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The Burden of Hypertensive Disorders of Pregnancy (HDP) on Perinatal Outcome and Caesarean Delivery at Tertiary Care Hospital, Bhubaneswar- a Prospective Correlational Study

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Abstract

HDPs are a major concern for mother and child challenging the advanced medical facility due to Increased maternal and newborn mortality with high incidences of cesarean delivery. A prospective observation was conducted using correlational model to investigate the impact of HDP on both maternal and neonatal outcome and the rate of cesarean section among women at tertiary care center of Bhubaneswar with sample of 150. Data analysed using SPSS version 20. The result shows that 15% of women had chronic hypertension, 52% were diagnosed with gestational hypertension (GHTN) or pregnancy induced hypertension (PIH), 21% has preeclampsia (PE) and 9% had eclampsia (E). Also the women suffering with superimposed PE/ Severe PE and eclampsia is 5%. The data on maternal outcome reveals that total 68% of women presented with complications due to PIH and major type of complications were Endocrine related (27%), hypertension related (12%) and others were 29%. Similarly the data on newborn outcome shows that 16% of baby has fetal distress after delivery and 14% needed resuscitation. Total 11% babies were IUGR, 37% babies admitted to ICU due to complication and 10% of baby died out of complication secondary to PIH. Again the data on type of delivery shows that maximum (59%) women underwent emergency cesarean section and 19% has planned C section. And only 20% of women had delivered by vaginal delivery. PIH is one of the leading cause for adverse maternal and newborn outcome including mortality and also it is contributing to highest rate of cesarean delivery.

Keywords: Cesarean Section, Hypertensive Disorders of Pregnancy, Perinatal Outcome, Pregnancy Induced Hypertension.

Introduction

Maternal health is an important aspect of a well grown society. According to WHO about 287 00 women died because of the perinatal complication in the year 2020. And it is also reported by WHO that those are the preventable causes of the maternal mortality. The cause contributed are infections, unmanaged bleeding, uncontrolled high blood pressure in pregnancy, miscarriages and many more (1). Hypertensive disorders of pregnancy (HDP) considered as the most significant and intriguing unsolved problem till date. Global figures estimates about 10% of the pregnancies complicating secondary to HDP (2). Whereas in India, the prevalence of HDP is 18.6% among the primigravida (3). Wang W *et al.,* has reported the global incidence of PIH 16-18 million with a total increase of 11% from 1990-2019. Similarly, they also have reported the maternal death rate as 28000 in 2019 (4). A study of Northeast India on Maternal to Perinatal Outcomes among women with HDP and Factors Influencing It, shows that today 5460 deliveries took place and out of that 7% experienced HDP, 28% has prenatal hypertension, 27.6% cases of mild PE, 34% developed severe form of PE, and 11% had eclampsia. According to the data on maternal outcomes, 12 instances (2.9%) resulted in maternal fatalities and 54 cases (13.4%) were admitted to the ICUs. Pulmonary edema (33.3%) and cerebral hemorrhage (66.6%) were the causes of maternal mortality. 60 cases (14.9%) of perinatal death were reported (5). Pregnancy hypertension and mortality at hospitalization goes hand in hand. This finding is quite similar to a report given by CDC which projects those severe maternal problems like heart attacks and strokes

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are significantly linked to HDPs of the maternal deaths that happened while the mother was in the hospital for delivery, 24.3% had pregnancy-related hypertension and 31.6% had any documentation of HDP. 7.4% of deaths had documented maternal hypertension, either chronic or nonspecific (6). Hence the hypertensive pregnancy and maternal mortality go hand in hand. And here is another data reveling the same. About 3% of pregnancies are complicated by preeclampsia, while 5–10% of pregnancies are complicated by all other hypertension diseases. The cause of death were HELLP syndrome, hepatic bleeding, CNS depression and vascular insult to the heart or kidneys (7). The mortality rate from eclampsia and preeclampsia rise as mother age increased. After the first live birth and at gestational age of 20–28 weeks, there was the largest risk of death. Compared to women who got any kind of prenatal treatment and education, those women received not a single prenatal care and education doubles risk of dying out of preeclampsia or eclampsia. The fatality among black women is 6.4 per 10,000 instances of preeclampsia-eclampsia at birth, which was twice as high as that of white women. Thus, the need for a particular teaching program and prenatal care for pregnant mothers with hypertension (8).

Apart from maternal mortality, newborn mortality is also another concern associated with PIH. A large scale study conducted on 2 437 718 women shows that 10, 2095 women experienced HDP, including 33,733 with hypertension, 679 with eclampsia, and 67 683 with pre-eclampsia. Furthermore, intrauterine death among the women with severe PE is 781, women with eclampsia is 17, women with HTN is 223 and the death of babies born to HDP mothers during follow up period is 19. Thus, from birth to early adulthood, maternal HDP especially eclampsia and severe pre-eclampsia is linked to higher chances of overall mortality as well as cause-specific mortalities in offspring (9). Another paper also produces similar type of information that PIH is associated with stillbirth and neonatal mortality. Women having their second or higher-order deliveries had a greater risk of PIH-related stillbirth (OR = 2.2 [95% confidence interval = 2.1–2.4]). When it came to newborn deaths, the patterns were comparable (1.3 [1.2–1.4] in first and 1.6 [1.5–1.8] in second or higher-order births). Consequently, PIH is linked to a significant incidence of stillbirth and newborn mortality, particularly in multiparous women. This association may be caused by more severe PIH or a larger burden of underlying disease (10).

Because of the above adverse outcomes, the number of cesarean delivery is also increasing among mothers with PIH. And it is well known to all that more the cesarean section that adds more to postpartum complications. Here is a study reported that among PIH women, rate of 75.7% of deliveries were cesarean, compared to 24.3% of vaginal births and 5.4% of women with severe preeclampsia (PE) with problems, 38.2% with severe PE, and 6.4% with PE among those in the C sections (11). A regional study of Bhubaneswar, Odisha has studied on gestational hypertension and its impact on fetal outcome. The study has recruited total 492 women with HDP. The prevalence of preeclampsia and eclampsia were 12.8% and 4.3% respectively. And preeclampsia superimposed with chronic hypertension was 5.3%. The adverse fetal outcome included preterm birth (39%), LBW (20%), IUGR (13%), NICU admission (23%) and overall fetal death was 5%. Therefore the authors recommended early and continuous screening of the high-risk women for safe delivery (12). Similarly another study examining the pregnancy induced hypertension and its impact on feto-maternal outcome was conducted in a tertiary care hospital of Bhubaneswar, Odisha in 2018. The study concluded that the pregnancy hypertension is more evident among primigravida i.e 64%. The risk of preeclampsia increases among elderly gravida women (93.5%). Maternal adverse events include increase cesarean delivery ($p=0.00891$) and stillborn ($p<0.001$) including NICU admission and preterm births (13). Therefore more studies on hypertensive pregnancy are the need of the hour not only for early identification of the condition and prompt management, rather also to create awareness in the society to treat it as urgent and to seek medical help as soon as possible. There are studies which has addressed the issue of hypertensive pregnancy and their adverse impact on mother, child as well as on the increase number of cesarean section. But this issue was less addressed in the state of Odisha. Even though there are plenty of studies on this condition in the region it but still change in timeframe and nature of

population over time made the author to splash light on the same. Therefore the author decided to have a more extensive research to minimize the adverse effect on the health of both mother and newborn.

Methodology

Research Design and Participants

The current study has adopted a prospective correlational design with quantitative approach. The present study was conducted at IMS and SUM Hospital, Bhubaneswar. The sample of this study included 150 pregnant women who were diagnosed with hypertensive disorders of pregnancy and are attending antenatal OPD of IMS and SUM Hospital, Bhubaneswar.

Sample Size Estimation and Inclusion Criteria

The sample size for the study comprises of 150 caregivers who met the inclusion criteria. Sample size was calculated assuming the proportion of women with PIH as 36% as per the study by Verma *et al.,* (12). The other parametes considered for sample size calculation were 10% absolute precision and 95% confidence level. The following formula was used for sample size calculation.

$$N = Z2\ P\ (1-p)/d2$$

Where n= sample size Z= Z statistic for a level of confidence level= 1.960 P= expected prevalence= 0.36 d= precision= 0.1. The required sample size as per the above mentioned calculation was 135. To account for a non-participation rate of an about 12%, another 15, subjects was added to the sample size. Hence the final required sample size would be 150.The study has included all the pregnant women diagnosed with HDP, who must have 3 contact visit antenatally and 1 contact visit postnatally with availability of complete medical record. The exclusion criteria were women attending OPD first time after 30 week of gestation, who denies to participate, those delivered in other health facilities, women with twin gestations (to avoid their potential confounding effect on the adverse perinatal outcomes associated with HDP), women with comorbid chronic medical disorders like diabetes, severe anemia, renal disease, cardiac disease, antiphospholipid antibody syndrome and those with known TORCH infections and women with epilepsy were excluded from the study.

Data Collection Tool

The investigator has used total three tools for collecting information from the sample. The first tool is demographic proforma for collecting the baseline characteristics. It has total four items (age, education, occupation and religion). The second tool is a two point rating scale on maternal outcome and obstetrics parameters. It has total nine items. The score was yes = 1 and No = 0. The third tool is also a two point rating scale for assessing newborn outcome. It has total six items. The score was yes = 1 and No = 0.

Data Collection Procedure

Before collecting data, the researcher sought formal permission from the relevant authorities of the antenatal OPD of IMS and SUM Hospital, BBSR. The investigators introduced themselves to the subjects, established a good rapport, and explained the study's purpose and significance. Participants were assured that their responses would be kept confidential. Informed consent was obtained from each subject, signifying their willingness to participate in the study

Method of Administration

After obtaining permission from the concerned authority, the data was collected. The researcher approached women who were diagnosed with hypertensive disorders of pregnancy and are attending antenatal clinic at IMS and SUM Hospital, Bhubaneswar. The investigator interviewed 150 pregnant women with HDP attending antenatal OPD. Before the interview, informed consent was obtained from the respondents, and confidentiality was assured to the subject. The privacy of the participants was strictly maintained while conducting the interview. The investigator filled out the response personally. The average time taken to interview each subject was 20-25 minutes. After the interview, the investigator thanked the respondents.

Ethical Permission

The study obtained prior written permission from the college authority after obtaining ethical clearance from the institutional ethical committee. The samples were selected using a computer generated random sampling method. The eligible samples were identified based on inclusion and exclusion criteria. The purpose of the study and data collection process was explained, and informed written consent was obtained from each of the 150 samples.

Analysis of Data

Data were collected using structured interview questionnaires and entered into IBM SPSS Statistics 20 Version for cleaning, coding, and analysis. The use of appropriate statistical methods allows for the exploration of relationships between perinatal outcomes, rate of cesarean section among women with HDP. As the author has taken two variables with assumption of relationship between them, henceforth the author has selected correlational analysis for the same. The data was analyzed using descriptive and inferential statistics. Data on baseline characteristics, prevalence of various types of HDP, maternal and newborn outcome were presented in terms of frequency and percentage. The relationship between maternal outcome and newborn outcome with rate of cesarean section was established by Karl Pearson's correlation coefficient. Lastly, the association maternal and newborn outcome with sociodemographic variables were established using the Chi-square test.

Results

The data of the current study on description of baseline characteristics of women with HDP depicts that, most of the women were in the age group of 25-35 years (61%). Mostly they were studied up to intermediate level (44%) and also 43% were studied up to graduation and above. In occupation, maximum were housewife (65%) and most were Hindu (94%, Table 1). Similarly the study also describes the obstetrics and maternal outcome parameters in terms of frequency and percentage. The result shows that maximum women has less than equal to 2 pregnancies (82%), most were primiparous (64%), most had no living birth (68%) and very less has one or more abortion (24%). Mostly there is no history of cesarean section (80%) and maximum were delivered by emergency cesarean section (59%). Which can be understood that the HDP is an obstetrical emergency leading to mostly emergency cesarean section to save the lives of both mother and the unborn baby. Maximum women were diagnosed with pregnancy induced hypertension (PIH)/ Gestational hypertension (GHTN) (52%). Maximum women have experienced complications (68%), and mostly the complications were related to endocrine and others (Table 2).

The data on fetal outcome depicts that most of the babies delivered were male (53%), most of them had not needed resuscitation (86%), maximum do not have fetal distress (74%), IUGR (90%). Fetal death were 10%. The data on baby condition shows that most of the babies were well (54%), ICU admission were 37% and death of babies were 10% (Table 3).Further to establish the relationship between type of delivery and maternal outcome, the correlation analysis was done and the result shows a negative correlation ($r= -0.143$) between the two, which may be interpreted as bad maternal outcome are mostly associated with cesarean delivery (Table 4). The result of the correlational analysis shows a negative correlation of type of delivery with newborn outcome at $r=-0.149$, which may be interpreted as bad newborn outcome also may associated with cesarean delivery as above (Table 5).

Lastly the chi square analysis between the maternal outcomes with sociodemographic variable shows that none of the variables have significant association with maternal outcome except for education, which may be concluded that more educated the mother is, the chance of adverse maternal outcome is less as mother will seek medical attention in time (Table 6). Similarly, for establishing association between newborn outcome with sociodemographic variable by chi square analysis shows that, none of the variables have significant association with newborn outcome ($p<0.05$) except for occupation, which may be concluded that more stressful the occupation are associated with adverse newborn outcome (Table 7). Table 1 showing the frequency and percentage distribution of demographic characteristics. Table 2 describes the obstetrical parameters and maternal outcome in terms of frequency and percentage. Table 3 describes the fetal outcome in terms of frequency and percentage. Table 4 shows correlation analysis between maternal outcomes with type of delivery. Table 5 shows correlation analysis between newborn outcomes with type of delivery. Table 6 shows chi square analysis between maternal outcomes with baseline characteristics. Table 7 shows chi square analysis between newborn outcomes with baseline characteristics.

Table 1: Description of Socio-Demographic Characteristics in Frequency and Percentage (N=150)

Variables	f (%)
Age	
< 25 years	41 (27.33)
25 to 35 years	91 (60.6)
> 35 years	18 (12)
Education	
Illiterate	3 (2)
Primary	18 (12)
Up to intermediate	65 (43.3)
Graduate and above	64 (42.6)
Occupation	
Housewife	97 (64.6)
Employed	53 (35.3)
Religion	
Hindu	141 (94)
Muslim and others	9 (6)

Table 2: Description of Obstetrics Parameters and Maternal Outcomes by Frequency and Percentage (N=150)

Variables	Experimental Group
Gravida n(%)	
≤ 2	122 (81.3)
> 2	28 (18.6)
Para n(%)	
Primi	96 (64)
Multi	54 (36)
Livebirth n(%)	
None	102 (68)
One or more	48 (32)
Abortion n(%)	
None	114 (76)
One or more	36 (24)
History of LSCS n(%)	
Present	28 (18)
Absent	121 (80)
Type of delivery n(%)	
Vaginal	30 (20)
Assisted	4 (2.6)
Planned LSCS	28 (18.6)
Emergency LSCS	88 (58.6)
Type of HDP	
Chronic HTN	22(14.6)
PIH/GHTN	77(51.3)
Preeclampsia	31(20.6)
Eclampsia	13(8.6)
Superimposed PE/ Severe PE and Eclampsia	7(4.6)
Complication n(%)	
Absent	49 (32.6)
Present	101 (67.3)
Type of complication	
No complication	49 (32.6)

Endocrine	40 (26.6)
Hypertension related	17 (11.3)
Others	43 (28.6)

Table 3: Description of Fetal Outcome by Frequency and Percentage

Variables	**Experimental Group**
Gender n(%)	
Male	79 (52.6)
Female	71 (47.3)
Resuscitation n(%)	
No	129 (86)
Yes	21 (14)
Baby condition n(%)	
Well	80 (53.3)
Death	15 (10)
ICU admission	55 (36.6)
Fetal distress n(%)	
No	111 (74)
Yes	24 (16)
IUGR n(%)	
No	134 (89.3)
Yes	16 (10.6)
Fetal death	
Yes	15 (10)
No	135 (90)

Table 4: Correlation Analysis between Type of Delivery and Maternal Outcome

		Maternal_Outcome	**Delivery_Type**
Maternal_outcome	Pearson Correlation	1	-.143
	Sig. (2-tailed)		.079
	N	151	151
Delivery_type	Pearson Correlation	-.143	1
	Sig. (2-tailed)	.079	
	N	151	151

Table 5: Correlation Analysis between Type of Delivery and Newborn Outcome Correlations

		Delivery Type	**Baby Outcome**
Delivery_type	Pearson Correlation	1	-.149
	Sig. (2-tailed)		.069
	N	151	151
Baby_outcome	Pearson Correlation	-.149	1
	Sig. (2-tailed)	.069	
	N	151	151

Table 6: Association between Maternal Outcome with Sociodemographic Variables in Experimental Group by Chi Square Test

Variable	Chi Square	df	p Value
Age	31.86	44	.914
Education	34.74	6	.000
Occupation	.092	2	.955
Type Of Hdp	7.91	8	.442
Type Of Delivery	3.87	8	.869

Table 7: Association between Newborn Outcome with Sociodemographic Variables in Experimental Group by Chi Square Test

Variable	Chi Square	df	p Value
Age	54.19	44	139
Education	3.17	6	.786
Occupation	12.4	2	.002
Type Of Hdp	6.95	8	.541
Type Of Delivery	10.51	8	.231

Discussion

The findings revealed that, out of 150 women maximum had gestational hypertension (52%), and minimum (5%) had superimposed PE and E. among those women maximum has encountered endocrine related problem (27%) as maternal outcome. Similarly, the maximum babies of those women admitted to ICU (37%) the fetal death is 10%. A statistically significant correlation was established between the type of delivery and maternal outcome (r= 0.143) as well as between type of delivery with fetal outcome (r=0.149). Also, a statistically significant association was found between educational qualification with maternal outcome ($p<0.05$) and occupation with fetal outcome (p 0.02). A prospective cohort of north India in 2021, revealed that the most common hypertensive condition during pregnancy was preeclampsia (PE), which accounted for 44.2% of cases followed by eclampsia i.e 28%, GHTN is 23% and CHTN is 5%. It is seen that infants born to hypertensive mothers has developed fetal growth restriction in 62% cases, preterm babies were 66%, low birth weight babies were 75% and about 54% babies needed admission to NICU. In the group with eclampsia, 78.6% required NICU hospitalization, 65.7% were preterm, and 42.9% had fetal development limitation. Which is similar to our study finding that HDPs are prevalent in India. But in our study Gestational hypertension was prevalent and in their study preeclampsia was mostly prevalent (14). Another study of Southwest Ethiopia in 2021 investigated on perinatal outcome and associated factor among women with HDP. Among the 211 women with HDP, 80 (37.9%) experienced problems associated with HTN and 20% had problems related to HELLP syndrome which has contributed to both maternal and perinatal outcomes, which a bit differ to our study where endocrine problems were highest and next to that were hypertension and HELLP syndrome related complication. In terms of perinatal outcomes, 91 cases (43.1%) had a negative result with a 95% confidence interval (36.3, 50.1). The instances of Preterm deliveries, LBW births ,

stillborn babies, and intrauterine fetal deaths comprise 30%, 16%), 6% and 2% of the adverse outcomes, respectively (15). Another study of USA in 2023 investigated on 666,905 babies who were born to women with high blood pressure disorders of pregnancy. The incidences of those disorders among the sample were superimposed preeclampsia is one percent, HDP only eight percent, CHTN alone is about 2% and women without hypertension is 89%. The investigators observed more adverse outcome among the sample like Preterm deliveries, SGA and newborn mortality. When compared to women without high blood pressure, the adverse neonatal outcome differs significantly among mothers with HDP, and Chronic HTN (relative risk [RR] = 1.79, 1.39, and 1.48, respectively). Most of the babies born were preterm (RRs ranged from 3.14 to 5.25) or small for GA (SGA) (RRs ranged from 1.67 to 3.64), even after controlling for differences in risk by race/ethnicity. This finding is quite similar to our study (16).

A case control study addressing prevalence, perinatal outcome and rate of cesarean section in 2020 shows that the prevalence of hypertensive disorders was 12%. The delivery of preterm infant is 22% with odds ratio [OR] 2.59, 95% confidence interval [CI], 2.40-2.80). The LBW babies were 24% with OR 2.75; 95% CI, 2.55-2.96). The outcome of APGAR score < 7 was 1.40% with OR 1.27; 95% CI, 0.97-1.67). The incidence of intrauterine fetal death were 2% with OR 2.12; 95% CI, 1.67-2.70). Similarly, the rate of LSCS is 60% with OR 3.34; 95% CI, 3.14-3.55). The study concluded that the severe the hypertensive disorders is the more is the rate and severity of adverse maternal and perinatal outcome. This is also supports the finding of ours (17). Pregnancy-related outcomes for mothers with hypertensive disorders is a recent study of 2023 revelated similar kind of data as of our study. This study also found that women with severe form of preeclampsia and eclampsia are more likely to give birth to preterm babies. The study also showed that the prevalence of babies born at <34 weeks' is 21% with adjusted RR, 2.5; 95%CI, 1.19–5.25). Again, delivery by LSCS is 79% with adjusted RR, 2,139; 95%CI, and 1,386–3,302). The average days of hospital stay in women with PIH are prolonged that is 44%, babies admitted to Neonatal ICU is 31% and overall mortality in perinatal period is 24%. Hence the problem of high BP during pregnancy never to be neglected and care should be taken to address this issue with every mother to prevent the future occurrences and complications (18).

Conclusion

Pregnancy hypertensions are challenging health issues taking maternal and newborn life for granted. What we found from this study is major problems were encountered due to lack of information about when to seek help and where to. As a large part of the complications are preventable, hence the healthcare providers to be more focused on prevention aspect through educational intervention and community care models. Therefore increasing the quality of life of women with hypertensive problems.

Strength of the Study

The study's validity and reliability are strengthened by its methodological rigor, specific aims, and adherence to ethical norms on perinatal outcome and rate of cesarean section among women with HDPs at a tertiary care hospital in Bhubaneswar, Odisha, India

Limitations of Study

The presence of confounding variables, such as other factors or treatments, may influence the relationship between perinatal outcomes with cesarean section rate among women with HDP. The outcomes of the study could be distorted if these variables are not sufficiently taken into account. The results of the study might only be applicable to a small number of people or environments outside of the particular tertiary care hospital in Odisha, India. Factors such as demographics, maternal and newborn outcome and rate of cesarean section among women with HDP may vary in different locales or medical care facilities.

Abbreviations

HDP: Hypertensive disorders of pregnancy, GHTN: Gestational Hypertension, PIH: Pregnancy induced hypertension, CHTN: Chronic hypertension, PE: preeclampsia, E: Eclampsia, IUGR: Intrauterine growth retardation, ICU: intensive care unit, WHO: world health organization, CDC: center for disease control, OPD: outpatient department, NICU: Neonatal intensive care unit, HELLP: hemolysis elevated liver enzyme and low platelet count.

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Author Contributions

Madhusmita Nayak: Conceptualized and conducted the study, collected, analysed and interpreted the data, drafted the manuscript, Pravati Tripathy: Conceptualized the study, Prasanta Kumar Nayak: Analysed and interpreted the data, Debajani Nayak: Drafted the manuscript.

Conflict of Interest

The author declares no conflict during the study.

Ethics Approval

Obtained from Institutional Ethics Committee. Letter no- Ref.no/IEC/IMS.SH/SOA/2021/234.

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