Morphological Study of Placenta in Pregnancy with Hypertension in Western Odisha.

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ABSTRACT

The aim of my study is to compare the morphological changes of placenta in preeclampsia with that of normal placenta and to analyze placental changes in the pregnancy induced hypertension. The material consisted of fifty term placenta collected from the labour room and operation theatre of the department of obstetrics and gynaecology, V.S.S. Medical College Hospital, Burla, after the normal or induced delivery of women clinically diagnosed as pre-eclampsia, severe pre-eclampsia, eclampsia, pre-eclampsia superimposed on essential hypertension and normal uncomplicated pregnancies as control. The weight, diameter, thickness of centre, infraction, calcification, retroplacental hematoma is observed. The weight, diameter, thickness of placenta, in study group appears to be towards lower side in comparison to the controls. There is higher incidence of marginal insertion of cord in study group in comparison to controls. Retroplacental hematoma, multifocal and central infraction observed in study group. This study will help in understanding of the specific aetiologies of adverse outcome which will lead to specific treatment and preventive measures for those with risk for recurrence in subsequent pregnancies, specifically in pre-eclampsia and eclampsia cases.

Keywords: Placenta, Pregnancy Induced Hypertension, Infarction, Retroplacental haematoma.

INTRODUCTION

Pregnancy Induced Hypertension (P.I.H.) is a matter of serious concern at present as regards to fetal outcome in pregnancy, as well as maternal morbidity and mortality. The exact etiology of hypertension in pregnancy is little known to medical fraternity, Toxemia of pregnancy, a multi system disorder, peculiar to pregnancy is characterised by gestational hypertension, proteinuria and activation of coagulation cascade with associated abnormalities in renal and hepatic function. Structural and functional derangement of placenta, evoke a considerable interest, as these may be the only yardsticks to measure adequacy of the foetal environment.

The foetus, placenta and mother consist the vital triad in pregnancy. Placenta is the most accurate record of the infants’ prenatal experience as stated by Benirschke (1981)1. Placenta in Latin means cake, that is floppy mass. Placenta is a vital organ for fetal development, derived from both foetal and maternal tissues, the maternal portion being the decidua basalis and the fetal portion is chorionfrondosum. Harold Fox, Neil J (2007).2 It is basically meant for exchange of nutrients between maternal and foetal circulation to ensure an optimal environment for foetal growth and development Chang KT (2009)3, Shams F, Rafique M, Samoo NA, Irfan R (2012)4. Common pathologies of pregnancy like intrauterine growth retardation, preeclampsia (pregnancy induced hypertension), are associated with incomplete vascular remodeling in the placenta. Standring S, Collins P, Healy JC5.

Hypertensive disorders complicating pregnancy are common and form one of the deadly triads along with haemorrhage and infection, which result in large number of maternal deaths and thereof foetal deaths.

The present study intends to compare the morphological changes of placenta in preeclampsia with that of normal placenta and to analyze placental changes in the preeclampsia-eclampsia syndrome.

Morphological study will include placental shape, weight and thickness through a mid-placental section, and calculation of placenta: fetus weight ratio.

Umbilical length and thickness will be recorded, and umbilical cord insertion will be divided into two categories:

(i) normal, which comprised central and lateral cord insertion, and
(ii) abnormal, which constituted marginal (<2 cm from the placental margin) and velamentous umbilical cord insertion.

As the placenta is the direct link between mother and foetus, the examination of placenta gives the clear idea of what had happened with it, when it was in the mother’s womb and what is going to happen with the foetus in the future.

With this objective, the present study was carried out. In fact, there is very limited data available on the
relationship between placental pathology and perinatal outcome.

The present study was undertaken to analyze the quantitative placental changes in toxaemia of pregnancy which included mild pre-eclampsia, severe pre-eclampsia and pre-eclampsia superimposed on essential hypertension.

To compare and to correlate with the severity of maternal disease, the study of placenta from uncomplicated pregnancies were taken as control.

**MATERIALS AND METHODS**

The present study has been carried out in the department of Anatomy, V.S.S Medical College, Burla, Odisha, during the period from October 2011 to September 2013.

The material consisted of fifty term placentae collected from the labour room and operation theatre of the department of obstetrics and gynaecology, V.S.S. Medical College Hospital, Burla, after the normal or induced delivery of women clinically diagnosed as pre-eclampsia (12 cases), severe pre-eclampsia (10 cases), eclampsia (14 cases), pre-eclampsia superimposed on essential hypertension (4 cases) and normal uncomplicated pregnancies (10 cases) as control.

Soon after the delivery, placenta was collected in a clean tray and umbilical cord, membranes and placental disc were examined sequentially.

In umbilical cord its length, attachment to placenta (central/eccentric/marginal/vilamentious), true knots or congestion is observed. In membranes colouration/haemorrhage regions/membranous vessels was noted.

After trimming the membranes and the cord following observations were noted in respect of the placental disc, its weight, diameter, thickness at center, infarction fresh/old/both, marginal/central/both, calcification, thrombus, haemorrhage fibrin deposition, retroplacental haematomata.

**RESULTS**

Out of fifty singleton placentae undertaken for gross and microscopic analysis in the present series, 40 were in study group and 10 were in control group.

The study group was further sub classified into grade I (Mild pre-eclampsia), grade II (Severe Pre-eclampsia), grade III (eclampsia) and grade IV (Pre-eclampsia superimposed on essential hypertension).

The total number of cases in each grade has been shown in Table 1

The control group consisted of ten placentae collected from women having no bad obstetrics history, no history of bleeding during pregnancy, duration of amenorrhoea corresponded to height of uterus and had normal foetal presentation.

All of these were normotensive and their haematocrit values were within normal limits.

**Maternal Data**

Taking all grades into consideration, maximum number of toxemia of pregnancy were noted below 20 years of age (50%), followed by the age group between 21-25 yrs. (27%).

Pre-eclampsia superimposed on essential hypertension were observed in elderly patients only (Table 2).

The toxemias of pregnancy were seen mostly in primigravida (67.5%) and the occurrence showed a downward trend as the gravida increased.

Pre-eclampsia superimposed on essential hypertension were seen in multigravida (Table 3).

### Table 1: Distribution of Cases

<table>
<thead>
<tr>
<th>Study Group</th>
<th>Toxemia of Pregnancy</th>
<th>No. of Cases (n)</th>
<th>Percentage of Toxemia cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gr. I</td>
<td>Mild Pre-eclampsia (Mild PET)</td>
<td>12</td>
<td>30%</td>
</tr>
<tr>
<td>Gr. II</td>
<td>Severe Pre-eclampsia (Severe PET)</td>
<td>10</td>
<td>25%</td>
</tr>
<tr>
<td>Gr. III</td>
<td>Eclampsia</td>
<td>14</td>
<td>35%</td>
</tr>
<tr>
<td>Gr. IV</td>
<td>Pre-eclampsia superimposed on essential hypertension</td>
<td>4</td>
<td>10%</td>
</tr>
<tr>
<td>Control group</td>
<td>Uncomplicated pregnancies</td>
<td>10</td>
<td>100%</td>
</tr>
</tbody>
</table>

### Table 2: Maternal Age Distribution of Various Cases

<table>
<thead>
<tr>
<th>Grades of Toxemia</th>
<th>Under Maternal Age in years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>21-</td>
</tr>
<tr>
<td>Gr. I (n=12)</td>
<td>5</td>
</tr>
<tr>
<td>Gr. II (n=10)</td>
<td>5</td>
</tr>
<tr>
<td>Gr. III (n=14)</td>
<td>10</td>
</tr>
<tr>
<td>Gr. IV (n=4)</td>
<td>-</td>
</tr>
<tr>
<td>Total (n=40)</td>
<td>20</td>
</tr>
</tbody>
</table>

### Table 3: Gravida Distribution of Cases

<table>
<thead>
<tr>
<th>Grade of toxemia</th>
<th>G1</th>
<th>G2</th>
<th>G3</th>
<th>G4</th>
<th>G5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gr. I (n=12)</td>
<td>9</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Gr. II (n=10)</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Gr. III (n=14)</td>
<td>11</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Gr. IV (n=4)</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total (n=40)</td>
<td>27 (67.5%)</td>
<td>7 (17.5%)</td>
<td>3 (7.5%)</td>
<td>2 (5%)</td>
<td>1 (2.5%)</td>
</tr>
</tbody>
</table>

Control (n=10) 4 (40%) 3 (30%) 3 (30%) - -
This study revealed interestingly a higher incidence of eccentric or marginal insertion of cord in study group (50%) as compared to controls (20%).

Multifocal and central infarctions were observed in (67.5%) placentae of study group. Also, the size of infarction measuring more than 1cm³, were seen more often in toxemia cases (60%).

The infarction was absent in 70 percent of normal placentae, but whenever present (30%) it involved marginal area and the size was less than 1cm³.

Placental calcification, was seen in 25% of toxemia cases and in 40% cases of disease free women.

Present study revealed 32.5% cases of pre-eclampsia and eclampsia were associated with retro placental hematoma; where as it was absent in the control group.

## Table 4A: Macroscopic Findings of Placenta in Different Grades of Toxemia Cases

<table>
<thead>
<tr>
<th>Group</th>
<th>Placental Weight N=400-550gm</th>
<th>Diameter N = 18-20cms</th>
<th>Thickness N=2.5cm -3.5cm</th>
<th>Insertion of cord</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N &lt; N &gt; N</td>
<td>N &lt; N &gt; N</td>
<td>N &lt; N &gt; N</td>
<td>Central</td>
</tr>
<tr>
<td>Gr.I (12) Mild PET</td>
<td>7 5  -</td>
<td>5 7  -</td>
<td>8 4  -</td>
<td>6 5  1  -</td>
</tr>
<tr>
<td>Gr.II (10) Severe PET</td>
<td>2 8  -</td>
<td>1 9  -</td>
<td>2 8  -</td>
<td>5 4  1  -</td>
</tr>
<tr>
<td>Gr.III (14) Eclampsia</td>
<td>1 13 -</td>
<td>- 14 -</td>
<td>1 13 -</td>
<td>7 7  - -</td>
</tr>
<tr>
<td>Gr. IV (4) Pre-eclampsia superimposed on essential hypertension</td>
<td>3 - 1</td>
<td>3 - 1</td>
<td>3 - 1</td>
<td>2 2 - -</td>
</tr>
<tr>
<td>Total(40)</td>
<td>13 26 1</td>
<td>9 30 1</td>
<td>14 25 1</td>
<td>20 18 2 -</td>
</tr>
<tr>
<td>Control(10)</td>
<td>8 2 -</td>
<td>8 2 -</td>
<td>8 2 -</td>
<td>8 2 - -</td>
</tr>
</tbody>
</table>

|                        | 80% 20%                     | 80% 20%                 | 80% 20%                  | 80% 20% - -   |

## Table 4B: Macroscopic Placental Lesions (Contd.)

<table>
<thead>
<tr>
<th>Group</th>
<th>Placental Infraction</th>
<th>Calication</th>
<th>Retroplacental Hematoma</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fresh</td>
<td>Old</td>
<td>Both</td>
</tr>
<tr>
<td>Gr.I(12) Mild PET</td>
<td>7</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Gr.II(10) Severe PET</td>
<td>9</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Gr.III(14) Eclampsia</td>
<td>10</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Gr.IV(4) PET Superimposed on essential hypertension</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Total(40)</td>
<td>29</td>
<td>24</td>
<td>21</td>
</tr>
<tr>
<td>Toxemia Cases</td>
<td>72.5%</td>
<td>60%</td>
<td>52.5%</td>
</tr>
<tr>
<td>Control</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>10cases</td>
<td>30%</td>
<td>30%</td>
<td>30%</td>
</tr>
</tbody>
</table>

## Macroscopic Placental Lesions (Table 4 - A & B)

Placentae from 65% of toxemia of pregnancy weighed below normal as compared to 20% amongst the controls. The lowest placental weight found in this study was 180gms.

Both the diameter and thickness were reduced in study group (62.5%), compared to normal (20%).

Reduction in weight, diameter and thickness were correlated to increased grade of toxemia.

This study revealed interestingly a higher incidence of eccentric or marginal insertion of cord in study group (50%) as compared to controls (20%).
DISCUSSION

The placenta has been described as the mirror of the perinatal mortality. A glance at the literature reveals that the preeclampsia-eclampsia syndrome exerts its deleterious effects on the placenta. So, the present study was undertaken to analyse placental changes in the preeclampsia eclampsia syndrome with a view to assess the significance of villous abnormalities by histopathological methods because these changes serve as a guide to the duration and severity of disease.

The majority of cases of various grades of toxemia of pregnancy were found in younger age range and in primigravida, has also been observed by Baker9; Page2; Kher8; Dutta1 and William Manjunatha HK10. According to Page2, Primigravida have unyielding abdominal wall leading to higher intra-abdominal pressure that could lead to decreased uterine blood flow by external compression of myometrium as the uteroplacental blood flow in part is controlled by tone of myometrium through which all blood vessels must pass to reach the intervillous space. The second hypothesis is immunological where effective immunisation by previous pregnancy is lacking in primigravida.

Present study revealed 65% of placentae belonging to toxema group weighed significantly less as compared to placentae of the control group. This was also observed by Nummi11; Kher8; Bhattacharyya7; Sodhi13 and Dutta14; Narasimha A15; Nobis and Das16 in their study have shown that the placental weight in toxemic cases varies from 279 to 407 gm. This finding is comparable with Virupaxi17. In high risk pregnancies like anemia and PIH, the placental weight is significantly reduced with the severity of the disease. (Narasimha A15)

In the study done by Virupaxi17 the umbilical cord insertion was more towards the margin with the increase in severity of anemia.

At term the fetoplacental ratio varies between 6:1 and 8:1 (Morrison, 1963). Variable findings are available about fetoplacental weight ratio. Nummi11; Holz18 and Soma18 found increased fetoplacental weight ratio whereas, Fox19; Kher8 Dutta14 found this ratio to be decreased.

However the present study revealed fetoplacental weight ratio at near normal range in all grades of toxemia of pregnancies except grade IV (Preeclampsia superimposed on essential hypertension) where it was found to be decreased. It was also observed that mean placental weight in grade IV was more than mean placental weight of control.

Fox20 has explained that hypertrophy of placental mass in response to chronic hypoxia in previously hypertensive patient leads to increased placental weight disproportionate to foetal weight resulting in low fetoplacental weight ratio. Improper antenatal care, poor socioeconomic condition, lack of education in rural women gave rise to low foetal as well as placental weight in Grade I, II, and III cases ultimately keeping the fetoplacental weight ratio within normal limit.

Diameter and thickness of placentae were reduced in 62.5% of toxemia cases. Similar observation was also made by Dutta14, Majumda17.

In the present study eccentric or marginal insertion of cord was noted in 50 percent of toxemic placentae, while Dutta14 observed in 42.2%of cases. Similar observation was also made by Majumdar S17.

The present study revealed both (red) and old (white) infarcts in majority of cases suffering from eclampsia and pre-eclampsia. Placental infraction more than 5% area considered pathological and more frequently seen in toxemia due to thrombotic occlusion of maternal uteroplacental vessels.

Similar finding was noted by Bandana Das22 where they showed an increased finding of infarction in cases of PIH. Udainia23 had also observed an increase in the incidence of placental infarction with severity of toxemia.

Similar observation was also made by Dutta14, Narasimha A15.

Placental calcification has shown variable values among study and control groups in previous studies. Calcification is regarded as evidence of placental senescence or degeneration.

In the present study 25% cases of study group showed calcification and 40% in control group showed the same. Similar observation seen by Fox19; Dutta14 and Manjunatha HK10.

Retroplacental haematoma with co-existent infract observed in 40% of cases of toxemia of pregnancy, has also been seen by other workers (Mathews24, Fox20, Dutta14, Manjunatha HK10 and Maham A25). Large haematoma that separates the considerable portion of villi from maternal blood supply are associated with high incidence of foetal hypoxia and death.

CONCLUSION

The foetus, placenta and mother constitute triad of contributors to pregnancy outcome. Placental examination becomes an important but not the only assessment of pregnancy-related problems. The placental examination will help in understanding of the specific etiologies of adverse outcome which will lead to specific treatment and preventive measures for those with risk for recurrence in subsequent pregnancies specifically in pre-eclampsia and eclampsia cases.

REFERENCES


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