESULTS

The study analysed 155 postpartum women, of whom 84 (54.2%) had hypertensive disorders during pregnancy, while 71 (45.8%) were normotensive. The demographic, clinical, psychological, and neonatal outcomes are detailed below. Table 1 presented the demographic and clinical characteristics of the participants. Women in the hypertensive group were significantly older, mean age = 35.12 ± 4.59 years compared to the normotensive group, mean = 30.51 ± 3.88 years, p = 0.001. They also had higher BMI levels, 30.04 ± 4.58 versus 25.17 ± 3.63, p = 0.001 and lower haemoglobin levels, 9.92 ± 1.5 versus 12.07 ± 0.93, p = 0.001.

Table 1: Demographic and Clinical Characteristics (n=155)

Variables	Hypertensive Group Mean ± SD/ Frequency (%)	Non-Hypertensive Group Mean ± SD/ Frequency (%)	p-value
Age (Years)	35.12 ± 4.59	30.51±3.88	0.001
Education			
Illiterate	27	17	0.427
Matriculate	27	25	
Graduate	23	18	
postgraduate	7	11	
Socioeconomic Status			
Poor (<20,000)	23	20	0.256
Lower (20,000 -50,000)	22	18	
Middle (60,000-80,000)	30	18	
Upper (>80,000)	9	15	
Marital Status			
currently Living with Spouse	67	63	0.09
Separated	14	4	
Widow	3	4	
Occupation			
Housewife	57	40	0.14
Employed	27	31	
Joint Family			
No	38	40	0.16
Yes	46	31	
Joint Family			
Gestational Hypertension,	42	0	0.001
Preeclampsia,	35	0	
N/A	0	71	
Eclampsia	7	0	
BMI	30.04 ± 4.58	25.17 ±3.63	0.001
Blood Pressure	150.28 ± 10.22	119.83 ± 5.35	0.001
Haemoglobin Level	9.92 ±1.5	12.07 ± 0.93	0.001
Depression Score	11.85 ±3.00	8.71 ±2.03	0.001

Table 2 highlighted the psychological and obstetric risk factors. PPD was significantly more prevalent among women with hypertensive disorders, with 59.5% of hypertensive women (50 out of 84) having an EPDS score ≥10, compared to 25.3% (18 out of 71) in the normotensive group (p = 0.001). Lack of emotional support (p = 0.001), history of depression (p = 0.001), and experience of domestic violence (p = 0.001) were significantly associated with PPD. Uneducated spouses and financial difficulties were also more common in the hypertensive group (p = 0.009 and p = 0.035, respectively).

Table 2: Psychological and Obstetrical Risk Factors (n=155)

Variables	Hypertensive Group Frequency (%)	Non-Hypertensive Group Frequency (%)	p-value
Unemployed Husband			
No	52	53	0.09
Yes	32	18	
Uneducated Husband			
No	38	47	0.009
Yes	46	24	
Husband with Psychiatric History			
No	63	63	0.029
Yes	21	8	
Lack of Emotional Support			
No	45	58	0.001
Yes	39	13	
Previous History of Depression			
No	54	62	0.001
Yes	30	9	
Dissatisfaction with Support			
No	54	53	0.164
Yes	30	18	
Domestic Violence			
No	53	65	0.001
Yes	31	6	
Financial Issues			
No	44	49	0.035
Yes	40	22	

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Dissatisfaction with Living Conditions			
No	51	61	0.001
Yes	33	10	
Stressful Life Events			
No	36	54	0.001
Yes	48	17	
Previous Loss of Baby			
No	71	65	0.18
Yes	13	6	
Chronic Disease History			
No	52	53	0.09
Yes	32	18	
History of Hypertension in Previous Pregnancy			
No	42	50	0.01
Yes	42	21	
Negative Attitude towards Pregnancy			
No	52	52	0.13
Yes	32	19	
Negative Attitude towards Mother Role			
No	50	47	0.39
Yes	34	24	
Lack of Childcare Knowledge			
No	43	54	0.001
Yes	41	17	
Absence of Breastfeeding			
No	55	56	0.65
Yes	29	15	

As shown in Table 3 neonates born to hypertensive mothers had lower birth weights, with 55% weighing <2.5 kg compared to 25% in the normotensive group (p = 0.001). Neonatal admissions were significantly higher in the hypertensive group (41% vs. 15%, p = 0.001). Operative delivery rates were also higher among hypertensive mothers (p = 0.002).

Table 3: Delivery and Neonatal Outcomes (n=155)

Variables	Hypertensive Group	Non-Hypertensive Group	p-value
Mode of Delivery			
NVD	43	12	0.002
Instrumental Delivery	26	55	
Operative	15	4	
Baby Gender			
Male	41	33	0.77
Female	43	38	
Neonatal Admission			
None	26	49	0.001
<7 Days	41	15	
>7 Days	17	7	
Birth Weight			
<2.5Kg	55	25	0.001
>2.5Kg	29	46	
EPDS Score			
<10	34	53	0.001
≥10	50	18	

Women with hypertensive disorders had significantly higher mean EPDS scores (11.85 ± 3.00) than normotensive women (8.71 ± 2.03, p = 0.001). Chi-square analysis confirmed a significant association between hypertensive disorders and PPD (p < 0.05). Stratified analysis showed that the risk of PPD remained significant even after adjusting for confounding factors such as mode of delivery, neonatal admission, and birth weight. The elevated prevalence of PPD among hypertensive women can be attributed to both physical and psychosocial stressors, complications during delivery, lack of emotional support, and adverse neonatal outcomes. The increased rates of neonatal admissions and low birth weight in hypertensive pregnancies likely add further stress, compounding maternal mental health challenges. These findings emphasise the need for comprehensive care that addresses both medical and psychological aspects in women with hypertensive disorders. Figure 1 showed that a higher proportion of hypertensive women had elevated depression scores (≥10) compared to the normotensive group.

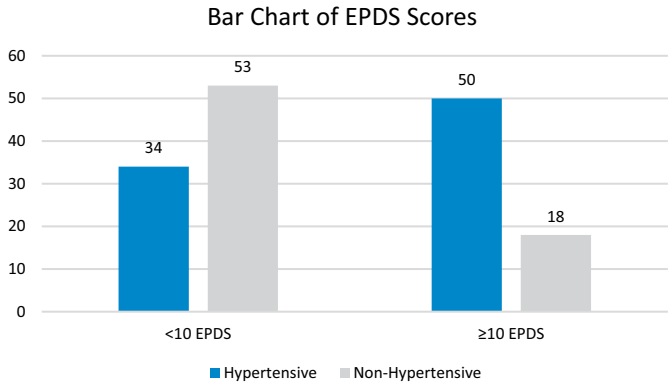

Figure 1: Illustrates the EPDS Score Distribution

DISCUSSION

This study highlighted the strong association between hypertensive disorders during pregnancy and an increased risk of PPD. These findings align with prior research suggesting that both physical complications and psychosocial stressors associated with hypertensive pregnancies contribute to heightened mental health risks [11, 12]. Women with hypertensive disorders had significantly higher EPDS scores (mean = 11.85 ± 3.00) than normotensive women (8.71 ± 2.03, p = 0.001), confirming a higher prevalence of PPD among hypertensive mothers. This association persisted even after adjusting for confounders such as socioeconomic status, mode of delivery, and neonatal admissions. The findings suggest that hypertensive conditions not only increase physical risks but also elevate psychological distress in postpartum women. The biological mechanisms linking hypertensive disorders and PPD remain an area of growing research. Several studies suggest that systemic inflammation,

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oxidative stress, and neuroendocrine dysregulation in hypertensive pregnancies may contribute to the onset of depressive symptoms. Elevated levels of pro-inflammatory cytokines such as interleukin-6 and tumour necrosis factor-alpha (TNF-α) have been associated with both hypertensive disorders and mood disturbances, providing a potential biological explanation for the observed link between hypertension and PPD [13, 14]. These results were consistent with previous studies emphasizing the strong correlation between hypertensive disorders and maternal mental health conditions [15]. The investigation of Rocha de Moura MD *et al.*, in 2021 documented that women suffering from preeclampsia had an almost twofold risk of encountering PPD compared to normotensive women, which aligns with these findings. Also, other studies by Lin YW *et al.*, in 2021 focused on the contribution of chronic stress during hypertensive pregnancies toward maternal depression [16, 17]. Alongside biological aspects, psychosocial stress was another important factor that explains the high prevalence of PPD in hypertensive mothers in this study. The lack of emotional support (p=0.001), financial challenges (p=0.035), and domestic violence (p=0.001) were linked to higher scores for EPDS. Mothers with complicated pregnancies, prolonged hospitalizations, and Neonatal Intensive Care Unit (NICU) admissions for their newborns showed a lot of anxiety and emotional distress. Such findings suggest that combined medical psychological and social support systems would be necessary in reducing the risk of PPD for women with high blood pressure complications. Similarly, this study found that babies born to hypertensive mothers were at greater risk of negative outcomes as they were more likely to be born underweight (<2.5 kg in 55% versus 25% of the normotensive group; p = 0.001) and need to be admitted to the neonatal unit (41% versus 15%; p = 0.001). These adverse neonatal outcomes add further emotional and psychological burdens on new mothers, increasing susceptibility to PPD.Previous research supports this association, as mothers of preterm or low-birth-weight infants experience heightened postpartum stress and depressive symptoms [18, 19]. This underscores the need for targeted postpartum interventions addressing both maternal mental health and neonatal well-being [20]. Despite these significant findings, this study has certain limitations: The use of a cross-sectional design prevents causal inference. Future longitudinal studies are needed to establish causality between hypertensive disorders and PPD. Non-probability consecutive sampling limits generalizability, as participants were selected from a single hospital setting. A larger, multi-center study would enhance external validity. Potential residual confounding remains, despite these efforts to adjust for key variables such as socioeconomic status and previous depression history. Future studies should explore the biological mechanisms linking hypertensive disorders and depression, focusing on inflammatory pathways, neuroendocrine dysregulation, and oxidative stress. Longitudinal analyses tracking PPD development over time in women with pregnancy-related hypertensive conditions. The effectiveness of integrated care models combining hypertensive disorder management with early mental health interventions.These findings highlighted the importance of integrating mental health screening into routine prenatal and postnatal care for hypertensive women. Healthcare providers should: Implement early PPD screening in hypertensive pregnancies to ensure timely psychological support. Address social determinants of maternal mental health, such as domestic violence, lack of emotional support, and financial strain.Encourage a multidisciplinary approach involving obstetricians, psychiatrists, and neonatologists to provide holistic care.

CONCLUSIONS

The research showed that women suffering from hypertensive complications throughout pregnancy were more likely to develop PPD. Particularly, women with severe hypertensive disorders such as preeclampsia and eclampsia were at risk of developing PPD. The findings emphasized the need for early identification and management of hypertensive disorders, not only to mitigate physical complications but also to reduce the risk of postpartum mental health issues. Improved outcomes can be attained for both mothers and children by integrating mental health checks and support in routine prenatal and postnatal care for women with hypertensive disorders.

Authors Contribution

Conceptualization: N
Methodology: RM, FB, NM, N
Formal analysis: FG, NM, NH
Writing, review and editing: FG, NM, NH, RM
All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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