

The Placental Changes in Hypertensive Disorder of Pregnancy and Compare with Normal Pregnancy

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ABSTRACT:

Objective: The aim of the study is to study the spectrum of placental changes in Hypertensive disorder of pregnancy and correlate with normal pregnancy. **Material & Methods:** It was an observational study conducted in department of Obs & Gynae in Mahatma Gandhi Medical college, Jaipur Rajasthan on 50 placenta out of which 25 belong to hypertensive disorder of pregnancy (Blood pressure >150/90), and 25 placenta belong to control group (uncomplicated pregnancy). **Results :** In hypertensive disorder of pregnancy mean placental weight and volume was found to be much lower then the control group. Statically significant difference was found among the group according to weight of placenta with p value 0.027 and volume of placenta with p value 0.032.. Macroscopic features like calcification, infarct, retro placental hematoma was found much more then the control group, moreover these are more common in severe form of hypertensive then the milder form of hypertensive disorder of pregnancy. No Statically significant difference was found among the group according to shape of placenta with p value 0.88. Incidence of low birth weight and still birth was also more in hypertensive disorder patient then in control group. **Conclusion :** Placental changes are more common in hypertensive disorder of pregnancy then in control and it is associated adverse fetal outcome i.e. low birth weight and still birth.

Keywords: Placental Changes, Hypertensive disorders of pregnancy, Normal pregnancy.

INTRODUCTION:

Human placenta plays a key role in metabolic, secretary, respiratory, nutritional, excretory, endocrine and immunological functions to support the growing fetus. Placenta forms a functional unit between the mother and the fetus and any pathological event that concern

placenta will also influence the fetus. Mother, Placenta and fetus constitute the triad for perinatal outcome. Therefore examination of placenta in cases of maternal disorders provides vital information to both obstetrician and neonatologist.

Hypertension is defined as systolic blood pressure (BP) greater than or equal to 140 mm Hg and/or diastolic BP greater than or equal to 90 mm Hg. (1)

Hypertension disorder of pregnancy is classified as preeclampsia, eclampsia gestational hypertension, chronic hypertension. (2)

Earlier literature suggests that high incidence of foetal hypoxia, intra-uterine growth retardation, decrease birth weight and death in HDP (hypertensive disorder of pregnancy). This is associated with higher incidence of decrease Mean placental weight and volume. Macroscopic features like retro placental hematoma, infarcts and calcification in the placenta of mothers suffering from PIH.

In a study on 60 placentas by Navbir at Era's Lucknow Medical College, Lucknow concluded that the Mean placental weight and volume was found to be much lower in the study group. In pregnancy induced hypertension macroscopic features like retroplacental haematoma, calcification, infarct are more common than control group. The mean birth weight of babies in PIH was less as compared to the control group; also the incidence of still births was more. (3)

As there is relationship between placental changes and fetal outcome, Present study has been undertaken to assess the morphology and histology of placenta from mothers with HDP and to correlate the findings with those from normal pregnancies.

The aim of my study is to assess the spectrum of placental changes and its correlation with fetal outcome in pregnancy with hypertension patients.

MATERIAL AND METHODS:

It was an observational comparative study conducted between January 2014 and September 2015 in obstetric and Gynecology department of Mahatma Gandhi Medical College, Jaipur (Rajasthan). After obtaining approval from Institutional Ethical Committee, 25 placenta cases of hypertensive disorder of pregnancy based on inclusion and exclusion criteria were taken and divided into three groups: preeclampsia 11 placenta, eclampsia 5 placenta, chronic hypertension 9 placenta. Women were collected from Obstetric Department and 25 placenta of controls were taken from uncomplicated normal pregnancies for assessing the spectrum of placental changes and divided into four groups. All respondents were properly explained about the study and their written consent was taken.:

Group 1 – Preeclampsia

Group 2 – Eclampsia

Group 3 – Chronic Hypertension

Group 4 - Control Group

Inclusion criteria- blood pressure (>150/90), no other associated medical disorder

Exclusion criteria- not willing for study, multifetal gestation, associated with other medical disorder.

Procedure:

Detailed history was taken according to structured proforma. Placenta were collected soon after delivery and kept in 10% formalin. Placental membranes stripped off. Umbilical cord cut to a length of 2.5 cm. Placenta were washed gently to remove any adherent clots and gently dried with filter paper. Weight of the placenta was obtained on the weighing machine. Volume of the placenta was obtained by water displacement method in a graduated 1 litre beaker. Detailed gross examination of the placenta was done to note the shape and any abnormalities in the shape of the placenta. The

fetal surface of the placenta was scrutinized; the state of membranes was noted. Presence of any sub amniotic hematoma looked for. Maternal surface was examined for presence of any retro-placental hematoma and calcification. Mode of insertion of umbilical cord was noted along with any umbilical cord abnormalities.

The ANOVA test and chi square test was used to determine whether there was a statistical significant difference between control and hypertensive group. A $p < 0.05$ was considered to be statistically significant.

RESULTS:

50 placentas were taken out of which 25 placenta belonged to study group that include 11 (22%) placenta in pre-eclampsia, 5 (10%) patient in eclampsia group, 9 (18%) patient in chronic hypertension, 25 placentas were taken as control.

Mean age of patient in mild preeclampsia, eclampsia, chronic hypertension were 22.14 years, 22.56 years, 30.12 years respectively, while in control group mean age was 28.53 years (Table 1).

Table 1: Demographic observation in study and control group

| Disease | No of patients | Percentage | Mean age | Mean parity |
|----------------------|----------------|------------|----------|------------------|
| Pre-eclampsia | 11 | 22 | 22.14 | Para 2 |
| Eclampsia | 5 | 10 | 22.56 | Primipara |
| Chronic hypertension | 9 | 18 | 30.12 | para 3 |
| Control group | 25 | 50 | 28.53 | Para 2 or para 3 |

The mean placental weight in present study in preeclampsia, eclampsia, chronic hypertension were found to be 415.5 gm, 333.18 gm, 382.5 gm respectively, while in control group it was 439.5 gm. Statically significant difference was found among the group according to weight of placenta with p value 0.027. Mean placental volume in preeclampsia, eclampsia, chronic hypertension were 409.64 ml³, 328.33 ml³, 371.5 ml³ respectively while in control group it was 431.17 ml³. Statically significant difference was found among the group according to volume of placenta with p value 0.032. (Table 2).

Table 2: Placental weight and volume in study and control group

| Study Groups | Placental weight (in gms) | | | Placental volume (in ml ³) | | |
|------------------|---------------------------|---------------------|-------------------------------|--|---------------------|-------------------------------|
| | Range | Mean \pm SD | ANOVA | Range | Mean \pm SD | ANOVA |
| Group 1 (n = 11) | 300-520 | 415.5 \pm 60.47 | F= 3.348 df= 3 p= 0.027 | 310-520 | 410.30 \pm 57.30 | F= 3.201 df= 3 p= 0.032 |
| Group 2 (n = 5) | 210-540 | 333.18 \pm 123.47 | | 200-530 | 329.33 \pm 123.27 | |
| Group 3 (n = 9) | 300-490 | 382.5 \pm 67.35 | | 290-480 | 371.5 \pm 66.10 | |
| Group 4 (n = 25) | 320-419 | 439.5 \pm 73.9 | | 305-615 | 432.17 \pm 78.13 | |

In present study, in pre eclampsia, eclampsia, and chronic hypertension, 72.72%,

64% , 77.77%,placentas were discoid in shape and 27.28% , 16% , 22.23% of placentas were irregular shaped respectively in study group, while in control group 84% placenta were discoid in shape, while 16 % placenta were irregular . No Statically significant difference was found among the group according to shape of placenta with p value 0.88. (Table 3)

Table 3: Placental shape in study and control group

| Shape of placenta | Preeclampsia N (%) | Eclampsia N (%) | Chronic Hypertension N (%) | Control N (%) |
|-------------------|-----------------------------|--------------------|-------------------------------|------------------|
| Discoid | 8 (72.72) | 3 (60) | 7 (77.77) | 21 (84) |
| Irregular | 3 (27.28) | 2 (40) | 2 (22.23) | 4 (16) |
| Chi square | Chi = 1.647, df=3, p= 0.888 | | | |

In our study gross infarcts were seen in 17/25 in study groups (in preeclampsia 7/11 case, in eclampsia 3/5, in chronic hypertension 7/9) while in control group 5/25 patient. Gross retro placental hematoma were seen in 7/25 cases in study group (3/11cases in mild preeclampsia, 2/5 in eclampsia, 2/9 in chronic hypertension) while in control group there was no retro placental hematoma.

Gross calcification were seen in 19/25 cases in study group (7/11case in preeclampsia, 5/5 in eclampsia, 7 out of 9 in chronic hypertension) while 3 out of 25 cases in control group (Table 4).

In our study in pre eclamptic 2/11 cases had still births, in eclampsia out of 1/5 cases had

still birth, and in chronic hypertension 2/9 cases had still births while in control group there was no still birth. Mean weight of baby observed in mild preeclampsia, eclampsia, chronic hypertension were 2.79 Kg, 2.16 Kg, 2.59 Kg respectively, while in control group it was 3.27 Kg (Table 5).

Table 4: Distribution of infarct, retro placental hematoma and calcification in study and control group

| Pathologic features | Group 1 Pre-eclampsia (N = 10) | | Group 2 Eclampsia (N=5) | | Group 3 Chronic hypertension (N= 9) | | Group 4 Control (N = 25) | |
|--------------------------|---------------------------------------|--------|-------------------------------|--------|--|--------|---------------------------------|--------|
| | Present | Absent | Present | Absent | Present | Absent | Present | Absent |
| Infarct | 7 (63%) | 4 | 3 (60%) | 2 | 7 (77%) | 2 | 5 (20%) | 20 |
| Retro placental Hematoma | 3 (27.27%) | 8 | 2 (40%) | 3 | 2 (22.22%) | 7 | - | 25 |
| Calcification | 7 (63%) | 4 | 5 (100%) | - | 7 (77%) | 2 | 3 (12%) | 22 |

Discussion:

Fox and Langley said that the placenta is the mirror image of the perinatal period. (4) Kher and Zawar have reported reduced placental weight in cases of higher grades of hypertension, while placenta from cases of mild preeclampsia were reported to weigh within normal range. (5)

The study of Udainia et al, found the mean placental weight of 435.63 gm in mild hypertension and 371.43 gm in severe hypertension. (6)

Table 5: Fetal outcome in study and control group

| Fetal outcome | Group 1 Pre-eclampsia (N = 10) | Group 2 Eclampsia (N=5) | Group 3 Chronic hypertension (N= 9) | Group 4 Control (N = 25) |
|------------------------------------|---------------------------------|-------------------------|-------------------------------------|---------------------------|
| Live birth | 9 | 4 | 7 | 25 |
| Still birth | 2 | 1 | 2 | 0 |
| Birth weight in Kg (Range) | 2.0-3.5 | 1.5-3.2 | 2.18-3.13 | 2.14-4.4 |
| Birth weight in Kg (Mean \pm SD) | 2.79 \pm 0.43 | 2.16 \pm 0.72 | 2.59 \pm 0.28 | 3.27 \pm 0.46 |

Navbir P (2012) found mean placental weight in eclampsia patient was 329.17 gm and in mild hypertension was 412.5 gm³. In our study the results were also comparable; it was 333.18 gm in eclampsia and 415.5 gm in mild hypertension.(3)

Fox and Langley reported placental infarct, 34% in women with mild preeclampsia and 60% in severe eclampsia.(4) Workers like Wigglesworth (1962);(7) Maqueo et al (1961);

Kher and Zawar (5) Masodkar et al.and Mathews et al stated that placental infarcts involving more than 10% surface area are significant.(8,9) Earn observed that there was no adverse effect on fetus even if infarction involved more than half of placenta.(10) So no conclusion can be offered regarding extent of placental infarct and its significance. In our study we found 63 % infarctions in mild preeclampsia, 60% in eclampsia and 77% in chronic hypertensive patient. Over all 66.66 % infarcts were seen in HDP cases and 20% infarcts in control group.

Navbir P noted retro placental hematoma in 30.52% of pregnancy induced hypertension cases.(3) Fox reported the retro placental hematoma in 12-15% eclamptic cases (toxemic).(11) Salvatore reported retro placental hematoma in 3.1% mild preeclampsia and 25.8% in severe preeclampsia.(12)

Some worker stated retro placental hematoma as a complication of HDP like Bartholomew and Kracke while others stated retro placental hematoma as a cause of HDP like Hibbard and Jeffcoate .(13) In our study we observe 29.83 % retro placental hematoma in HDP cases, while no retro placental hematoma in control group.

Navbir P noted placental calcification in 78.09 % in pregnancy induced hypertension and 10 % in control group.(3) Similar change was seen by Fox et al, Shanklin and Mehrotra et al. (11,14,15) In our study we noted 80 % calcification in HDP cases and 20 % in control group.

A correlation between placental calcification and primi gravidity had been noted in the present study. 72.73% (16/22) placentae in the study group showing calcification were from

primigravidae as compared to 33.3% (2/6) from the control group. This relationship between placental calcification and primi gravidity has reported by Fox (16) and Wentworth. (17)

Kher and Zavar have reported a significant reduction in the foeto placental weight ratio. (5) Wigglesworth has experimentally showed it in rats that reduced placental blood flow results in a smaller fetus. (18)

Gruenwald hypothesized that a smaller placenta reflects poor foetal growth. (19) Nummi however reported contradictory findings, that there was a poor correlation between foeto-placental weight ratio and maternal or foetal complications.(20) Fox noted that in many hypertensive gestations there was decreased foeto-placental weight ratio because of a compensatory hypertrophy of the placenta under the influence of unfavorable maternal environment. (21)

CONCLUSION:

A comparative study between 25 placenta from women with various grades of hypertension during pregnancy and 25 from disease free gestation was conducted. Placental weight (377.06 gm v/s 439.5 gm) and volume (370.33 ml v/s 432.17 ml). It was found to be much lower in higher proportion of cases of eclampsia and pre eclampsia and chronic hypertension Lower foeto-placental weight was observed in cases of severe form of the hypertensive disorder of pregnancy than in milder forms. So, it is concluded that lighter placenta usually accompanied a low birth weight of the fetus. The three main gross lesions which were observed were placental infarcts (66.66% v/s 20%) retro placental hematoma (29.83 v/s 0%) and calcification (80 vs.12%). There incidence in

hypertensive pregnancies was higher as compared to placenta of the control group.

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Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee.

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