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Impact of Hypertensive changes in Pregnancy on Foetal outcome based on Fundus photography

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Abstract:
Background: *Hypertensive disorders of pregnancy are the major cause of pregnancy related deaths, pregnancy complications and foetal complications in India.*
Objectives: The Objective of the study is to Grade the hypertensive changes in the pregnancy using Maternal Fundus photography, and evaluate the fetal outcome.
Methods: *Hypertensive retinal changes in 50 pregnant pre-eclamptic or with hypertension disorders of pregnancy presenting to tertiary care hospital, M.L.B. Medical college, Jhansi were classified using Keith-Wagner-Barker classification by employing Fundus photography as the diagnostic tool, and data collection. Adverse maternal and fetal complications registered as maternal deaths and fetal outcome documented as stillbirth, neonatal death and newborn respiratory complications.*
Results: *Women with eclampsia were younger (18 years), >50% were on their first pregnancy, had higher blood pressure, higher mortality and greater number of near miss cases and their children had lower birth weight, higher intra-uterus and neonatal mortality, and more respiratory distress. Women with pre-eclampsia/eclampsia and their fetuses had intermediate outcome and those with chronic hypertension and pre-eclampsia the better outcome among those with HDP. Foetuses with higher complications such as still birth and respiratory complications had higher grade of hypertensive Fundus changes in the mother as compared to low birth weight or those without complications.*
Conclusion: *In a tertiary care and referral hospital, eclampsia and chronic hypertension superimposed on pre-eclampsia are associated with a worst outcome for mothers and foetuses, and Hypertensive Fundus grading provides a linear if not direct correlation with the fetal outcome.*
Keywords*: eclampsia, pre-eclamptic, hypertension, pregnancy complications.*

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I. Introduction

Hypertensive disorders of pregnancy (HDP) are among the leading causes of maternal mortality, hospitalization due to clinical complications and deterioration of maternal and fetal prognosis.[1] It is

estimated that hypertension complicates about 5–10% of all pregnancies, although the incidence may vary according to the characteristics of the studied population and the criteria used for diagnosis.[1] In addition, low socioeconomic levels are associated with increased risk of complications related to HDP.[1] Hypertension is the most common medical problem encountered during pregnancy, complicating 2-3% of pregnancies. Hypertensive disorders during pregnancy are classified into 4 categories, as recommended by the National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy: 1) chronic hypertension, 2) preeclampsia-eclampsia, 3) preeclampsia superimposed on chronic hypertension, and 4) gestational hypertension (transient hypertension of pregnancy or chronic hypertension identified in the latter half of pregnancy).[2]

Chronic hypertension is high blood pressure that precedes pregnancy, is diagnosed within the first 20 weeks of pregnancy, or does not resolve by the 12-week postpartum check-up. Two categories of severity are recognized: mild (up to 179 mm Hg systolic and 109 mm Hg) and severe (≥ 180 systolic or 110 diastolic).[3] Preeclampsia is a multiorgan disease process of unknown aetiology characterized by the development of hypertension and proteinuria after 20 weeks of gestation.[4]

Preeclampsia is defined as elevated blood pressure after 20 weeks of gestation (≥ 140 mm Hg systolic or ≥ 90 mm Hg diastolic) plus proteinuria (> 0.3 g/24 hours). A random urine protein/creatinine ratio of less than 0.21 indicates that significant proteinuria is unlikely with a negative predictive value of 83 percent; however, confirmatory 24-hour urine protein determination is recommended.[5][6]

Severe preeclampsia is defined as any of the following:

- Markedly elevated blood pressure measurements (systolic ≥ 160 mm Hg or diastolic ≥ 110 mm Hg) taken at least 6 hours apart with the patient on bed rest
- Proteinuria (≥ 5 g/24 hours or ≥ 3+ on two random samples 4 hours apart)
- Manifestations of end-organ disease: oliguria (< 500 mL in 24 hours), cerebral or visual disturbances, pulmonary edema, cyanosis, epigastric or right-upper quadrant pain, impaired liver function, thrombocytopenia, or fetal growth restriction.[3]

Eclampsia is the most severe form of the HDP. It is accompanied by high maternal and fetal mortality and morbidity, especially in underdeveloped or developing countries. According to some studies, eclampsia is responsible for nearly 50,000 annual maternal deaths.[7]

Some potentially serious conditions such as placenta previa, disseminated intravascular coagulation, cerebral haemorrhage, pulmonary edema, hepatic insufficiency and acute renal failure are often associated with HDP, worsening the maternal prognosis. Regarding the foetus, perinatal complications include prematurity, fetal growth restriction, fetal distress and perinatal death.

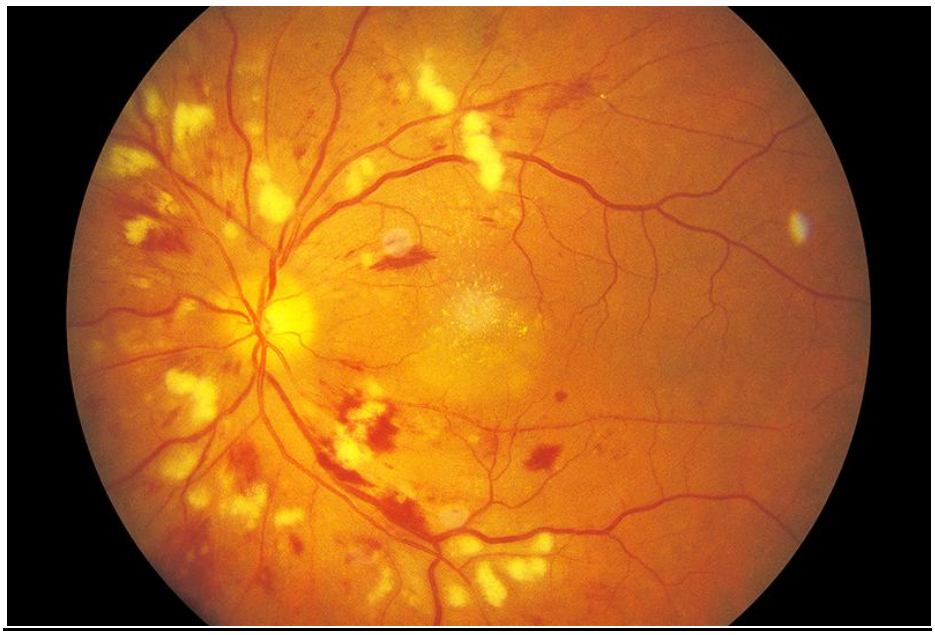
This study aims to establish the association between effect of maternal hypertension on maternal health and subsequently impact on the fetal health and outcome.

II. Methods

This is a retrospective observational study of pregnant patients that Admitted in the Department of Obs. & Gynae. In tertiary care centre, M.L.B. Medical College, Jhansi, in a 7 months period, presenting with signs of hypertension and later diagnosed as preclamptic or eclampsia, and fundus was examined for grading of hypertension on the basis of Keith Wagner barker Classification.

Keith–Wagener–Barker Classification

Grade	Features
1	Mild generalized retinal arteriolar narrowing
2	Definite focal narrowing and arteriovenous nipping
3	Signs of grade 2 retinopathy plus retinal hemorrhages, exudates, and cotton wool spots
4	Severe grade 3 retinopathy plus papilloedema



Hypertensive Retinopathy Grade IV

Inclusion criteria
1. Primigravida
2. 18-45 years of age

Exclusion criteria
1. No associated heart disease and other co-morbidities such as diabetes, asthma etc.
2. No history of prior pregnancy complications such as abortion.
3. No history of any organ dysfunction
4. History of alcohol or drug abuse

Study design: Retrospective observational study
Study location: Department of Ophthalmology and Department of obstetrics and gynaecology at tertiary care hospital, Maharani Laxmi Bai Medical college, Jhansi.
Sample size: 50 Patients

Duration of study: 7 months (June 2019-Dec 2019)

Although potentially reversible with appropriated treatment, seizures were considered a life threatening condition and included as neurological dysfunction. Maternal and fetal perinatal outcomes were monitored and registered from the admission to hospital discharge or death.

Gestational age was calculated from the date of last menses. Reported BP values are those obtained 6 hours after hospital admission.

Hypertensive disorder	**Gestational hypertension**	**Pre- eclampsia**	**Eclampsia**
Age	**32.9 +/- 2.7**	**26.7 +/- 6.7**	**18.3 +/- 2.1**
Gestational age	**35.6 +/- 3.7**	**37.3 +/- 3.2**	**33.2 +/- 5.6**
Diastolic blood pressure (mm Hg)	**96 +/- 20**	**98 +/- 14**	**110 +/- 12**

Table 1.1

The study was conducted according to Helsinki Declaration principles and was approved by an independent ethics committee.

III. Results

During the 7 months period, a total of 50 pregnant women were admitted and followed up. Chronicl hypertension was diagnosed in 34, preeclampsia in 16, and eclampsia in 10 patients. Table 1.1 shows a summary of their demographic, clinical and gestational parameters. As one may observe, pregnant women with chronic hypertension were older and those with eclampsia, the youngest, only 18 years old on average. Gestational age at delivery was higher in the pre-eclampsia group and lower in the eclampsia group compared with those with Chronic hypertension alone. The proportion of women in their first pregnancy was different among all groups, and expressively higher in the groups with pre-eclampsia and eclampsia. Diastolic BP at admission differed between groups, being lowest in the Chronic hypertension group and highest in the eclampsia group.

Table 1.2 shows maternal and fetal outcomes related to HDP. All groups of women with HDP had high proportion of stillbirth (close to 10%), being lowest in the group of mothers with pre-eclampsia compared with the other groups, which differ statistically only from the group of mothers with Gestational hypertension. Atypically high number of still birth, and low birth can be attributed to small sample size, in eclamptic patients.

Hypertensive disorders	**Chronic Hypertension N=34**	**Pre- eclampsia N = 16**	**Eclampsia N=10**	**Hypertensive Fundus Grading**
Still birth	4 (11.76%)	1 (6.25%)	2 (20%)	III, IV
Fetal + neonatal Death	5 (14.70%)	2 (12.50%)	2 (20%)	III, IV
Newborn respiratory complications	5 (14.70%)	3 (18.75%)	3 (30%)	II, III
Low birth weight (LBW)	12 (35.29%)	8 (50 %)	6 (60%)	I, II

Table 1.2

When we consider fetal loss, stillbirth plus neonatal mortality (up to 28 days after birth), it is possible to observe the vulnerability of the neonates of women with eclampsia, being close to 30%, higher than all other groups of mothers with HDP. Respiratory newborn complications (anoxia and/or respiratory distress) were also high in all groups (14–30%).

Fundus changes of the hypertensive disorders of pregnancy in majority of cases involving fetal complications of still-birth had Grade III-IV maternal changes, including those of fetal and neonatal death. Newborn with respiratory complications had grade II-III changes and low birth weight babies had grade II-I fundus changes in the mother.

The average birthweight of neonates was low for all groups of women with HDP (about 2200 g), and substantially different in the group of women with eclampsia (50%).

IV. Discussion

Our study showed that women with eclampsia were very young (mean age of 20 years) and those with Chronic hypertension the oldest, about 33 years old (Table 1.1). Maternal and fetal outcomes were better for women with essential hypertension than for the other groups.[8] Nonetheless Hypertension in pregnancy is a common complication of pregnancy and one associated with significant maternal and fetal morbidity and mortality. The central issue in the management of hypertension in pregnancy is achieving a balance between the maternal benefits derived from improved BP control, and the fetal risks resulting from intrauterine medication toxicity and possible uteroplacental hypoperfusion.[9]

HDP continue to be an important cause of maternal, intra-uterus and newborn death (Table 1.2). Fetal and neonatal mortality, as well as newborn respiratory distress, was very high in all HDP, being highest in eclampsia (Table 1.2). Chronic hypertensive disorder of pregnancy, frequently unvalued, is a very important risk factor for fetal death and newborn respiratory complications. Also, birth weight was particularly lower in children of women with eclampsia. Fetuses with higher complications such as still birth and respiratory complications had higher grade of hypertensive Fundus changes in the mother as compared to low birth weight or those without complications. Maternal Fundus findings correlate linearly, if not directly or quantitatively with the fetal outcome, and provides a overview of expected outcome with a given set of Fundus findings.

Conflicts of interest: The authors declare no conflicts of interest in preparing this article.

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