

COMPARATIVE STUDY OF PLACENTAL CHANGES IN MILD AND SEVERE HYPERTENSIVE DISORDERS OF PREGNANCY

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ABSTRACT

BACKGROUND

The present study is undertaken to analyse placental changes in the mild and severe hypertensive disorders of pregnancy with a view to assess the significance of placental changes, which may serve as a guide to the severity of disease and complications.

The aims of this study are:

1. To study histopathology of the placenta in cases of mild and severe hypertensive diseases of pregnancy.
2. To correlate the pathological changes in the placenta with severity of hypertension.
3. To study spectrum of features in placenta that could be responsible for the manifestation of complications of pregnancy.

MATERIALS AND METHODS

100 cases of women with hypertensive disorders complicating pregnancy including gestational hypertension, preeclampsia, eclampsia, preeclampsia superimposed on chronic hypertension and chronic hypertension are taken. Retrospective hospital based study of 100 cases over a period of one year from January 2015 to 2016 in RIMS, Srikakulam (AP).

RESULTS

In the present study, the mean placental diameter was found to be decreased in severe hypertensive group than the mild group. In the present study, calcification were associated with severity of hypertension and retroplacental haematomas were more with severity of hypertension in pregnancy. The mean placental diameter was found to be decreased in severe hypertensive group than the mild group. Calcification were associated with severity of hypertension and retroplacental haematomas or more with severity of hypertension in pregnancy. The infarctions were more with severe group of hypertension.

CONCLUSION

From the present study, it can be concluded that hypertensive disorders complicating pregnancy adversely influence the morphology of placenta, more so in severe hypertensive cases than in mild hypertensive cases.

KEYWORDS

Comparative Study, Placental Changes, Mild and Severe Hypertension in Pregnancy.

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BACKGROUND

Hypertensive disorders in pregnancy are common and form a deadly triad along with haemorrhage and infection that contributes to maternal mortality and morbidity. Their incidence in pregnancy is 5% - 10%.¹ Women in developing countries are seven times more likely to develop preeclampsia than women in developed countries.² The maternal mortality rate (MMR) in India is 178 per one lakh live births.³ Hypertensive disorders of pregnancy are strongly associated with both maternal and foetal complications.

Placenta is a vital organ maintaining pregnancy and promoting foetal development, which functions as to help developing foetus to derive its nutritional substances and obtain its metabolic and immunological requirements.⁴

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The aetiology and pathological mechanism in the development of hypertensive disorders of pregnancy is still controversial. However, it is generally accepted that the placenta is the key organ in pathogenesis of the disease and important mechanism involved in defective remodeling of spiral arteries that could contribute to the hypoxic environment and thereby placental insufficiency which can lead to the maternal and foetal complications.^{5,6}

The maternal and foetal complications in hypertensive disorders complicating pregnancy are associated with significant pathological changes in the placenta depending on severity of hypertension, whether it is mild or severe hypertensive disorder complicating pregnancy.⁷ Placental examination will help in understanding the specific aetiologies of adverse outcome, which will lead to specific preventive and treatment measures for those with the risk for recurrence in subsequent pregnancies and long-term sequelae in hypertensive disorders of pregnancy.

The present study is undertaken to analyse placental changes in the mild and severe hypertensive disorders of pregnancy with a view to assess the significance of placental changes, which may serve as a guide to severity of disease and complications.

Aims and Objectives of the Study

1. To study histopathology of the placenta in cases of mild and severe hypertensive diseases of pregnancy.
2. To correlate the pathological changes in the placenta with severity of hypertension.
3. To study spectrum of features in placenta that could be responsible for the manifestations of complications of pregnancy.

MATERIALS AND METHODS

1. Study Design: Hospital based prospective study.
2. Source of Data: Pregnant women with hypertensive disorders in the Department of Obstetrics and Gynaecology in RIMS Medical College, Srikakulam.

Selection Criteria

1. Gestational hypertension.
2. Preeclampsia.
3. Eclampsia.
4. Preeclampsia superimposed on chronic hypertension.
5. Chronic hypertension.
6. Singleton pregnancy.

Exclusion Criteria

1. Antenatal women with molar pregnancy.
2. Antenatal women with multiple pregnancies.

A detailed history has been taken regarding the symptoms of hypertensive disorders complicating pregnancy at the time of admission. A detailed menstrual history, relevant past, obstetric history, significant past medical history, history of previous surgeries, relevant personal and family history related to hypertensive disorders complicating pregnancy is taken. A thorough general and physical examination including body mass index, pulse rate, temperature, blood pressure and respiratory rate were noted.

Study Population and Method

100 cases of women with hypertensive disorders complicating pregnancy including gestational hypertension, preeclampsia, eclampsia, preeclampsia superimposed on chronic hypertension and chronic hypertension are taken.

The data was collected regarding placental changes in mild and severe hypertensive disorders in pregnancy during a period of 2016 to 2017 from OBG Dept. RIMS, Srikakulam.

Statistical Analysis

Data were collected, processed and examination results were analysed with the help of Chi-square test and association of the placental lesions with severity of hypertension were noted. Statistical analysis was done using SPSS.

Software Version 20.0

Method of Blood Pressure Measurement

BP measurements were obtained by a mercury sphygmomanometer in all subjects, three consecutive times with a gap of five minutes. BP was measured with a woman in sitting position with the arm at the level of the heart with an appropriately sized cuff.

Korotkoff phase five was used to designate diastolic blood pressure.

In cases where BP is consistently higher in one arm, the arm with the higher values was taken for all BP measurements.

The mean of three systolic values and the mean of three diastolic values of same patient were taken as the mean systolic blood pressure (SBP) and the mean diastolic blood pressure (DBP) respectively.

Definition of Mild and Severe Hypertension

1. Mild hypertension > 140/90 mmHg to < 160/110 mmHg.
2. Severe hypertension > 160/110 mmHg.

Detailed systemic examination including cardiovascular system, central nervous system, respiratory system and obstetrical examination were performed after thorough examination. Following investigations were sent for laboratory investigations-

1. Hb%.
2. PCV.
3. RBS.
4. Blood grouping and Rh typing.
5. Platelet count.
6. Bleeding time clotting time.
7. Serum uric acid.
8. Liver function tests.
9. Renal function tests, serum creatinine and blood urea.
10. Urine albumin, sugar, microscopy.
11. Fundoscopy.
12. Obstetric ultrasonography.

In the present study, 50 cases of mild and 50 cases of severe hypertension complicating pregnancy were taken and followed till delivery. The placentae were collected immediately after delivery in a clean tray, washed under tap water. Placental weight, thickness and diameter were measured. Maternal and foetal surfaces, membranes and umbilical cord were examined and any abnormalities were noted. Then the placenta was sent to the laboratory in a container with 10% formalin solution for examination and processing.

In the pathology laboratory sections were taken from the following sites: Umbilical cord, insertion of umbilical cord, membranes, sections from four different quadrants of the placenta and from any gross lesion. Processing was done and microscopic slides were prepared and stained with haematoxylin and eosin and studied under microscope.

The following Parameters were Stained-

1. Weight.
2. Diameter.
3. Thickness.
4. Maternal surfaces.
5. Foetal surfaces.
6. No. of cotyledons.
7. Cord anomalies.
8. Calcifications.
9. Infarction.
10. Retroplacental haematoma.

Microscopic Changes and Features like the following were also Studied-

1. Tenney-Parker changes.
2. Villous hypermaturity.
3. Avascular villi.
4. Fibril deposition.
5. Calcifications.
6. Infarction.
7. Retroplacental haematoma.

At the time of delivery, foetal condition including Apgar score at 1 minute and 5 minutes and baby birth weight was noted. Babies with NICU admission were followed and outcome noted. Gross and microscopic placental changes in the mild and severe cases of hypertension were studied with the help of pathologist and compared along with foetal outcome. Examination results were analysed with the help of Chi-square test and association of the placental lesions with severity of hypertension were noted.

RESULTS

In the present study, out of total 100 cases pre-eclampsia was seen in 82%, gestational hypertension in 7%, superimposed pre-eclampsia in 4%, eclampsia in 6% and chronic hypertension in 1% were noted. Comparing both mild and severe hypertension cases gestational hypertension cases were present only in mild hypertensive cases, preeclampsia cases were almost same in both mild and severe hypertensive group. Superimposed pre-eclampsia was seen only in severe hypertensive group and chronic HTN cases were present in mild HTN group; 6% cases of eclampsia had severe HTN.

In the present study of 100 cases with 50 mild and 50 severe cases, total 61 cases of primi gravida and 39 cases of multi gravida are present. In primi gravida, 31 belonged to mild group and 30 belonged to severe group. In multi 19 cases were in mild group and 20 cases were in severe group.

In the present study, the mean systolic blood pressure of 145 mmHg was seen in mild cases and 173 mmHg was seen in severe group. The mean diastolic blood pressure in mild and severe groups were 98 mmHg and 113 mmHg respectively.

In the present study, out of 100 cases of both mild and severe hypertension, proteinuria was found in 92% of cases including mild and severe cases.

In the present study, the gestational age at the time of delivery was recorded. It was observed that overall incidence of preterm deliveries was significantly higher in severe hypertensive group when compared to mild group.

In the present study, out of 100 cases 72 women had induced onset of labour, whereas only 23% cases went into spontaneous labour.

In the present study out of 100 cases, 56% delivered through vaginal route. Out of 56 cases, 30 cases were with mild and 26 cases were with severe HTN delivered through vaginal route. The instrumental delivery rate was 8%. Caesarean section rate was 36% including both mild and severe cases.

In the present study, of total 100 cases 11% had LBW babies (< 1500 gms).

Cases with birth weight of 1500 - 2500 gms were 18 cases. Cases with more than 2500 gms were 30 in mild group and 22 in severe group. LBW cases were more in severe group. In the present study, the mean birth weight in mild

group was 2700 gms and in severe group was 2200 gms. Mean placental weight in mild group was 496 gms. In severe group was 421 gms. The mean foetoplacental ratio of mild group was 5.42. The mean foetoplacental ratio of severe group was 5.17. It was observed that foetoplacental ratio in severely hypertensive mother was relatively reduced when compared to mild group.

In the present study, the mean placental diameter was found to be decreased in severe hypertensive group than mild group.

In the present study, calcifications were associated with severity of hypertension and retroplacental haematomas or more with severity of hypertension in pregnancy. The infarctions were more in severe group of hypertension.

In the present study, out of 100 cases a total of 49 cases had fibrin deposition in the placenta. This comprised cases from both mild as well as severe hypertension groups. However, the incidence of fibrin deposition was comparatively higher in severe hypertensive group when compared to mild hypertensive group at 65.3% and 34.7% respectively. When this variable was statistically analysed between the groups, it was found to be statistically significant at a P value of 0.003.

Group	CAL	RPH	INF	TPCH	AVV	VHM	FD
Mild HTN	14	12	9	25	15	18	17
Severe HTN	34	22	15	34	24	28	32
Total	48/100	34/100	24/100	59/100	39/100	46/100	49/100
P Value	0.000	0.035	0.163	0.067	0.065	0.045	0.003
Table 1. Comparison of Placental Findings in both the Groups							

Foetal Outcome	Mild HTN	Severe HTN	Total
Live	49	40	89
IUD	1	4	5
Still Birth	-	3	3
Neonatal Death	-	3	3
P value= 0.033			
Table 2. Foetal Outcome			

Correlation of Foetal Loss with Placental Findings

In the present study, out of 100 cases 5 cases of IUD, 3 cases of stillbirths and 3 cases of neonate deaths were present. Individual placental changes in all these cases were studied. Calcifications were present in 6 out of 11 cases, retroplacental haematoma was seen in 7 out of 11 cases. Infarction was seen in 4 out of 11 cases. Tenney-Parker change was observed in 8 out of 11 cases, vascular villi was noted in 7 out of 11 cases, villous hypermaturity was found in 7 cases and fibrin deposition was noted in 8 out of 11 cases. Though, relatively all placental changes were increased and associated with poor foetal outcome. But when this was calculated, no single lesion was found to be significantly associated with foetal outcome.

Also in the present study, birth weights of total 100 cases was divided into two groups of less than 2.5 kgs and greater than 2.5 kgs. Birth weight was compared with individual placental lesions. In the present study, calcifications and

avascular villi were significantly associated with low birth

weight babies.

B.WT	Calcification		Infarction		RPH		TP Change		A Villi		VHM		FD	
	P	A	P	A	P	A	P	A	P	A	P	A	P	A
<2.5	26	15	12	29	17	24	27	14	23	18	21	20	23	18
>2.5	22	37	12	47	17	42	32	27	16	43	25	34	26	33
	P=0.01	P=0.18	P=0.30		P=0.24				P=0.003		P=0.38		P=0.23	

Table 3

Note

RPH= Retroplacental haematoma.

TV change= Tenney-Parker change.

A. villi= Avascular villi.

VHM= Villous hypermaturity.

FD= Fibrin deposits.

P= Present.

A= Absent.

P < 0.05 is significant.

P > 0.05 is insignificant.

In the present study, calcifications and avascular villi were significantly associated with low birth weight babies.

In the present study proteinuria was found in 92% of cases including mild and severe cases. Among these, 2+ and 3+ values of proteinuria were noted in 29 and 19 cases of severe hypertension respectively. Whereas 1+ proteinuria, 24 cases were observed in mild group and only 2 cases were observed in severe hypertension group. This was statistically significant when compared with the mild group. It can be observed that more number of cases in severe hypertensive group required induction of labour than cases in mild hypertensive group. In the present study, more number of cases (64 cases) were delivered by vaginal route (64%) and 36 cases were delivered by caesarean section (36%). Most of the emergency caesarean sections were done in view of foetal distress.

DISCUSSION

Hypertensive disorders of pregnancy remain one of the leading causes of maternal and perinatal morbidity and mortality, especially in developing countries. They complicate 5% - 10% pregnancies in India and are responsible for 8% - 9% of maternal deaths in India.

The intrauterine existence of the foetus is dependent on one vital organ, that is placenta. Placenta is for maintenance of pregnancy and for promoting normal growth and development of the foetus.

Pregnancy complications like hypertension are reflected in the placenta, both macroscopically and microscopically. Maternal vasospasm leads to reduced uteroplacental blood flow and constriction of stern arteries resulting in various changes in the placenta according to severity of hypertension.

In the present study, out of 100 cases 82% cases belonged to preeclampsia and only 1% of chronic hypertension and 6% of eclampsia cases were present. In the present study, the mean systolic blood pressure in the severe hypertension group was 173 mmHg and in mild blood pressure group was 145 mmHg and mean diastolic blood pressure was 113 mmHg and 98 mmHg respectively. In the present study, mean placental weight in mild hypertensive cases was 496 grams and severe hypertension cases was 421 grams. Placental weight was inversely related to severity of hypertension, which was significant. Also, there was decreased mean placental diameter in severe

hypertensive group (14 cms), whereas in mild cases it was 16 cms.

Incidence of calcification was found to be 28% in mild groups, whereas it was 68% in severe groups. In the present study, incidence of retroplacental haematoma was observed in 24% of mild hypertension cases and 44% in severe group cases.

It is also found in the study that incidence of placental infarction was high in severe hypertension cases (30%) when compared to low incidence of infarction in mild cases of hypertension (18%).

In the present study after studying and observing all placental findings, calcifications, retroplacental haematomas, villous hypermaturity and fibrin deposition were significantly associated with severe hypertensive cases compared to mild cases of hypertension.

In hypertensive disorders of pregnancy, one of the risk factors is the parity of women. In the present study, overall 61% were primigravidae out of which 31 cases belonged to mild hypertensive group and 30 cases belonged to severe hypertensive group, whereas 39% were multigravidae out of which 19 cases belonged to mild hypertensive group and 20 cases belonged to severe hypertensive group. Though, parity was not statistically significant in mild and severe hypertensive groups, there was increased number of primigravidae cases (61%) seen in both groups.

CONCLUSION

From the present study, it can be concluded that hypertensive disorders complicating pregnancy adversely influence the morphology of placenta, more so in severe hypertensive cases than in mild hypertensive cases. The presence of calcifications, retroperitoneal haematoma, villous hypermaturity and fibrin deposition were significantly higher in severe hypertensive cases than in mild hypertensive cases. The other histopathological changes like infarction, Tenney-Parker changes and avascular villi were also increased in severe hypertensive cases and the foetal outcome was poor as the severity increased.

The present study was undertaken to analyse placental changes in hypertensive disorders of pregnancy, because the changes may serve as a guide to the severity of disease. Women with hypertensive disorders of pregnancy, especially with severe hypertension, have been shown to have nearly a two-fold increase in risk for ischaemic heart disease, stroke and venous thromboembolic disease in 5 to 15 years after pregnancy.

Due to the long-term risks of HDP, specific cardiovascular risk factors should be addressed and suitable recommendations must be made addressing dietary and lifestyle modification including exercise and maintenance of ideal body weight.

Summary

1. Placental weight (mean 4210 grams) was lower in cases with severe hypertension group when compared with mild hypertension group.
2. Foetoplacental weight ratio was relatively reduced in severe hypertension group compared to mild hypertension group.
3. Placental diameter was reduced in severe hypertension group (14.0 cm) compared to mild hypertension group (16.8 cm). It was statistically significant.
4. Placental thickness was reduced in severe hypertension group. The association of reduced thickness was with severity of hypertension.
5. Calcifications were present in 48 cases of total 100 cases, out of which 34 cases (70%) were in severe hypertensive cases which was also significant.
6. Retroplacental haematoma was present in 12 cases of mild hypertension, whereas in 22 cases in severe hypertension.
7. In the present study the incidence of infarction in placenta was 24%, out of which 15 cases (62%) had severe hypertension.
8. There was incidence of 59% cases of Tenney-Parker change, out of which 34 cases (57%) were with severe hypertension compared to 25 cases (42%) with mild hypertension showed the change. This was not statistically significant.
9. Incidence of avascular villi in mild cases of hypertension was 53.8% and 61% in severe hypertension group. These findings were not statistically significant.
10. Incidence of villous hypermaturity was 46% in present study; 28 cases (60%) were in severe hypertension and 18 cases (39%) were in mild hypertension group. Statistically significant with P value of 0.045.
11. Out of 49 cases with fibrin deposition in the present study, 32 cases (65%) were in severe hypertension group and 17 cases (34%) were in mild hypertension group. (P= 0.003) this was significant.
12. With comparison of individual placental lesions with low birth weight and calcifications, avascular villi were significantly associated with low birth weight babies.
13. More number of placental changes were seen in severe hypertension cases than in mild hypertension cases.
14. Out of total 100 cases in the present study, 11 perinatal deaths were noted out of which only 1 case was mild hypertension case and 10 cases (90.9%) were severe hypertension cases (p= 0.003), i.e. severe hypertension is associated with poor foetal outcome.

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