Hypertensive disorder of pregnancy and its immediate outcome on neonates in a tertiary care hospital of Western Nepal

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ABSTRACT

Background: Hypertensive disorders in pregnancy remain a major cause of maternal and neonatal morbidity and mortality worldwide. This study prospectively examined the immediate neonatal outcome of women with maternal hypertensive disorder of pregnancy (HPD).

Methods: This is a prospective study conducted at NICU in Universal College of Medical Sciences Hospital over a period from 2nd February 2018 to 1st February 2019. Fifty-two mothers and their newborns were selected. Mothers with gestational hypertension, preeclampsia, and preeclampsia superimposed on chronic hypertension and chronic hypertension were included.

Results: Mean maternal age was 26.4 years. Mean gestational age was 34±4 weeks. 38 were male and 24 were female with male: female ratio 1.72:1. Thirty seven (71.2%) mothers needed lower uterine caesarian section, fourteen (26.9%) mothers delivered NVD and one (1.9%) forces delivery. Low birth weight (<2.5kg) babies were 25 (48.1%), very low birth weight (<1.5kg) were 9 (17.3%) and normal weight were 18 (34.3%). Intrauterine growth retardation (IUGR) were 18(30%). Perinatal asphyxia 10 (19.2%) were most common cause of admission, other cause of admission were sepsis and prematurity.

Conclusions: Eclampsia is still a common and serious complication of pregnancy. Proper antenatal care, detection of preeclampsia with early management and timely referral of high risk patient, administered of MgSO₄ in correct doses and properly timed caesarean section in selected cases would reduce the incidence of eclampsia associated maternal and perinatal morbidity and mortality in our facility.

Keywords: Anti-hypertensive drugs, Gestational hypertension, Hypoxia, Hypertension, Maternal hypertension disorder of pregnancy, Preeclampsia

INTRODUCTION

Hypertensive disorders of pregnancy have remained a significant public threat in both developed and developing countries, contributing globally to maternal and perinatal morbidity and mortality.¹² In India, the incidence of this threatening condition was 5.38%.³

Majority of fetal complications occur due to prematurity and hypoxia.⁴⁵ fetal complications are related to the severity of preeclampsia, duration of the disease and degree of proteinuria.⁶

Pregnancy-related hypertension (PHTN) syndromes are a frequent and potentially deadly complication of pregnancy, while also negatively impacting the lifelong health of the mother and child. PHTN appears in women likely to develop hypertension later in life, with the stress of pregnancy unmasking a subclinical hypertensive phenotype.⁷ However, distinguishing between PHTN and chronic hypertension is essential for optimal management. Preeclampsia (PE) is linked to potentially severe outcomes and lacks effective treatments due to poorly understood mechanisms. Inadequate remodelling of spiral uterine arteries (SUAs), the cornerstone of PE pathophysiology, leads to hypoperfusion of the developing placenta.⁸

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normal pregnancies, extravillous trophoblast (EVT) cells assume an invasive phenotype and invade SUAs, transforming them into large conduits. Decidual natural killer cells play an essential role, mediating materno-fetal immune tolerance, inducing early SUA remodeling and regulating EVT invasiveness. Notch signalling is important in EVT phenotypic switch and is dysregulated in PE. The hypoxic placenta releases antiangiogenic and proinflammatory factors that converge upon maternal endothelium, inducing endothelial dysfunction, hypertension, and organ damage. Hypoxia-inducible factor 1-α is upstream of such molecules, whereas endothelin-1 is a major effector. We also describe important genetic links and evidence of incomplete materno-fetal immune tolerance, with PE patients presenting with autoantibodies, lower Treg, and higher Th17 cells. Thus, PE manifestations arise as a consequence of mal-placenta or/and because of a predisposition of the maternal vascular bed to excessively react to pathogenic molecules. From this pathophysiological basis, we provide current and propose future therapeutic directions for PE. Spasm of the uteroplacental circulation leads to fetal distress, accidental haemorrhage, IUGR, IUD, low birth weight, low APGAR score, NICU admissions and early neonatal death. Perinatal morbidity is increased due to spontaneous preterm labour or iatrogenic preterm induction. Hypertensive disorders of pregnancy (HDP) is the most common complication and seriously endanger the safety of the mother and the fetus during pregnancy as well as continue its impact on neonatal period. HDP is a multi-organ, heterogeneous disorder of pregnancy associated with significant maternal and neonatal morbidity and mortality. In some circumstances, delivery is needed to halt its progression for the benefit of the mother, fetus and for the neonate.

The most widely accepted definition and classification of hypertensive disorders of pregnancy was proposed by the National High blood Pressure Education Program (NHBPEP) Working, which used a blood pressure of 140/90 mmHg or higher on two separate occasions at least 4 hours apart as the diagnostic criterion.

The classification of high blood pressure in pregnancy are as follows.

- **Gestational hypertension:** hypertension manifested after 20 weeks of gestation.
- **Pre-eclampsia (PE)/Pre-eclamptic toxemia (PET):** Hypertension associated with proteinuria greater than 0.3 g in a twenty four hour urine collection or greater than 1 g/L in a random sample.
- **Essential hypertension:** The presence of sustained blood pressure of 140/90 mm Hg or higher before pregnancy or before twenty weeks of gestation.
- **Pre-eclampsia superimposed on essential hypertension (HTN):** Pre-eclampsia diagnosed in a previously hypertensive woman.

This classification by National High Blood pressure Education Program Working Group.

**Eclampsia:** Pre-eclampsia when complicated with convulsion and/or coma.

The term pregnancy induced hypertension (PIH) is defined as the hypertension that develops as a direct result of the gravid state. It includes (i) Gestational hypertension (ii) Pre-eclampsia (iii) Eclampsia.

Ten percent of the pregnancy was complicated with hypertensive disorders of pregnancy. Among them 90% was due to gestational hypertension and PE. Moreover, preeclampsia produces potentially lethal complications including placental ablation, disseminated intravascular coagulation, intracranial hemorrhage, hepatic failure, acute renal failure, and cardiovascular collapse. IUGR, intrauterine fetal demise are the other related obstetric problems were observed among these mother. The offspring of women with hypertension during pregnancy experience higher rates of prematurity and low birth weight compared to healthy maternal controls. Other medical problems like respiratory distress syndrome (RDS), transient tachypnea of the neonate (TTN), persistent pulmonary hypertension (PHHN) and respiratory failure observed in late preterm neonates (34-36 weeks) specially with maternal history severe preeclampsia. Special neonatal care is required for such baby which is associated with emotional and financial stress for both parents and third party payers and long-term developmental consequences.

**METHODS**

This is a prospective study conducted at NICU in Universal College of Medical Sciences Hospital over a period from 2nd February 2018 to 1st February 2019.

**Inclusion criteria**

There were 52 neonates with their maternal history of hypertensive disorder during pregnancy, like gestational hypertension, preeclampsia, eclampsia, patient or essential hypertension were selected for the study. Both inpatient and outpatient mothers with regular antenatal check-up (ANC) with good documentation regarding maternal physical condition, regular documentation of blood pressure with antihypertensive medication and documentation of condition of the fetus were included for the study.

This study was done to evaluate immediate outcome of admitted neonates. Data regarding the demographic parameter of the mother like Antenatal checkup, gestational age (determine by last menstrual period or 1st trimester ultrasound) type of maternal hypertensive disorder of pregnancy, obstetric problems like preterm labour, mode of delivery were recorded in structured questionnaire.
Neonatal parameters were sex, gestational age, birth weight and the neonatal medical problems like respiratory distress syndrome, congenital pneumonia, meconium aspiration syndrome, perinatal asphyxia with convulsion were also recorded.

Investigation were complete blood count and blood culture, serum electrolytes were done, abnormal coagulation profile was assessed by prothrombin time and partial thromboplastin time. 19

**Exclusion criteria**

Mothers with infant of diabetic mother (IDM), gestational mellitus (GDM), and chronic diseases like chronic renal failure, chronic liver disease, and endocrine diseases, collagen disease, and mothers with raised blood pressure observed in only last one or two visit at term and babies with definite congenital malformation, metabolic disorder, and any syndrome were excluded from the study. 20

The approval of Institutional Review Committee of Universal College of Medical Sciences, Bhairahawa, Nepal was taken before the initiation of experiment. Registration No. UCMS/IRC/031/18. All the protocols and experiments were conducted in compliance with the ethical principles and guidelines.

**Statistical analysis**

The data was analyzed by using SPSS version 20.0.

**Management of hypertension**

Fetal monitoring consisted of DFMC, FHR monitoring, NST, umbilical and cerebral Doppler. USG was done for the fetal weight, serial growth, AFI, BPP, placental location and maturity.

Treatment included rest, dietary changes, and control of blood pressure by using antihypertensive (methyl dopa, labetalol or nifedipine) and obstetric management. In patients of eclampsia, treatment was given for control of BP, control of seizures by anticonvulsants (mgso4 was used as the anticonvulsant of choice and Pritchard regimen was followed: 4g of 25% MgSO4 IV was given slowly over 5-10 minutes and 5gm of 50% MgSO4 LM was given into each buttocck followed by 5gm 50% MgSO4 LM 4hrly in alternate buttocck) and control of complications. Ultimately pregnancy was terminated and delivery was conducted.

In mild preeclampsia and gestational hypertension termination of pregnancy was done by inducing labour at 37 weeks at this gestational age, the maternal and fetal risks during expectant management clearly out weight potential benefits to fetus. In patients <37 weeks of gestation, termination of pregnancy was warranted only if maternal condition deteriorated or if there was fetal compromise. 21,22

Pregnancy was terminated by LSCS for urgent termination for maternal shake as in acute fulminating preeclampsia and eclampsia when cervixes was not ripe and also for fetal sake when fetus was in jeopardy as indicated by deranged Doppler studies (revers diastolic flow), severe IUGR, meconium staining of liquor or fetal distress. 23

**RESULTS**

Total 52 mothers with their neonates were selected for the study. Mean maternal age was 24.96 years. Mean gestational age was 37±5 weeks. Nine (15%) needed ventilator care and 6(10%) needed nasal continuous positive airway pressure (NCPAP) for respiratory problem. 6(10%) babies were expired and 54(90%) survived.

**Table 1: Maternal demographic profile.**

| Demographic profile | Frequency | Percentage (%) |
|---------------------|-----------|----------------|
| Cast                | 52        | 100            |
| Hindu               | 38        | 73.1           |
| Muslim              | 14        | 26.9           |
| Age                 |           |                |
| 20-25               | 31        | 59.6           |
| 26-30               | 17        | 32.7           |
| 31-35               | 3         | 5.8            |
| >35                 | 1         | 1.9            |
| Locality            |           |                |
| Rural               | 32        | 61.5           |
| Urban               | 30        | 38.5           |

**Table 2: Other neonatal delivery techniques.**

| Neonatal delivery techniques | Frequency | Percentage |
|------------------------------|-----------|------------|
| LCSC                         | 37        | 71.2       |
| NVD                          | 14        | 26.9       |
| Forceps                      | 1         | 1.9        |
| Consanguity                  | 4         | 7.7        |

Table 1 and Table 2 demonstrates demographic characteristics of patient. Eclampsia were more common in the age group 20 to 25 yrs group (59.6%) and rural areas (61.5%). In this study 37(71.2%) needed lower uterine caesarian section (LSCS) for delivery and normal vaginal delivery 14(26.9%) and 1(1.9%) forceps delivery. 38(73.1%) were Hindu 14(26.9) were Muslim among which 4(7.7%) were have consanguity marriage.

Table 3 representing the maternal hypertension there are the various ranges of hypertension and 26.9% patent presented with severe hypertension with BP>160/110, 57.7% patient had BP between 140/90-159/109 and 15.4% patient had BP <140/90.

Table 4 showed the neonatal gestational age total no of patients are n=52 Majority of patient n= 37 (71.2%)
presented as gestational age >37 weeks, n= 10 (19.2%) patient between 32-36 weeks and n= 5 (9.6%) at <32 weeks.

Table 3: Types of maternal hypertensive disorder.

| Types of B.P.          | No. of Cases | Percent |
|------------------------|--------------|---------|
| Systolic               | Diastolic    |         |
| <140                   | 90           | 8       | 15.4 |
| 140 - 159              | 90 - 109     | 30      | 57.7 |
| >160                   | >110         | 14      | 26.9 |

Table 4: Distribution of neonates according to gestational age.

| Distribution of neonates (gestational age) | No. of Neonates | Percentage |
|-------------------------------------------|-----------------|------------|
| <32 weeks                                 | 5               | 9.6        |
| 32-36 weeks                               | 10              | 19.2       |
| 37-42 weeks                               | 37              | 71.2       |

Table 5: Distribution of neonates according to birth weight.

| Birth Weight          | No. of neonates | %    |
|-----------------------|-----------------|------|
| Low Birth weight (1.5-2.5 kg) | 25             | 8.1  |
| Very low birth weight (1-1.5 kg) | 9              | 17.3 |
| Normal birth weight (2.5 kg or more) | 18             | 34.6 |
| LGA                   | 0               | 0    |
| IUGR                  | 17              | 32.69|

Table 5 representing the birth weight of neonates n=52 divided into according to their weight, low birth weight n= 25 (48.1%), very low birth weight n= 9 (17.3%), normal birth weight n= 18 (34.6%), LGA is zero and IUGR n=17 (32.69).

Neonatal clinical problems at the time of admission

This study showed that various neonatal clinical problems at the time of administration as per the given data perinatal asphyxia were the most common cause or administration of neonates, that is total 10 cases 19.2% were present other comorbidities like sepsis, prematurity, hypoglycemia, RDS, HIE, polythermia, IVH apnea of prematurity MAS, neonatal seizure, hypothermia were also recorded. In which maximum cases were sepsis and prematurity, each is 7 cases that is (13.5%), followed by hypoglycemia and RDS each of cases were present (that is 7.7%) and 3 cases of HIE and polythermia were recorded. 5.8% and a case of hypothermia and congenital heart disease were also present (each 1%) and 5 other cases were also present which contributes 5.8% of total.

Figure 1 showed the percentage of neonatal clinical problems. Perinatal asphyxia were the most common cause for admission. Other comorbidies were prematurity, sepsis, hypoglycemia, and respiratory distress.

Figure 1: Neonatal clinical problems.

The study showed the fatal outcome at birth conducted among months of hypertension disorder at birth by using two different elements/outcome those are number of alive cases and no. of neonatal death cases among the total study subjects n=52 alive cases among the study subjects n=41 (78.8%) and the total neonatal death among study subjects is n=11 (21.2%) of the total (Table 7).

Table 7: Fetal outcome at birth among study subjects.

| Outcome      | No. of Cases | Percentage |
|--------------|--------------|------------|
| Alive        | 41           | 78.8       |
| Neonatal death | 11           | 21.2       |
| Total        | 52           | 100        |

Meconium stained liquor

Here the study of liquor conducted among 52 cases shows there were total 13 out of 52 cases were present with meconium stained liquor (25%) and 39 cases out 52 there were no meconium stained liquid (that is 75%).

DISCUSSION

Worldwide hypertensive disorders of pregnancy have been identified as a major health problem associated with increased perinatal morbidity and mortality. Various authors have found the frequency of hypertensive disorders of pregnancy between 7-10%24,25. Among them gestational hypertension was 46%, pre-eclamptic toxemia 45%.26 In our study gestational hypertension 30(57.7%) was the major hypertensive disorder of pregnancy and PET was 14(26.9%).

In this study, 37(71.2%) neonates were delivered by LSCS and 14(26.9%) delivered by NVD. In other study operative
delivery were reported to be increased in hypertensive disorders of pregnancies as seen in another 10 study.

Hypertensive disorders of pregnancy predispose women to acute or chronic utero-placental insufficiency, resulting in ante or intra-partum hypoxia even anoxia that may lead to fetal death.27 Perinatal outcome is strongly influenced by gestational age and the severity of hypertension as expressed by the need for antihypertensive treatment, irrespective of the underlying syndrome.28-29

So, fetal growth is a useful marker for fetal well-being.30,31 Pregnancies complicated by intrauterine growth restriction (IUGR), defined as a pathological process of reduced fetal growth, have been associated with increase in perinatal mortality.32,33 A high incidence of IUGR/SGA infants in women who have PE has been reported, ranging from 15% to more than 50%.34,35 Intrauterine growth retardation was 17 (32.60%) in our study. Low birth weight baby was 25(48.1%) and very low birth weight baby 9(17.3%) in this study. Therefore total 34(65.4%) neonates were <2.5kg.

Another problem is preterm delivery with maternal hypertensive disorder of pregnancy. Epidemiologic studies have reported alarmingly high rates of preterm births, predominantly due to preeclampsia. In our study, preterm (<32 weeks) were 5(9.6%), near term neonates (32-36 weeks) were 10(19.2%), so total 15(28.2%) delivered before 36 weeks. Term neonates (37-42 weeks) were 37(71.2%). The percentage of term and low birth weight babies were high in this study.

Neonates needed admission for other than intrauterine growth retardation and/or preterm delivery, were due to complications like perinatal asphyxia were 10(19.2%), sepsis 7(13.5%), respiratory distress 4(17.7%).

No difference in incidence of lung maturity was seen in different studies with or without the history of maternal hypertensive disorder of pregnancy or PE.36 Out of 52 neonates 41(78.8%) were discharge and 11(21.2%) neonates were expired.

Respiratory distress 30(50%) were most common cause of admission, other associated problems were perinatal asphyxia (PNA) with seizure and meconium aspiration syndrome and to rule out sepsis in suspected cases. Nine (15%) needed ventilator care and 6(10%) needed nasal continuous positive airway pressure (NCPAP) for respiratory problem. 6 (10%) babies were expired and 54(90%) survived. Average hospital stay was 18.32(±10.68) days with a highest hospital stay of 49 days and the lowest 4 days.

**CONCLUSION**

Maternal hypertensive disorder of pregnancy (HDP) is associated with neonatal mortality and the morbidity which is observed in this study. Significant number of babies were delivered by caesarian section and needed hospitalization. This is a major obstetric problem has a variable degrees of neonatal involvement, we observed mean birth weight, mean gestational age was less, IUGR was high in admitted group than that of the non-admitted group. Eclampsia is still a common and serious complication of pregnancy. Proper antenatal care, detection of preeclampsia with early management and timely referral of high risk patient, administered of MgSO4 in correct doses and properly timed caesarean section in selected case would reduce the incidence of eclampsia associated maternal and perinatal morbidity and mortality in our facility.

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