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Original Research Article

The outcome of preterm births in pregnant women with hypertensive disorders: an observational study

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ABSTRACT

Background: Hypertensive conditions occurring during pregnancy are linked to heightened chances of severe consequences, including preterm birth, intrauterine growth restriction, perinatal mortality and morbidity, acute kidney failure, sudden liver malfunction, excessive postpartum bleeding, HELLP Syndrome, disseminated intravascular coagulation, and seizures.

Methods: A prospective hospital-based study was conducted in a tertiary care hospital of eastern Uttar Pradesh, over the period of one year. The total sample size calculated was 235. Data was collected using the structured questionnaire. This study recruited the hypertensive pregnant women with a blood pressure reading of 140/90 mmHg or higher, irrespective of the timing of the blood pressure elevation, who visited the hospital for delivery over the course of one year. Various maternal variables were examined, including age, gestational age, number of previous deliveries, the status of the mother's blood pressure, and the type of delivery.

Results: In the present study, the births revealed the following distribution among different hypertensive disorders: chronic hypertension preterm: 100.0% 06 vs. term: 0% 0, eclampsia, preterm: 60.4% 64 vs. term: 39.6% 42, mild preeclampsia, preterm: 55.3% vs. term: 44.7%, severe preeclampsia, preterm: 48.5% vs. term: 51.5%, and gestational hypertension, preterm: 23.5% vs. term: 76.5%.

Conclusions: Based on the findings of this study, it was determined that hypertensive disorders play a pivotal role in influencing both the frequency of preterm delivery and the associated complications in infants resulting from premature birth.

Keywords: Hypertensive disorders, Pregnancy, Preterm birth

INTRODUCTION

Ensuring maternal health and preventing nutritional and systemic disorders are crucial for creating an ideal prenatal environment that fosters proper fetal growth and development. Typically, the fetus is shielded and safeguarded against detrimental physical, chemical, and biological factors. However, hypertensive disorders that arise during pregnancy pose a significant threat not only to maternal well-being but also to the welfare of the developing fetus. This condition forms a part of the

perilous triad, alongside hemorrhage and infection.¹ Hypertensive complications during pregnancy stand as one of the primary contributors to maternal and perinatal mortality rates in developing nations.² According to the classification provided by The American College of Obstetricians (ACOG), hypertensive disorders of pregnancy can be categorized into four groups, Group 1: Gestational Hypertension: This group includes cases where the resting blood pressure measures 140/90mmHg or higher after the 20th week of gestation, without the presence of proteinuria. Group 2: Chronic Hypertension:

Referring to hypertension that either existed before pregnancy or developed within the first 20 weeks of gestation. Group 3: Preeclampsia/Eclampsia: This category encompasses cases characterized by elevated blood pressure, along with either edema or proteinuria. Eclampsia refers specifically to the presence of seizures in addition to the signs of preeclampsia and Group 4: preeclampsia superimposed on chronic hypertension: This group describes situations where preeclampsia develops in pregnant women with pre-existing chronic hypertension.^{3,4} In developed, middle-income, and low-income countries, hypertensive disorders of pregnancy contribute significantly to the occurrence of preterm births. The risk of preterm birth is notably elevated in mothers with hypertension compared to those without hypertension.⁵ Preterm birth stands as a prominent factor contributing to neonatal morbidity and mortality among children under the age of five. India alone accounts for 23.6% of global preterm births.^{6,7} In developing countries such as India, several factors including inadequate obstetric care, high illiteracy rates, poor nutrition, inadequate infrastructure, early age of marriage, and young age at first pregnancy contribute to a high prevalence of hypertensive disorders during pregnancy. Consequently, these factors also contribute to unfavorable outcomes associated with hypertensive disorders in pregnancy.^{8,9}

Aim and objectives

The study aimed to scrutinize and discern the intricate factors that exert influence upon the occurrence of preterm births among expectant women afflicted with hypertensive disorders. Furthermore, an evaluation of the ensuing outcomes pertaining to these preterm births during the subsequent follow-up period was undertaken.

METHODS

This prospective hospital-based study was conducted at Nehru Hospital, B.R.D. Medical College in Gorakhpur, specifically within the emergency department of obstetrics and gynecology, over a duration of one year (October 2019 to September 2020). Approval for the study was obtained from the institute's Ethics Committee. The study population comprised antenatal women seeking medical care at the obstetrics and gynecology department of BRD Medical College in Gorakhpur.

The study aimed to investigate various aspects related to hypertensive disorders during pregnancy, focusing on antenatal women with singleton live births, ranging from 28 to 42 weeks of gestational age. Employing a prospective research design, the study collected data on factors associated with hypertensive disorders. Inclusion criteria encompassed patients diagnosed with hypertensive disorders after reaching 28 weeks of gestation, including cases of mild pre-eclampsia, severe pre-eclampsia, eclampsia, chronic hypertension, chronic hypertension superimposed with pre-eclampsia, and gestational hypertension in singleton pregnancies with hypertension.

Exclusion criteria involved the exclusion of antenatal cases without hypertensive disorders within the 28 to 42 weeks gestational age range, cases of hypertensive disorders occurring before 28 weeks of gestational age, cases of hypertensive disorders in twin pregnancies within the 28 to 42 weeks gestational age range, cases of hypertensive disorders associated with congenital anomalies, and cases of hypertensive disorders associated with other comorbidities. To ensure an adequate sample size, the study calculated that 235 participants would be required. This estimation was based on an estimated prevalence of preterm birth rate in hypertensive disorders of pregnancy of 18.0% and a 5% allowable error margin. Using the formula:

$$N = 4pq/l^2$$

This study focused on hypertensive pregnant women with a blood pressure reading of 140/90 mmHg or higher, irrespective of the timing of the blood pressure elevation, who visited the hospital for delivery over the course of one year. Various maternal variables were examined, including age, gestational age, number of previous deliveries, the status of the mother's blood pressure, and the type of delivery. Neonatal variables investigated included birth weight, whether the birth was term or preterm, the presence of intrauterine growth restriction (IUGR), intrauterine fetal demise (IUFD), neonatal death, and any complications experienced by the newborns. Data for the study were extracted from the medical records of the mothers and neonates, and a study-specific data collection questionnaire was completed. A pre-structured proforma was utilized to record information from individuals. After obtaining consent from the patients, relevant clinical data, such as age, sex, religion, presenting complaints, type of hypertension, demographic details, examination findings on admission, and neonatal outcomes, were recorded in the proforma. All collected information was recorded in a pre-designed proforma.

Statistical analysis

Statistical analysis was conducted by tabulating and graphically presenting the data. Percentage, arithmetic mean, and standard deviation were calculated, and the data were statistically analyzed and tabulated using SPSS version 21 (statistical package for social sciences). The chi-square method, mean±standard deviation, or proportions were employed for statistical analysis of variance. Statistical significance was set at a threshold of $p < 0.05$. The data were analyzed using standard methods.

RESULTS

The average age of the participants was 26.09 years, with a standard deviation of 4.69. Among the participants, 128 (54.5%) were Primigravida (first-time mothers), 97 (41.3%) were Multigravida (having multiple pregnancies), and 10 (4.3%) were Grand multipara (having given birth to several children).

Table 1: Distribution of study participants according to their sociodemographic profile and clinical profile (n=235).

Variables		N (%)
Sociodemographic profile of the participants		
Age (years)	18-25	130 (55.3)
	26-30	71 (30.2)
	31-35	30 (12.8)
	>35	4 (1.7)
Mean age (years)		26.09±4.69
Parity	Primigravida	128 (54.5)
	Multigravida	97 (41.3)
	Grand multipara	10 (4.3)
Occupation	Housewife	233 (99.1)
	Employed	2 (0.9)
Education	Illiterate	79 (33.6)
	Primary	37 (15.7)
	Middle	48 (20.4)
	High School	21 (8.9)
	Intermediate	31 (13.2)
	Graduate	19 (8.1)
Socioeconomic status	Upper	5 (2.1)
	Middle	42 (17.9)
	Lower	188 (80.0)
Dietary habit	Vegetarian	42 (17.9)
	Mixed	193 (82.1)
Clinical profile of the participants		
Number of ANC Visits	None	30 (12.8)
	One visit	41 (17.4)
	Two visits	59 (25.1)
	More than two visits	105 (44.7)
Diagnosis	Chronic hypertension	6 (2.6)
	Gestational hypertension	17 (7.2)
	Mild preeclampsia	38 (16.2)
	Severe preeclampsia	68 (28.9)
	Eclampsia	106 (45.1)
Urine dipstick	Nil	29 (12.3)
	Traces	15 (6.4)
	1+	56 (23.8)
	2+	70 (29.8)
	3+	65 (27.7)
Past history of hypertension	Yes	15 (6.4%)
	No	220 (93.6%)
Fetal maturity	Term	107 (45.5)
	Preterm	128 (54.5)
Birth weight of the newborn (kg)	<2.5	119 (50.6)
	>2.5	116 (49.4)

The majority of the participants, 233 (99.1%), were housewives, while only 02 (0.9%) were employed. In terms of education, 79 (33.6%) were illiterate, 37 (15.7%) had completed primary education, 48 (20.4%) had completed middle school, 21 (8.9%) had finished high school, 31 (13.2%) had intermediate education, and 19 (8.1%) were graduates. Regarding socioeconomic status, 05 (2.1%) were classified as upper class, 42 (17.9%) as middle class, and 188 (80.0%) as lower class. In terms of dietary habits, 42 (17.9%) of the participants followed a

vegetarian diet, while 193 (82.1%) had a mixed diet. When it came to antenatal care (ANC) visits, 30 (12.8%) of the participants had not visited any ANC clinics, 41 (17.4%) had attended one visit, 59 (25.1%) had attended two visits, and 105 (44.7%) had attended more than two visits. In terms of diagnoses, 06(2.6%) of the participants had chronic hypertension, 17 (7.2%) had gestational hypertension, 38 (16.2%) had mild preeclampsia, 68 (28.9%) had severe preeclampsia, and 106 (45.1%) had eclampsia.

Table 2: Distribution of the participants according to their sociodemographic, clinical profile, and fetal maturity (preterm n=128).

Sociodemographic variables		N	%
Age (years)	18-25	68	53.1
	26-30	37	28.9
	31-35	21	16.4
	>35	02	1.6
Occupation	Housewife	127	99.2
	Employed	01	0.8
Education	Illiterate	50	39.1
	Primary	20	15.6
	Middle	25	19.5
	High school	10	7.8
	Intermediate	16	12.5
	Graduate	07	5.5
Socio economic status	Upper	04	3.1
	Middle	18	14.1
	Lower	106	82.8
Mode of delivery	Vaginal	58	46.0
	LSCS	68	54.0
IUGR	Yes	22	17.2
	No	106	82.8
Indication of admission	Birth asphyxia	13	22.8
	Prematurity	17	29.8
	LBW	16	28.1
	Meconium aspiration	02	3.5
	Respiratory distress	09	15.8
Complication in NICU	Mortality	14	24.6
	None	07	12.3
	Respiratory distress	08	14.0
	Sepsis	09	15.8
	HIE	0	0.0
	Perinatal asphyxia	06	10.5
	Neonatal hyperbilirubinemia	06	10.5
	MAS	01	1.8
	ROP	04	7.0
IVH	02	3.5	

Table 3: Distribution and association of maternal hypertensive disorder and outcome of the newborn (n=235).

Diagnosis	Fetal maturity		Total	P value	χ^2
	Term N (%)	Pre term N (%)			
Chronic hypertension	0 (0.0)	06 (100.0)	06 (100.0)	0.007	14.046
Gestational hypertension	13 (76.5)	04 (23.5)	17 (100.0)		
Mild pre-eclampsia	17 (44.7)	21 (55.3)	38 (100.0)		
Severe pre-eclampsia	35 (51.5)	33 (48.5)	68 (100.0)		
Eclampsia	42 (39.6)	64 (60.4)	106 (100.0)		
Total	107 (45.5)	128 (54.5)	235 (100.0)		

Test of Significance= Chi-square test, p value<0.05=significant, p value<0.00=highly significant, p value>0.05=not significant

Regarding urine dipstick results, 29 (12.3%) showed no abnormalities (nil), 15 (6.4%) showed traces of abnormalities, 56 (23.8%) showed 1+ abnormalities, 70 (29.8%) showed 2+ abnormalities, and 65 (27.7%) showed 3+ abnormalities. Additionally, 15 (6.4%) of the participants had a past history of hypertension, while 220 (93.6%) had no previous history of hypertension (Table 1).

Among the participants, 107 (45.5%) had full-term fetal maturity, while 128 (54.5%) had preterm fetal maturity. In terms of birth weight, 119 (50.6%) of the participants had a birth weight of less than 2.5 kg, while 116 (49.4%) had a birth weight greater than 2.5 kg (Table 1). Among the participants, the highest number of preterm births was observed in the age group of 18-25 years, accounting for

68 cases (53.1%). This was followed by the age groups of 26-30 years with 37 cases (28.9%), 31-35 years with 21 cases (16.4%), and over 35 years with 2 cases (1.6%). Preterm births were predominantly observed among housewives, accounting for 127 cases (99.2%), followed by unemployed individuals with a small percentage (0.9% vs. 0.8%). Regarding education, the majority of preterm births were found among illiterate participants, with 50 cases (39.1%). This was followed by participants with middle school education, with 25 cases (19.5%), primary education with 20 cases (15.6%), intermediate education with 16 cases (12.5%), and high school education with 10 cases (7.8%). The majority of preterm births belonged to the lower socioeconomic status, with 106 cases (82.8%), followed by the middle socioeconomic status with 18 cases (14.1%). In terms of mode of delivery, cesarean section was more commonly performed for preterm births, accounting for 68 cases (54.0%), while vaginal delivery accounted for 58 cases (46.0%). In our study, intrauterine device (IUD) usage was observed in 25 cases (19.5%) among preterm births, while the majority of preterm births resulted in live-born babies, with 103 cases (80.5%) (Table 2). The distribution of preterm and term births varied across different diagnoses. In cases of chronic hypertension, all births were preterm 06 (100.0%). Eclampsia had a higher percentage of preterm births 64 (60.4%). Similarly, mild preeclampsia had a higher percentage of preterm births 21 (55.3%), while severe preeclampsia had preterm births 33 (48.5%). Gestational hypertension showed the preterm births 04 (23.5%). According to (Table 3), the preterm birth rate was 100% for cases of chronic hypertension and 60.4% for cases of eclampsia. The distribution of fetal maturity showed a significant difference among the various diagnostic groups ($\chi^2 = 14.046$, $p=0.007$), indicating that the diagnosis had an impact on the likelihood of preterm or term birth.

DISCUSSION

In our study, most of them were belong to the age group 18-25 years 130(55.3%). A similar result was observed by Sharma et al.¹⁰ They found aged 18-27 years were at high risk for hypertensive disorders in pregnancy. Assis et al found that age above 30 years was with a risk for preeclampsia. Parmar et al reported that HDP is more prevalent among pregnant mothers aged less than 20 years of age (53.0%) and 21-30 years (47%).^{11,12} In our study, 235 pregnant women with hypertensive disorders with singleton pregnancy were included. The majority of them were Eclampsia 106 (45.1%), severe preeclampsia 68 (28.9%), mild preeclampsia 38 (16.2%) rest were gestational 17 (7.2%) and chronic hypertension 06 (2.6%). Deorari et al, Nadkarni et al and Sharma et al reported HDP in their studies, preeclampsia (79%, 50.4%, 50.2%) followed by eclampsia (9.5%, 10.6%, 35.7%) respectively.¹³⁻¹⁵ In contrast, Roberts et al observed that 9.8% of mothers had pregnancy-induced hypertension, 6% of these had chronic hypertension, 4.2% were affected with preeclampsia, 0.3% had preeclampsia superimposed on chronic hypertension and 4.3% had gestational

hypertension.¹⁶ In our study, the incidence of IUGR was found in 44 (18.7%) of cases. Similar findings were observed in the studies conducted by Tavassoli et al and Yucesoy et al reported IUGR in 27.5% and 29.4% of neonates respectively.^{17,18} Sharma et al reported IUGR in 41.2%.¹⁵ The result was statistically insignificant similar results were found in both term and preterm. Delivery is the ultimate cure for preeclampsia or eclampsia. In our study, the cesarean rate was high at 146 (62.9%) in comparison to vaginal delivery at 86 (37.1%). Preterm had the larger proportion of vaginal delivery in comparison to cesarean (46.0% vs. 54.0%). Sharma et al observed vaginal delivery were 54.1% and cesarean at 45.8%. Ganguly et al, Zibaenezhad et al and Shahla et al reported cesarean rate of 34.3%, 45.8% and 67.3%, respectively.¹⁵⁻²¹ Preterm delivery was found in 128 (54.5%) of cases and the term was 107 (45.5%) with hypertensive disorders of pregnancy and the difference was found to be statistically significant. Most of the preterm birth were found in chronic hypertension 06 (100%), followed by eclampsia 64 (60.4%), mild preeclampsia 21 (55.3%) and gestational hypertension 04 (23.5%). A similar result was found by Khosravi et al 52.6% of preterm birth found in hypertensive mothers and most of the preterm deliveries were found in chronic hypertensive mothers.²² Yadav et al, Bangal et al and Vats et al found the preterm delivery rate to be 28.8%, 37% and 26.5% respectively in cases with hypertensive mothers.²³⁻²⁵ Sharma et al found prematurity in 62.8% of babies most of the preterm deliveries were in the eclampsia group, severe preeclampsia, and gestational hypertension.¹⁵ A high preterm birth rate indicates these women reported to us are in an advanced stage of disease necessitating urgent intervention because of maternal or fetal indication. The incidence of stillbirth in our study was 12.8%. A similar observation was found in Verma et al, Sharma et al, Sachan et al, and Berhe et al.^{15,26-28} Hypertensive disorders of pregnancy are a significant health issue for expectant mothers, leading to a considerable burden of maternal and perinatal illness and death. Recent research has confirmed that these disorders play a crucial role in increasing the occurrence of preterm delivery and subsequent complications in infants born prematurely.

CONCLUSION

Based on the findings of this study, it was determined that hypertensive disorders play a pivotal role in influencing both the frequency of preterm delivery and the associated complications in infants resulting from premature birth.

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