



COMPARATIVE STUDY OF HISTOPATHOLOGICAL CHANGES IN PLACENTA IN NORMAL AND HYPERTENSIVE PREGNANCY

Pathology

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ABSTRACT

Background: Maternal and fetal status are reflected in placenta. The pathophysiology of human placenta is closely associated with both maternal status and fetal development. Hence study of placenta gives information on the in-utero fetal condition. **Objectives:** The present study aims at comparing gross and histopathological changes in placenta in pregnancy with hypertension to that of placenta of uncomplicated pregnancy. **Methods:** A total of 110 placentae, 55 each from hypertensive and normotensive groups were included in this study conducted in Muzaffarnagar Medical College, Muzaffarnagar from January 2021 to June 2022. **Results:** Microscopic examination revealed significant microscopic changes in placentae of hypertensive group as compared to controls which were increased syncytial knots, fibrinoid necrosis, villous stromal fibrosis, calcification, infarction and acute chorioamnionitis. Grade III syncytial knots were seen in majority of hypertensive group (65.5%) as compared to control group (1.8%), which was statistically significant. Fibrinoid necrosis of grade II was 96.4% in hypertensive group. **Conclusion:** Hypertensive disorders of pregnancy cause many adverse macroscopic and microscopic changes in placenta which may increase with the severity of the disease. Study of placenta in hypertensive disorders of pregnancy serves as valuable diagnostic tool to understand and explain the pathophysiology of the condition affecting the mother and child.

KEYWORDS

Histology, Hypertensive pregnancies, Microscopic examination, Placenta, Pre-eclampsia

INTRODUCTION:

Placenta is attached to the uterine wall and represents the only point of contact between maternal and fetal tissues through the umbilical cord. It mirrors the intrauterine status of the fetus. Placental perfusion is maintained by two different cardiovascular systems i.e. maternal blood flow and fetal circulation.

Therefore, the pathophysiology of placenta is closely associated with both maternal status and fetal development.^[1,2]

Chronic hypertension is responsible for only 30% of the hypertensive disorders during pregnancy and about 70% of cases were enlisted as gestational hypertension, pre-eclampsia and eclampsia.^[3] Pregnancies complicated with pre-eclampsia have a high incidence of pre-term delivery, fetal growth restrictions, low birth weight, placental abruptions, cesarean delivery, cerebral edema, renal failure, thrombocytopenia and an intra-vascular coagulation.^[4]

Gross pathological changes are commonly seen in placentae of severe preeclampsia. Histological findings like syncytial knot formation, fibrinoid deposition, calcification etc. have been observed in greater amount in hypertensive placentae.^[5]

Study of placenta in hypertensive disorders of pregnancy serves as valuable diagnostic tool to understand and explain the pathophysiology of the condition affecting the mother and child.

This research work has been conducted with the objectives to study the morphological and histological variations of human placenta in hypertensive disorders of pregnancy and to compare the findings of the study with those of normal pregnancies.

MATERIAL AND METHOD

Study Design:

The present study was a Hospital based prospective study done by Simple Random Sampling in the Department of Pathology, Muzaffarnagar Medical College in close association with the Department of Obstetrics and Gynecology at our hospital during January 2021 to June 2022

Inclusion Criteria:

Placentae of cases of normal pregnancies & those complicated by hypertensive disorders of pregnancy were included in the study. The placenta received from the Department of Obstetrics and Gynecology was divided into two groups.

Group A: Pregnancy with Hypertension (cases): Placenta of mothers (with B.P. > 140/90 mmHg after 20 weeks of gestation, with/without edema, and/or proteinuria, and/or convulsion)

Group B: Normal Pregnancy (control): Placenta of uncomplicated term pregnancies with with normal blood pressure during gestation

Exclusion Criteria:

The placentae of pregnancies with hypertension before pregnancy or during first 20 weeks of gestation were excluded.

Statistical Data Analysis & Software:

The p value < .05 using chi-square test will be considered for statistical analysis. Statistical analysis using SPSS17/20 Statcal2 software will be done.

Procedure Of The Study

After 24-48hrs of fixation in formalin, gross examination of the placentae for presence of any infarction, calcification and retro placental clots was done. For microscopic examination, sections were stained with haematoxylin and eosin stain. Slides were studied under the compound microscope for study of Placental villi, size of villi, syncytial knot formation, fibrinoid necrosis, Stromal pathology, stromal fibrosis, calcification, and intervillous hemorrhage.

RESULTS

Total of 110 placentae were studied, Out of 55 hypertensive pregnancies, majority of placentae were from mothers of pre-eclampsia (58.2%) followed by gestational hypertension (32.7%). Least number of hypertensive mothers was 9.1%.

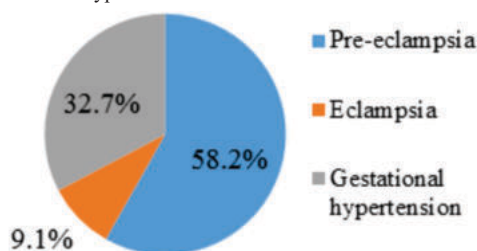


Image1: Pie chart showing distribution of cases in hypertensive group.

Majority of mothers in both hypertensive (63.6%) and control group (54.5%) belonged to primigravida. While mothers were multigravida

in hypertensive and control group in 36.4% and 45.5 % respectively. p value using chi-square test performed to examine the relation between blood pressure and gravida status. The relation between these independent variables was statistically not significant.

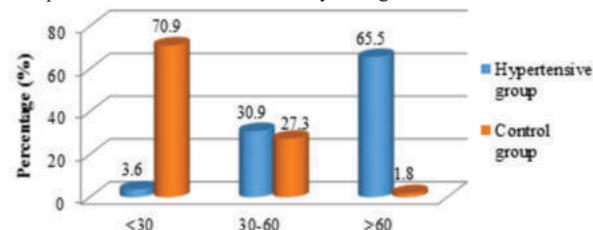


Image 2 : Histogram showing distribution of Syncytial Knots per 100 villi in both groups

Syncytial knots were identified and categorized into three grades depending on the number of syncytial knots per 100 villi in cases and control group.

Thirty nine cases (70.9%) of grade I syncytial knots were seen in control group while only 2 cases (3.6%) in hypertensive group. Hypertensive group showed 17 cases (30.9%) of grade 2 syncytial knots as compared to 15 cases (27.3%) of control group. Grade III syncytial knots were seen in majority of hypertensive group (65.5%) as compared to control group (1.8%) p value using chi-square test was performed to detect relation between blood pressure and syncytial knots per 100 villi. The relation between these variables was statistically significant. [p < .05]

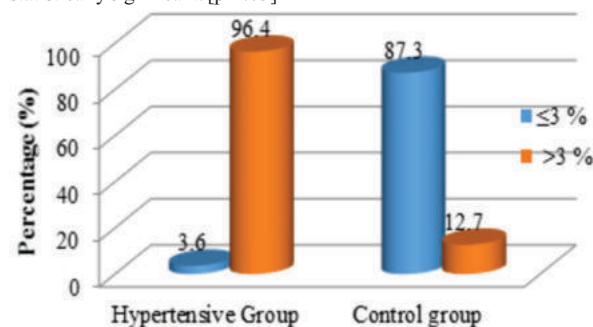


Image 3: Histogram depicting distribution of percentage of villi showing fibrinoid necrosis.

Fibrinoid necrosis was identified and categorized into two grades depending on the number of villi showing fibrinoid necrosis in cases and control group. Fibrinoid necrosis of grade II was more in 53 (96.4%) placentae of the hypertensive group than 7 (12.7%) placentae of control group. But fibrinoid necrosis of grade I was higher in 48 (87.3%) placentae of control group than placentae of hypertensive group (2 cases, 3.6%).

p value using chi-square test was calculated to know the relation between blood pressure and fibrinoid necrosis. The relation between these variables was statistically significant. [p < .05]

Table 1: Distribution of other microscopic features in hypertensive and control group

Microscopic Features	Hypertensive group (n =55)		Control group (n =55)		P value
	No.	%	No.	%	
Calcification	38	69.1	28	50.9	p = .52
Infarction	12	21.8	3	5.5	p = .012
Stromal fibrosis	23	41.8	2	3.6	p < .00001
Acute Chorioamnionitis	10	18.2	1	1.8	p = .004

DISCUSSION:

Mothers in hypertensive group delivering preterm were 61.8% while that in control group were 32.7%. It showed that mothers with hypertensive pregnancy delivered preterm in majority of cases. This was in agreement with research conducted by CR Gore et al. [6]

In contrast to findings of current study, Moldenhauer et al. [7] (2003) found in their study that cases in hypertensive group (60.1%) delivering preterm were less than the control group (66.7%).

Syncytial Knots:

In the present study >60 syncytial knots per 100 villi (grade III) were seen in 65.5% hypertensive placentae as compared to control placentae (1.8%). There was statistically significant difference between syncytial knots and hypertensive group. (p < .05) Similar findings were observed in studies conducted by Samala R et al 2017, Narasimha et al 2011, Mehendale et al 1988 and CR Gore et al 2018. [8,9,10,6]

Fibrinoid Necrosis:

Placentae in which fibrinoid necrosis involving up to three percent of placental villi is considered as normal and placentae in which the percentage of villi showing fibrinoid necrosis of greater than three is considered as abnormal. Fibrinoid necrosis has been considered as a hallmark of immunological reaction within the trophoblastic tissue. In the present study, more than three percent placental villi showing fibrinoid necrosis (grade II) in hypertensive placenta were 96.4% compared to 12.7% in control placenta. This showed percentage of placental villi exhibiting fibrinoid necrosis was more in hypertensive placentae as compared to that of control. [11]

In present study, mothers delivering beyond 37 weeks of gestation in hypertensive and control group were 38.2% and 67.3% respectively. Similar results were obtained by Agrawal P. et al 2018, Jena M et al 2015, Navbir et al 2012, Narasimha et al, 2011. [12,13,9,15]

Acute Chorioamnionitis:

In the present study acute chorioamnionitis was seen in 18.2% hypertensive group and 1.8% of control group. Moldenhauer et al [7] (32.7%) and Mehendale et al [10] (12.5%) also observed acute chorioamnionitis to be higher in placenta of hypertensive group as compared to control group.

CONCLUSION

Study of placenta in hypertensive disorders of pregnancy serves as valuable diagnostic tool to understand and explain the pathophysiology of the condition affecting the mother and child. Hypertensive disorders of pregnancy cause many adverse macroscopic and microscopic changes in placenta which may increase with the severity of the disease. Further studies may be required in different settings with larger sample size. More precise intervention strategies may be devised that can contribute to more effective management of the condition in the future. It will help to bring down the fetal and maternal mortality and morbidity.



Image 4 : Gross photograph of placenta showing maternal surface of placenta with cotyledons

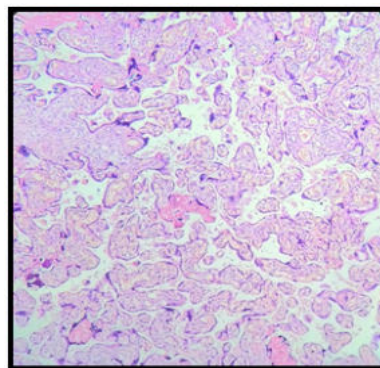


Image 5 : Showing increased syncytial knots (grade II) (H&E, 40X)

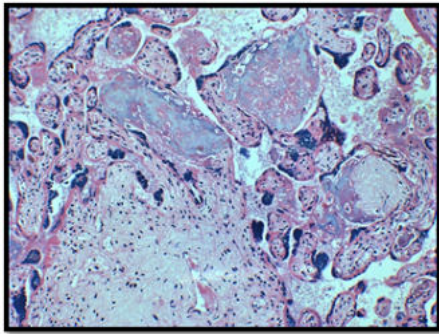


Image 6: H&E stained section showing increased syncytial knots (grade III) (H&E, 200X)

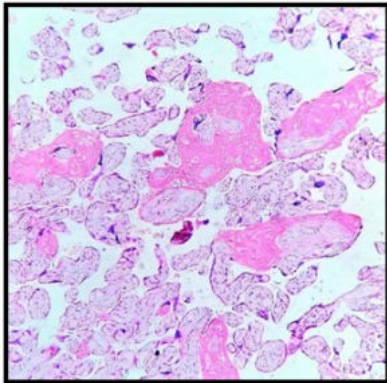


Image 7: Showing fibrinoid necrosis (grade II) (H&E, 40X)

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