ORIGINAL RESEARCH

Clinical Epidemiological Profile of *De Novo* Postpartum Hypertensive Disorder in BP Koirala Institute of Health Sciences, a Tertiary Care Center in Eastern Nepal

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Abstract

Aim: To identify the incidence, clinical risk factors, and clinical course of women with *de novo* postpartum hypertensive disorder without prior antepartum or chronic hypertensive disorders.

Methods: This is a retrospective cross-sectional study. Postpartum records of all pregnant women normotensive in the antepartum and prepregnancy period, delivered in this institute and women (within 6 weeks postpartum period) admitted with the diagnosis of new-onset postpartum hypertension in the reference time period (March 2020–May 2020) were evaluated. Women with an antenatal diagnosis of preeclampsia or chronic hypertension were excluded. Relevant information regarding demographic characteristics, history, pregnancy course, postpartum course, and significant morbidity was collected. The incidence of *de novo* postpartum hypertension (dPPHTN) was calculated. The medians were compared using the Wilcoxon rank-sum tests. The association between outcome variables and epidemiological and clinical variables was assessed using the Chi-square test. For follow-up of the course of HTN, patients with dPPHTN were inquired via telephone conversation regarding duration of treatment, adherence to home BP charting, and complications.

Results: Among 1,080 women who were normotensive 54 women developed dPPHTN giving us the incidence of 4.9%. Cesarean delivery was found to have a statistically significant association with dPPHTN. No statistically significant association was found in terms of parity, family history of HTN in first-degree relatives, and multiple gestations in the development of dPPHTN. No statistically significant difference was found between the medians of maternal age, gestational age at delivery, and that of birth weight among the two groups. The median postpartum day of presentation was 1st postpartum day with range of 0–7th postpartum day. The majority (92%) of cases were asymptomatic and were detected upon routine inpatient blood pressure monitoring, 5% patients had headache as the presenting symptom, and 1 patient presented with seizure. Median (range) peak systolic and diastolic blood pressures were 140 (120–170) mm Hg and 100 (70–110) mm Hg, respectively. The median length of hospital stay was 2 days with range of 2–7 days. About 19 (35%) patients were discharged with daily home blood pressure charting instructions, and 35 (65%) were discharged on oral medications. Regarding follow-up, 17 (31.48%) patients could not be contacted, 15 (27.77%) patients complied with home BP charting and discontinued antihypertensive therapy after physician consultation with duration of use of antihypertensive ranging from 7 to 14 days, 21 (38.88%) were noncompliant and lost to follow-up, 1 (1.8%) patient developed chronic hypertension.

Conclusion: *De novo* postpartum hypertension is an underrecognized disorder with potential serious maternal morbidity. Our study elucidates the need for the development and implementation of stringent postpartum surveillance and follow-up protocols in order to detect, manage, and prevent morbidity due to this disorder.

Keywords: *De novo* postpartum hypertension, Delayed onset preclampsia, Hypertensive disorders of pregnancy, Postpartum hypertension.

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Introduction

Hypertensive disorders of pregnancy (HDP) are common and serious disorders related to pregnancy that contribute as a leading cause of maternal mortality and morbidity worldwide. Globally, the incidence of HDP showed a rising trend with a total increase of 10.92% from 1990 to 2019.[1] According to a systematic review of global data by the World Health Organization, HDP has been identified as a leading cause of maternal death in developing countries accounting for approximately 18% of all maternal deaths worldwide.[1]

Postpartum HDP represents the persistence, exacerbation, or *de novo* development of gestational hypertension or preeclampsia and accounts for a large proportion of cases of morbidity and mortality due to HDP. *De novo* postpartum hypertension (dPPHTN) represents new-onset hypertensive disorder – gestational, preeclampsia, or eclampsia in the postpartum period up to 6 weeks in previously normotensive women, i.e., without prior antepartum or chronic hypertensive disorders.[2,3] The prevalence of dPPHTN is not well-studied, with reported rates ranging from 0.3 to 27.5%.[4]

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Lack of awareness of the occurrence of postpartum HDP in patients and physicians, postpartum surveillance and screening, and delayed recognition and management of HDP contribute to greater risk of maternal morbidity due to dPPHTN compared with antepartum HDP, including seizures, stroke, and rarely deaths.[5]

Despite the potential risk that dPPHTN carries, there is paucity of data in the literature reflecting its incidence, risk factors, clinical course, and future risk. No standard guidelines exist to guide its management, except from recommendations centered around the immediate treatment of severe hypertension (defined as systolic blood pressure (SBP) ≥160 mm Hg or diastolic blood pressure ≥110 mm Hg) to reduce the risk of acute stroke. This study was therefore conducted to identify incidence, clinical risk factors, and clinical course of dPPHTN.[3]

Methods

This is a retrospective cross-sectional study conducted at BP Koirala Institute of Health Sciences, a tertiary referral center that caters its service to Eastern Nepal. This study was approved by the Institutional Review Committee of this institute.

Study Population

All pregnant women normotensive in the antepartum and prepregnancy period, delivered and women (within 6 weeks postpartum period) admitted with the diagnosis of new-onset postpartum hypertension in our institute in the reference time period (March 2020–May 2020). Postpartum women with new-onset hypertension (SBP ≥140 and/or DPB ≥90 mm Hg) post delivery with sustained raised blood pressure over 4 hours were included as cases and rest as controls.

Patients with antenatal hypertensive disorder, history of chronic hypertension, postpartum patients with only single-recorded raised blood pressure, patients with incomplete hospital records, and those left against medical advice were excluded from the study.

Sample Size

Purposive sampling method was applied. Sample-size estimation was done based on the prevalence of postpartum hypertensive disorder in a large retrospective study.[2] Considering 5% significance ($\alpha = 0.05$), 85% power, and using the formula: $N = Z^2pq/d^2$, the sample size was calculated as follows:

Z = Z value of 1.96 of 95% of confidence interval.

p = Prevalence of postpartum hypertensive disorder (p) =9.9%.[2]

q = 100–p.

d = Margin of error (precision) – 18% of prevalence.

Z = 1.96, q = 90.1, p = 9.9.

Now, sample size, $N = Z^2pq/d^2$

$= 1.962 \times 9.9 \times 90.1/1.782$

$= 1080.$

Data Collection

Data for all patients fulfilling the inclusion criteria were extracted from the hospital records using a standardized data collection form. Data extracted from the records included maternal demographics, prepregnancy and antepartum risk factors, day of onset of raised BP, initial symptoms at the time of clinical presentation, investigations, management, and discharge instructions. For follow-up of the course of hypertension, patients with dPPHTN were inquired via telephone conversation regarding duration of treatment, adherence to home BP charting, and complications.

Table 1: Baseline characteristics

	Controls (n = 1,026)	*Cases (n = 54)*	*p-value*
Age (years)	24 (16–42)	25 (18–42)	0.35
Nulliparous	626 (61.01)	34 (62.96)	0.93
Multiparous	399 (38.88)	20 (37.03)	
Multiple gestation	9 (0.87)	1 (1.85)	0.50
Family history of HTN in first-degree relatives	43 (4.19)	2 (3.70)	0.86
Gestational diabetes	105 (10.23)	6 (11.11)	0.69
Gestational age at delivery			
Preterm	53 (5.16)	4 (7.04)	0.56
Term	922 (89.86)	47 (8.70)	
Postterm	51 (4.97)	3 (5.55)	
Gestational age at delivery (weeks)	40 (30–43)	39 (33–42)	0.18
Birth weight (kg)	3.04 (1.22–4.45)	2.90 (1.59–2.87)	0.14
Mode of delivery			
Vaginal	416 (40.54)	8 (14.81)	<0.001
Cesarean	210 (20.46)	26 (48.18)	

Data are in median (range) or *n* (%)

Statistical Analysis

Demographic data were presented as mean and standard deviation or median and interquartile range as appropriate. Categorical variables were presented as frequencies and percentage. The medians were compared using the Wilcoxon rank-sum tests. The association between outcome variables and epidemiological and clinical variables was assessed using the Chi-square test . All the analyses were performed using SPSS v.20.0. *P*-value equal to or less than 0.005 was considered as statistically significant.

Results

Among 1,080 women who were normotensive, 54 women developed dPPHTN giving us the incidence of 4.9%. As depicted in Table 1, the median (range) age in controls and case group was 24 (16–42) years and 25 (18–42) years, respectively, with no statistically significant difference among two groups. No statistically significant association was found in terms of parity, family history of hypertension in first-degree relatives, and multiple gestation and development of dPPHTN. No statistically significant difference was found between the medians of gestational age at delivery and that of birth weight among the two groups. Cesarean delivery was found to have a statistically significant association with dPPHTN (Table 1). Due to unavailability of data, the association between prepregnancy BMI and dPPHTN could not be calculated.

As depicted in Table 2, among the 54 women diagnosed with dPPHTN, the median postpartum day of presentation was 1st postpartum day with range of 0–7th postpartum day. Majority, i.e., 92% of cases were asymptomatic and were detected upon routine inpatient blood pressure monitoring, 5% patients had headache as the presenting symptom, and 1 patient presented with seizure. Median (range) peak systolic and diastolic blood pressures were 140 (120–170) mm Hg and 100 (70–110) mm Hg, respectively, 11% had proteinuria, 3.7% had raised serum creatinine level ≥1.1 mg/dL, and

Table 2: Clinical course: dPPHTN

Parameters	*Values*
Day of onset of raised BP postpartum	1 (0–7)
Diagnosis of dPPHTN	
Detection on monitoring of BP during hospital stay	50 (92.59)
Signs and symptoms	
Headache	3 (5.55)
Eclampsia	1 (1.85)
Maximum SBP (mm Hg)	140 (120–170)
Maximum DBP (mm Hg)	100 (70–110)
Laboratory reports	
Proteinuria	
1+	4 (7.40)
2+	1 (1.85)
Raised serum creatinine	2 (3.70)
Abnormal liver function test	4 (7.40)
Admission to ICU	1 (1.85)
Treatment	
IV medication (acute BP control)	1 (1.85)
Oral medication	
Single	35 (64.81)
Multiple	32 (91.42)
$MgSO_4$	3 (8.57)
	2 (3.70)
Duration of hospital stay (days)	2 (2–7)
Discharge	
HBC only	19 (35.18)
HBC and oral medication	35 (64.81)
Follow-up	
Could not be contacted	17 (31.48%)
Compliant	15 (27.77%)
Duration of antihypertensive use	7–14 days
Chronic HTN	1
Lost to follow-up	21 (38.88%)

Data are in median (range) or *n* (%)
DBP, diastolic blood pressure, HBC, home BP charting; IV, intravenous, $MgSO_4$, magnesium sulfate

7.4% had abnormal liver function test reflected by raised SGPT and SGOT levels (max: up to 300 U/L). One patient had intensive care unit (ICU) stay for observation for 1 day. Regarding management, one patient received multiple doses of intravenous antihypertensive (Labetalol) for acute control of high BP, and 35 patients were managed with oral antihypertensives. Among patients managed with oral drugs, 32 patients achieved desired BP (<140/90) with a single agent (Amlodipine), whereas 3 patients required multiple drugs (Amlodipine, Hydrochlorothiazide, and Labetalol). One patient presenting with seizure received magnesium sulfate: loading plus maintenance therapy, and one patient with imminent signs of eclampsia received only a loading dose. The median length of hospital stay was 2 days with range of 2–7 days.

Nineteen patients were discharged with daily home blood pressure charting instructions, and 35 were discharged on oral medications after being counseled about the danger signs, advising them to follow up on appearance of danger signs, persistent raised BP ≥140/90, or after 2 weeks with their blood pressure record if the blood pressure was controlled.

Regarding follow-up of patients with dPPHTN, 17 (31.48%) patients could not be contacted, 15 (27.77%) patients complied with home BP charting and discontinued antihypertensive therapy after physician consultation with a duration of use of antihypertensive being ranging from 7 to 14 days, 21 (38.88%) discontinued home BP monitoring and antihypertensive therapy on their own and did not follow up, and 1 (1.8%) patient developed chronic hypertension.

Discussion

In this study, at a single tertiary care center, we demonstrated the development of dPPHTN in 4.9% of postpartum women who were normotensive in the prepregnancy and antepartum period. There is paucity of data describing the overall incidence and risk factors for PPHTN in the literature. A large, observational, clinical study at a single tertiary care hospital, has demonstrated the incidence of dPPHTN to be 9.9%.[2]

In our study, cesarean delivery was found to have statistically significant association with development of dPPHTN. Similar findings were recorded in prior studies. The clinical risk factors for the eventual appearance of dPPHTN have been found to strongly resemble those for preeclampsia.[6,7] Our study found a significant overlap in patient demographics and clinical profile in postpartum women with and without new-onset HTN, which is consistent with the finding of prior retrospective cross-sectional study.[3]

Our study demonstrated the highest number of cases diagnosed as dPPHTN based on routine blood pressure measurement during inpatient stay with median day of blood pressure rise in the first postpartum day. Most patients were asymptomatic, with 5% of patients presenting with headaches. Patients were either discharged with instructions to monitor blood pressure at home or with antihypertensive medications and BP charting instructions. Out of 15 patients that complied with follow-up instructions, one patient developed chronic HTN. The clinical course of dPPHTN has not been adequately characterized. One small case series has found a median time of presentation of dPPHTN to be 5 days, with headaches and elevated blood pressures being the most common presentation.[8,9] Another study showed the median days of presentation to be 7 days, with the most common presenting symptom being headache and shortness of breath.[10,11] Prior observational studies showed that the increase in blood pressure has been typically seen after discharge from the hospital, which was associated with seizure, stroke, and rarely death.[11–13] Realizing the need for vigilance and importance of postpartum care, the American College of Obstetricians and Gynecologists (ACOG) has recently updated their guidelines to propose a model for postpartum care redefining this period as the "fourth trimester" from delivery to 12 weeks postpartum.[14] This study further substantiates the need for continued surveillance and need of implementation of the follow-up protocol in the postpartum period. Further studies are needed to characterize dPPHTN in the spectrum of HDP and frame standard management guidelines.

There are a few strengths of this study. First of all, the sample size is relatively large. This study was conducted in a tertiary center that serves a wide range of patient demographics and ethnicity, the results are applicable to countries with similar demographics. This study is not without limitations. As this was a retrospective study, the data available for analysis were limited to that available in medical records. Important characteristics such as weight and

BMI could not be compared due to lack of data. As our institute is a tertiary referral center catering service to most areas of Eastern Nepal with resource-limited health setup, large volumes of cases need to be accommodated for which earlier discharge (within 12–24 hours post delivery) is done for patients undergoing uncomplicated vaginal delivery. Many cases of dPPHTN could have been missed due to this earlier discharge practice, and hence the true incidence could have been underestimated. Data regarding follow-up of cases of dPPHTN were incomplete, as 31% patients could not be contacted upon repeated trials. Also, 38% patients were noncompliant and did not follow discharge instructions. Hence, a true picture of the clinical course of dPPHTN could not be depicted.

Conclusion

De novo postpartum hypertension is an underrecognized disorder with potential serious maternal morbidity. Our study elucidates the need for development and implementation of stringent postpartum surveillance and follow-up protocols in order to detect, manage, and prevent morbidity due to this disorder.

Consent for Publication

This article does not contain any identifiable information, details, videos or images of the patient. No new treatment or experiment was tried on the patient for the sake of study.

Availability of Data and Materials

Available from the corresponding author on reasonable request.

Authors' Contributions

AH is the primary author of this paper, involved in study design, data collection, analysis, and final manuscript writing. JY, PB, AD, and PY were involved in providing inputs for the study design and participated in paper editing. All authors read and approved the final manuscript.

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