

Comparison of Placentae from Hypertension Associated Pregnancies and Normal Pregnancies

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ABSTRACT

OBJECTIVES: This study was carried out to compare the placentae from hypertension associated pregnancies and normal pregnancies

DESIGN: Comparative study

SETTING: Isra University Hospital Hyderabad Sind.

METHOD: Eighty full term placentae were collected; 40 from normal and 40 from hypertensive pregnant women. Gross features of placentae were noted and then stained for their microscopic features. Birth weight and Apgar score of the newborn were recorded.

RESULTS: The weight and surface areas of placentae were significantly low in the hypertensive group whereas thickness of placenta and number of cotyledons were almost same in hypertensive and control groups. Microscopically increased number of syncytial knots, chorionic villi with excessive collagen was observed in placentae of hypertensive women. In hypertensive group birth weight of neonates was significantly low than control group while difference in APGAR score between two groups was statistically insignificant.

CONCLUSION: Hypertension during pregnancy is associated with remarkable changes in the placentae.

KEY WORDS: Placenta, APGAR score, hypertensive, normotensive, birth weight.

INTRODUCTION

Every year around 585,000 women die from complications of pregnancy and child birth, and more than 99% of these deaths occur in less developed regions¹. Globally it is estimated that 12% of all maternal deaths are related to the hypertensive disorders of pregnancy². Maternal mortality ratio in Pakistan is higher than in many parts of the world and maternal health indicators have shown little sign of improvement over the last few decades³. Hypertension is a global epidemic of general population and pregnancy is no exception to this rule⁴. The hypertensive disorders complicating pregnancy include fetal distress, intrauterine fetal death and placental abnormalities. Pregnancy complicated by hypertension is commonly associated with placental insufficiency⁵.

Pregnancy induced hypertension is associated with macroscopic and microscopic changes in the placental structure⁶. Maternal hypertension affects the uterine blood vessels and decreases their lumen, which leads to reduced blood flow between the intervillous spaces. Hypertension in pregnancy intensifies morphological changes of aging in placenta and subsequently effecting outcome of pregnancy including fetal distress, growth retardation and fetal death⁷. The resulting ischemia causes fetal hypoxia, which may lead to fetal distress and death. In recent years, it has been

revealed that there is clear relationship between morbid histological changes of placentae of hypertensive mothers and fetal growth retardation⁸.

Pregnancy induced hypertension is very common in our country and little or no work is done here to evaluate placental changes in this condition. Therefore present study was designed to evaluate changes in placentae of women with pregnancy induced hypertension and compare these with placenta of normal pregnancies.

STUDY OBJECTIVES

To evaluate the gross and histological structure of placenta in normotensive and hypertensive women.

To relate the birth weight and APGAR score to placental changes in the hypertensive and normotensive women.

MATERIAL AND METHODS

Eighty full term placentae from normal and hypertensive females at the time of their delivery were collected for this study.

Selection of Patients

Pregnant women between the age of 18-35 years, with parity between 0-4 and a blood pressure greater than 140/90 mmHg were included as cases. These were registered for this study from 7th month of gesta-

tion. Those subjects suffering from renal disease, liver disease, diabetes mellitus, obstetric abnormalities, i.e. abruptio placentae, congestive cardiac failure, twin pregnancy and jaundice were excluded from this study. All placentae obtained were after normal vaginal deliveries or elective C-section.

Written permission was taken from Ethical Committee for Postgraduate Research, Isra University. Objective of the study was explained to the subjects and their informed consent was taken.

Data Collection

The patients for this study were selected from the department of Obstetrics and Gynecology, Liaquat University of Medical & Health Sciences Jamshoro and Isra University Hospital Hyderabad. Demographic data was recorded for each patient. The clinical examination including blood pressure reading was done in labor room. Soon after delivery, placentae with cord and membranes were collected in jars filled with normal saline, and labeled. These jars were transported to the laboratory where umbilical cords of placentae were cut 4 cm distal to its attachments on the fetal surface, membranes removed, gross features noted and placentae cut, representative section were fixed in formalin. A total number of 80 placentae were collected, 40 from hypertensive pregnant women and 40 from normotensvie pregnant women. After delivery birth weight and Apgar score of neonates were recorded for each case.

The gross feature noted for placentae from each group includes shape, diameter, surface area, weight, cotyledons, central thickness and attachment of umbilical cord. Placentae from both groups were studied microscopically for average number of syncytial knots per unit area, amount of chorionic villous collagen, trophoblastic basement membrane thickness, tissue Processing for Sectioning and Staining.

Paraffin Sections

Placentae fixed in 10% formalin were processed for routine paraffin embedment. Sections were cut and mounted on clean gelatinized slides, stained with H&E, Mallory’s trichrome, and methenamine silver.

Micrometry

A stage micrometer was used for calibration of ocular micrometer and the counting reticule.

Statistical Analysis

The statistical significance of the difference between means of various parameters among two groups was evaluated by student “t” test. P value less than 0.05

was taken as significant. Statistical Package for Social Sciences (SPSS) Version 16 was used for analysis of data.

RESULTS

Eighty placentae were studied in this study and these were divided into two equal groups. Group A included the placenta of study group and group B had placentae of control group.

Gross features of placentae are described in **Table I**. The shape of placentae was oval to round in both groups. The diameter, surface area and weight of placentae from Group A (cases) were significantly less from Group B (controls), whereas statistically no significant difference was observed in number of cotyledons and central thickness in both groups. Most of the placentae had central attachment in both groups. The microscopic features including syncytial knots, chorionic villi with excessive collagen and thickness of basement membrane of trophoblast were compared between two groups and the results are shown in **Table II**. The mean number of knots in study group was significantly higher than that in control group.

The mean number of chorionic villi with excessive collagen was significantly higher in study group as compared to the control. Subtrophoblastic basement membrane thickness was higher in placentae of study group as compared to that of in the control group; however, the difference was statistically insignificant.

The mean weight of neonate in study group was significantly less as compared to the neonates of control group. However, there was no significant difference in the mean APGAR score of two groups (**Table III**).

TABLE I: THE COMPARISON OF GROSS FEATURES OF PLACENTA

Variable	Cases (n=40)	Controls (n=40)	P value
Diameter (cm) mean±SD	15.82 ± 0.92	16.39 ± 1.14	< 0.05
Surface area (cm ²) mean±SD	179.93 ± 38.45	269.32 ± 15.87	< 0.01
Weight (gm) mean±SD	307.12 ± 49.13	520.31± 39.02	< 0.01
Cotyledons number mean±SD	16.92 ± 0.91	17.10 ± 0.98	> 0.05
Central thickness (cm) mean±SD	2.04 ± 0.22	2.11 ± 0.31	> 0.05

TABLE II: COMPARISON OF MICROSCOPIC FEATURES OF PLACENTA

Variable	Cases (n=40)	Controls (n=40)	P value
Syncytial knots/0.0625mm ² (mean±SD)	7.5±1.2	6.7±1.4	< 0.05
Chorionic villi excessive collagen /0.0625mm ² (mean±SD)	4.83 ± 2.27	3.80 ± 1.50	< 0.05

TABLE III: THE COMPARISON OF WEIGHT & APGAR SCORE OF NEWBORN

Variable	Cases A (n=40)	Controls B (n=40)	P value
Weight (kg) mean±SD	2.50±0.28	2.92 ± 0.10	< 0.01
Apgar score (5minutes) mean±SD	6.10±0.70	6.23 ± 0.80	> 0.05

DISCUSSION

Present study was carried out to compare the placentae from hypertension associated pregnancies and normal pregnancies. We found significant differences between various parameters of placental morphology and histology between the two groups.

This study reveals that weight and surface area of placenta in study group were lower than the control group. These findings are in agreement with the other studies conducted by various other researchers⁸⁻¹⁰. The number of cotyledons and central thickness of placenta in centimeters was almost same in the both groups with no significant difference. These findings are similar to findings in other studies¹¹⁻¹³.

Various authors have reported increase in the incidence of marginal insertion of the umbilical cord and areas of infarction in the placenta of hypertensive females but in this study no significant difference was observed in any of the two groups in this regard^{9,13-15}. Site of insertion of umbilical cord is genetically and racially determined, Hypertension in pregnancy causes placental hypoxia leading to loss of large number of parenchymal cells, which causes appearance of syncytial knots and synthesis of fibrous tissue in their place. This fibrous tissue is synthesized by fibroblasts of stroma, which are also responsible for subtrophoblastic basement membrane thickness^{7,16}.

The histology of placenta of hypertensive mothers in this study also showed significant increase in syncytial knots formation, chorionic villi with relatively excessive

collagen and subtrophoblastic basement membrane thickness in comparison to the control group. Identical finding has also been reported by other series on the subject^{8,15,17}.

Hypertension in pregnancy is one of the major cause of maternal and fetal morbidity and mortality¹⁸. In developing as well as in developed countries the impact of hypertension in pregnancy is heavy, primarily on the fetus and it results in low birth weights and decreased APGAR score¹⁹.

We found the lower birth weights in infants of mothers who had hypertensive disorders during pregnancy; this is in agreement with other studies^{16,20,21}.

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