Original Research Paper

Volume-9 | Issue-8 | August - 2019 | PRINT ISSN No. 2249 - 555X

Obstetrics & Gynaecology

CORRELATION OF HISTOPATHOLOGICAL CHANGES IN PLACENTA IN HYPERTENSIVE DISORDERS OF PREGNANCY WITH PERINATAL OUTCOME

Dr. Mohini Paul Head of Unit, Senior Specialist, Kasturba Hospital.

Dr. Anam Ghani* Resident Doctor, Kasturba Hospital *Corresponding Author

ABSTRACT HDP are known to complicate up to 10% of gestations and have become a major public health issue. The study was conducted in Kasturba Hospital in the Department of Obstetrics and Gynaecology, Delhi. The study consisted of 100 antenatal patients, 50 were normotensive (control) and 50 diagnosed with hypertensive disorders of pregnancy (cases). The term placenta were collected after delivery and examined for gross and histopathological changes. The findings were correlated with perinatal outcomes. The main gross features noted were calcification and infarction and main histopathological features were fibrinoid necrosis, increased BM thickening, increased syncytial knotting, and stromal calcification. The increased incidence of these findings in HDP was found to be associated with adverse perinatal outcomes.

KEYWORDS : pregnancy induced hypertension, placenta, perinatal outcomes

INTRODUCTION:

Hypertensive disorders of pregnancy complicate about 10% of pregnancies and account for a significant amount of maternal and perinatal mortality and morbidity and have now become one of the major public health issues.[3-4]However, their etiology remains uncertain thereby limiting effective intervention for these disorders. Many factors like abnormal trophoblastic invasion of the spiral arterioles, immunological maladaptive tolerance between maternal, paternal (placental), and fetal tissues, Maternal maladaptation to cardiovascular or inflammatory changes of normal pregnancy, genetic factors including inherited predisposing genes and epigenetic influences have been known to be etiological factors in development of hypertension.

The placenta is a highly specialized organ of pregnancy which functions both as a unique agent of human symbiosis and as the fetal renal, respiratory, hepatic, gastrointestinal, endocrine and immune system, allowing exchange of gases, nutrients and waste products. It can be called as "the diary of intrauterine life of the fetus" as it forms the morphological record of anatomical condition, intrauterine events and intrapartum events of gestation.[5] The main functional units of the placenta, the chorionic villi,[6] in some women incite vasospasm and lead to hypertension.[7] Pregnancy complications like hypertension are reflected in placenta in a significant way both macro and microscopically and are usually a reflection of the decreased blood flow that occurs due to vasospasm.

The abnormalities reported in placenta are calcification, infarction, retroplacental haemorrhage, stromal calcification, fibrinoid necrosis, increased syncytial knotting, and increased basement membrane thickening. Thus, examination of the placenta can give an insight on the in utero conditions of the fetus and correlation of these placental findings with the perinatal outcomes can help in better understanding of the disease and implementation of better surveillance methods and so it was proposed to undertake a detailed study of placenta in HDP and correlate the findings with perinatal outcome.

MATERIALS AND METHODS:

The study was conducted in age and parity matched cases (diagnosed with hypertension) and controls (normotensive)

Inclusion criteria:

Patients presenting to Kasturba Hospital, 18-35 years of age with singleton pregnancy diagnosed with hypertensive disorder of pregnancy as having blood pressure ≥140/90 mm of hg with or without proteinuria after 20 weeks of gestation. [ACOG2013][8]

Exclusion criteria:

- Age <18yrs,>35years
- History of leaking per vaginum /premature rupture of membranes
- Multiple pregnancy
- Patient on medication for any other disease like hypothyroidism, diabetes etc.

All selected patients were followed up for maternal outcomes during labour, delivery and post-partum.

Fetal outcome was analysed by recording APGAR score at 1 minute of delivery, birth weight, need for NICU admission, neonatal infection, gross congenital anomaly or any other neonatal complications.

The placenta were collected immediately after delivery from labour rooms or operation theatres and observed for any gross abnormalities. Next they were dipped in 10% formalin for 5 days. Sections were taken from umbilical cord and from 12, 3, 6 and 9' o clock position at margins. The slides were prepared with haematoxylin and eosin stain. The following criteria were selected to identify the pathologic features reported in the placenta:

1. Fibrinoid necrosis: >3% villi in one field
2. Increased syncytial knots: >30% villi in one field
3. Thickening of basement membrane: >3% villi in one field
4. Stromal calcification: >5% villi in one field

OBSERVATIONS AND RESULTS:

40 % of cases and 20 % of controls showed various gross abnormalities like: calcification, infarction and haemorrhage, of which amongst the hypertensives, calcification was noted most frequently (15) followed by infarction (8) and retroplacental clots (6). Of the cases, 4 placentae showed both calcification and infarction. 3 showed both infarction and calcification while 1 showed both retroplacental haemorrhage and infarction.1 placenta in cases had all the three abnormalities i.e. calcification, infarction and retroplacental haemorrhage.

Table 1: Histopathological findings in placenta:

Histopathological Findings	Case (50)	Control (50)	P value
Syncytial knots			
Increased	36(72%)	9(18%)	<0.001
Normal	14(28%)	41(82%)	
Fibrinoid necrosis			
Present	26(52%)	3(6%)	<0.001
Absent	24(48%)	47(94%)	
Stromal calcification			
Present	23(46%)	6(12%)	<0.001
Absent	27(54%)	44(88%)	
Basement membrane thickening			
Present	27(54%)	0(0%)	<0.001
Absent	23(46%)	50(100%)	

P < 0.05 considered significant

Placental histopathological findings and their correlation with perinatal outcomes:

Increased syncytial knots: syncytial knots are focal aggregates of syncytial nuclei forming multinucleated protrusion from the villous surface. SK density is said to be increased if syncytial knots are seen in

>30% villi in one field. In our study, incidence of increased syncytial knots as 72% in hypertensives which was significantly higher than 18% in normotensives (P<0.05). The mean birth weight amongst cases showing increased syncytial knots was 2.43±0.25kgs which was significantly lower than mean birth weight amongst cases without increased syncytial knots, 2.81±0.34 kg (P<0.05). Of the 15 babies requiring NICU admission, 14 had showed increased syncytial knotting in placenta which was significantly higher as only 1 baby that required NICU admission did not have increased syncytial knotting (P=0.01). Amongst the 8 babies that developed neonatal complications, 7 showed increased syncytial knotting in placenta (P=0.40) and 4 were IUD.

Fibrinoid necrosis: is a special form of necrosis with deposition of "fibrinoid", a non cellular, eosinophilic, homogenous material deposited in subtrophoblastic space that finally occupies the whole villous stroma. The incidence of fibrinoid necrosis in cases was 52% which was significantly higher than in controls 6% (P<0.05). The mean birth weight amongst cases with placental fibrinoid necrosis was 2.41±0.26 kg which was significantly lower than mean birth weight amongst cases without in whom it was 2.67±0.34 kg (P<0.05). The mean APGAR score amongst babies with placental fibrinoid necrosis was 7.43±2.01 which was lower as compared to mean APGAR score amongst cases without placental fibrinoid necrosis 7.96±1.82. However, the difference was not statistically significant (P<0.35). Amongst the 15 babies requiring NICU admission, 11 babies had fibrinoid necrosis in placenta while 4 did not. This difference was statistically significant. (P=0.02). Of 8 babies having neonatal complications, 6 had placental fibrinoid necrosis while 2 babies with neonatal complications did not have fibrinoid necrosis. (P=0.24)

Stromal calcification: is the presence of foci of calcifications in stroma of tertiary villi and is seen as fine punctate basophilic granules. The incidence of stromal calcification was 46% in hypertensives which was significantly higher than in controls 12%. The mean birth weight and APGAR score at 1 min amongst cases with placental stromal calcification was 2.40±0.28 kg and 6.95±2.13 respectively which was significantly lower as compared to mean birth weight amongst cases without placental Stromal calcification in whom it was 2.65±0.32 kg and 8.27±1.53 respectively (P<0.05). In cases with stromal calcification, 11 babies required NICU admission while 4 babies without placental stromal calcification required NICU admission, thus rate of NICU admission was significantly higher in cases with stromal calcification. (P<0.05).7 babies had neonatal complications in whom the placenta showed stromal calcification and it was statistically significant (P=0.01).

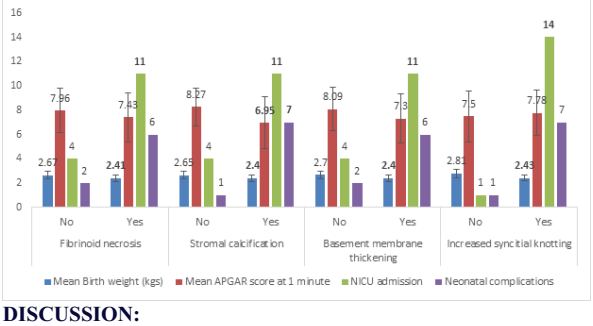
Basement membrane thickening: is the result of hyperplasia of cells of the cytotrophoblast leading to excessive secretion of basement membrane proteins. The incidence of basement membrane thickening in cases was 54% which was significantly higher than controls (P<0.05). The mean birth weight amongst cases with increased BM thickening in placenta was significantly lower: 2.40±0.27 kg as compared to those without: 2.7±0.32 (P<0.05). The mean APGAR score amongst babies with increased BM thickening in placenta was 7.3±2.01 which was lower as compared to those without in whom it was 8.09±1.78. 11 babies with placenta showing increased BM thickening required NICU admission which was statistically significant and 6 babies with increased BM thickening in placenta had neonatal complications like MAS and RD at birth (P=0.24).

Table 2: Correlation of histopathological features with perinatal outcomes:

Histopath findings	Mean Birth weight (kg)		Mean APGAR score at 1 minute		NICU admission		Neonatal complications	
	no	Yes	no	yes	no	yes	no	yes
Fibrinoid necrosis	2.67±0.34	2.41±0.26*	7.96±1.82	7.43±2.01	4	11*	2	6
Stromal calcification	2.65±0.32	2.40±0.28*	8.27±1.53	6.95±2.13*	4	11*	1	7*
Basement membrane thickening	2.7±0.32	2.40±0.27*	8.09±1.78	7.3±2.01	4	11*	2	6
Increased syncytial knotting	2.81±0.34	2.43±0.25*	7.50±2.10	7.78±1.86	1	14*	1	7

P value <0.05 is significant(*)

Table 2: Correlation of histopathological features with perinatal outcomes:



DISCUSSION:

In the present study, it was observed that the characteristic features on histopathological examination in placenta of Hypertensive mothers was presence of fibrinoid necrosis, increased syncytial knotting, increased basement membrane thickening and stromal calcification which were associated with adverse perinatal outcomes.

Kurdukar MD et al (2007)[9] reported that in eclampsia cases with fibrinoid necrosis, 100% had LBW babies, 100% cases had low APGAR score, and 40% fetal loss though no statistical significance was seen amongst fibrinoid necrosis, LBW and low APGAR score by them. **Vijayalakshmi B et al (2015)**[10] observed statistically significant association between fibrinoid necrosis and NICU admissions. It is believed that increased deposition of fibrin material in the terminal villi leads to decreased feto-placental transfer of oxygen and nutrients leading to intrauterine fetal compromise and adverse perinatal outcomes. The present study shows a significant association between fibrinoid necrosis and adverse perinatal outcome in terms of low birth weight, increased NICU admission and neonatal complications.

In the present study, placental stromal calcification was seen in 46% of cases with HDP and a significantly lower birth weight and low APGAR score at 1 minute was observed in patients with stromal calcification. Calcification occurs in normal pregnancy as well as it is an indicator of ageing of the placenta but increased deposition of calcium in HDP placentae suggests an increase in the calcium content which may be due to premature placental ageing leading to increased deposition over the course of time. And this could be responsible for LBW babies and neonatal asphyxia in babies of mothers with Hypertension.

Avasthi K et al (1991)[11] and **Kurdukar md et al (2007)**[9] found an increased basement membrane thickening in hypertensive cases to be associated with low APGAR scores and low birth weights. **Navbir P et al (2012)**[7] observed that in 70% cases with basement membrane thickening, 5 cases (23.81%) had low birth weight babies and 14.29% had APGAR < 7 at birth. The basement membrane thickening occurs secondary to placental ischaemia and is due to excess proliferation of cytotrophoblast as a compensatory mechanism and secretion of basement membrane material. This excess deposition leads to a decreased feto-maternal exchange leading to FGR and LBW babies and adverse perinatal outcomes.

Syncytial knots count was found to be significantly increased amongst placentae of hypertensive mothers. **Kambale T et al(2016)**[12] **and Kurdukar MD et al(2007)**[9] reported similar findings as the present study of birth weight and the APGAR score at 1 min being lower amongst cases with hypertension . **Vijayalakshmi B et al(2015)**[10] reported that of 66.67% of cases with increased syncytial knots , 18.75% had APGAR < 7 (neonatal asphyxia) and 35% had low birth weight babies. Some theories suggest syncytial knots are a manifestation of syncytial degeneration, and thus, excess syncytial knots signify an accelerated placental maturation indicating a decline in its function which further leads to adverse perinatal outcomes.

CONCLUSION:

Thus from the present study it can be concluded that most of the placental changes observed on histopathology are a consequence of placental ischaemia which occurs due to reduced maternal blood flow. The adverse outcomes that affect the fetus are mainly due to decreased maternal blood supply resulting in decreased oxygen and nutrition supply.

REFERENCES

1. Lai, C., Coulter, S. A., & Woodruff, A. (2017). Hypertension and pregnancy. Texas Heart Institute Journal, 44(5), 350-351.
2. Magee, L. A., Helewa, M., Moutquin, J. M., Von Dadelszen, P., & Hypertension Guideline Committee. (2008). Diagnosis, evaluation, and management of the hypertensive disorders of pregnancy. Journal of Obstetrics and Gynaecology Canada, 30(3 Supplement 1), S1-48.
3. Chen, X. K., Wen, S. W., Smith, G., Yang, Q., & Walker, M. (2006). General obstetrics: Pregnancy-induced hypertension is associated with lower infant mortality in preterm singletons. BJOG: An International Journal of Obstetrics & Gynaecology, 113(5), 544-551.
4. Brown, M. A., Hague, W. M., Higgins, J., Lowe, S., McCowan, L., Oats, J., ... & Walters, B. N. J. (2000). The detection, investigation and management of hypertension in pregnancy: full consensus statement. Australian and New Zealand Journal of Obstetrics and Gynaecology, 40(2), 139-155.
5. Stocker j, Dehner, Hussain A. Stocker and Dehner's paediatric pathology.
6. Gude, N. M., Roberts, C. T., Kalionis, B., & King, R. G. (2004). Growth and function of the normal human placenta. Thrombosis research, 114(5-6), 397-407.
7. Navbir, P., Alka, N. A. G. A. R., & Antima, G. (2012). Histological changes in placentae in pregnancies complicated by pre-eclampsia and eclampsia and corelation with foetal outcome. Int J Pharm Bio Sci, 3(2), 551-560.
8. American College of Obstetricians and Gynecologists. (2013). Hypertension in pregnancy. Report of the American College of Obstetricians and Gynecologists' task force on hypertension in pregnancy. Obstetrics and gynecology, 122(5), 1122.
9. Kurdukar, M. D., Deshpande, N. M., Shete, S. S., & Zawar, M. P. (2007). Placenta in PIH. Indian journal of pathology & microbiology, 50(3), 493-497.
10. Vijayalakshmi, B., & Kitteli, S. (2015). A study of histopathological changes of placenta in pre eclampsia and perinatal outcome. Journal of Evolution of Medical and Dental Sciences, 4(67), 11667-11674.
11. Avasthi, K., & Micha, U. (1991). Histopathology of placenta and its correlation with fetal outcome. J Obstet Gynecol Ind, 41, 317.
12. Kambale, T., Iqbal, B., Ramraje, S., Swaimul, K., & Salve, S. (2016). Placental morphology and fetal implications in pregnancies complicated by pregnancy-induced hypertension. Medical Journal of Dr. DY Patil University, 9(3), 341.