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Original Research Article

Study of pregnancy induced hypertension in relation to placental and fetal birth weight

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ABSTRACT

Background: A healthy placenta is the most important factor in producing a healthy baby. Placenta which is the most important organ for maintaining and continuing healthy pregnancy and fetal growth. Study aimed to evaluate Pregnancy induced hypertension in relation to placental and fetal birth weight.

Methods: Total 200 mothers participated in the study, various parameters related with placental and fetal weight were calculated and analysed.

Results: This study observed the reduction of placental weight in the hypertensive disorders. Placental weight shows marked variation in all the groups and coefficient of variation was higher in severe PIH group, but mean weight was less with increased severity of PIH. Baby weight shows marked variation in all the groups and coefficient of variation was increased with severity of PIH and mean weight was less with increased severity of PIH. Placental weight was significantly reduced in pre-eclamptic pregnancies and it was directly correlated with fetal birth weight.

Conclusions: Hypertensive disorders of pregnancy adversely influence the placental weight, which ultimately, adversely influence the maternal and perinatal outcomes.

Keywords: Birth weight, Fetal, Hypertension, Pregnancy, Placenta

INTRODUCTION

A healthy placenta is the most important factor in producing a healthy baby. Placenta which is the most important organ for maintaining and continuing healthy pregnancy and fetal growth. It has two components: the fetal placenta (Chorion frondosum), which develops from the same blastocyst that forms the fetus, and the maternal placenta (Decidua basalis), which develops from the maternal uterine tissue.¹

During the gestational period, it provides nutrition, gas exchange, waste removal, endocrine, immune support and a special circulation system to the developing fetus.^{2,3} Careful examination of the placenta can provide insight regarding the in utero environment of the fetus before delivery and therefore assessment of placenta is getting

more importance in modern obstetrics and such placental changes can be an “early warning system” for fetal problems.⁴

Placental weight and its relationship to infant size at birth have been studied in past which indicated that placental weight was associated with pregnancy outcome. High placenta weight was associated with a poor perinatal outcome, a low Apgar score, respiratory distress syndrome and perinatal death; whereas a low placental weight was associated with medical complications in the mother.⁵

Pregnancy-induced hypertension is the general classification for hypertension diseases during pregnancy, which include pregnancy-induced hypertension (without proteinuria), pre-eclampsia (with proteinuria), and

eclampsia (pre-eclampsia with convulsions). This disease is responsible for high maternal and perinatal morbidity and mortality rates and is one of the main public health problems.^{6,7} It is also estimated that pregnancy induced hypertension (PIH), one of the hypertensive disorders of pregnancy, affects about 5-8% of all pregnant women worldwide.⁸

Toxemia of pregnancy or pregnancy induced hypertension (PIH) is one of the foremost cause of death among mothers and fetuses. Various studies on placenta have shown that placental weight is directly related to foetal weight. Placenta in PIH mothers is irregular, small in size with marginal attachment of umbilical cord. Hence, this study is undertaken to evaluate the effects of hypertension on placental and fetal birth weight and to correlate their relationship.

METHODS

It is a prospective, observational study conducted in the department of Obstetrics and Gynecology, Index medical college, Indore, Madhya Pradesh, during the period of September 2015 to October 2016. Study was conducted on 200 placentae collected from labor room and operating theatre. Informed consent was obtained from all women who were enrolled in study.

The mothers were studied clinically for height, weight, blood pressure, pulse etc. along with recording of their medical history. Their lab investigation reports were noted. The placenta with cord and membranes were collected and observed immediately after the delivery. Any abnormality of the umbilical cord and membrane was noted.

Inclusion criteria

Cases of hypertensive disorders of pregnancy like

- Mild pregnancy induced hypertension
- Severe pregnancy induced hypertension
- Eclampsia.

Exclusion criteria

- Gestational hypertension
- Chronic hypertension
- Twin pregnancies
- Gestational age <36 weeks or >42 weeks.

Study was carried in two groups one is control and other is study group. Control group consist of 100 Placenta belonging to normotensive women. Study group consist of 100 placenta belonging to hypertensive disorder which were again divided into.

- Study group A- Mild PIH - Patients having diastolic blood pressure more than 90 and less than 100mm of

Hg, proteinuria (Traces to 1+) with minimal liver enzyme elevation.

- Study group B- Severe PIH - Patients having a diastolic pressure of 110 mm of Hg or more, proteinuria (2+ or more), visual disturbances, headache, oliguria, elevated serum creatinine, hyperbilirubinemia, thrombocytopenia, marked elevation of liver enzymes with pulmonary edema.
- Study group C- Eclampsia- patients had most of the features of severe PIH with convulsions.

Placentae with umbilical cord and membranes were collected immediately after delivery. In all cases, the amnion and chorion were trimmed from the placenta. The umbilical cord was cut at a distance of 5 centimeters from the site of insertion. Placenta was washed in running tap water, dried with the help of blotting paper and weighed. The placentae along with the umbilical cord identified by corresponding code number and were preserved in 10% formalin solution for 48 hours for fixation.

Placental measurements were done in the same way as mentioned in previous studies. Once fixed, placentae were measured on a weighing machine graduated in grams (gm) and diameter was measured with the help of a measuring tape in centimeters. Weight of newborn was recorded from hospital record and feto-placental weight ratio was calculated. Placental coefficient was calculated by the following formula: Placental coefficient=placental weight in grams / birth weight in grams.

Statistical analysis

The data were statistically analyzed by using Statistical Package for Social Sciences (SPSS). The values of continuous variables were presented as mean values.

RESULTS

Total 200 placentae were evaluated, 100 were from pregnancy induced hypertension and remaining 100 are from normal group patients.

Table 1: Distribution of cases as parity.

Type of cases	Primigravida		Multigravida	
	No. of cases	%	No. of cases	%
Control (n-100)	52	52	48	48
Mild PIH (n-61)	33	54.09	28	45.91
Severe PIH (n-28)	14	50	14	50
Eclampsia (n-11)	06	54.54	05	45.45

In pregnancy induced hypertension group 61% have mild PIH, 28 % have severe PIH and 11% have eclampsia shows that out of 100 normotensive subjects, Table 1 shows that out of 200 cases, 52% constituted primigravida and 48% constituted multigravida.

Among mild PIH cases 54.09% cases were primigravida and only 45.91% were multigravida whereas in severe PIH the distributions were 50% each. In eclampsia cases

54.54% were primigravida and 45.45% were multigravida.

Table 2: Distribution of cases as per age group.

Age group	Control		Mild PIH		Severe PIH		Eclampsia	
	n-100	%	n- 61	%	n-28	%	n-11	%
17-20	25	25	15	24.59	10	35.71	-	-
21-24	18	18	12	19.67	06	21.42	02	18.18
25-28	42	42	28	45.90	09	32.14	03	27.27
29-32	15	15	06	9.83	03	10.71	06	54.54

Table 2 shows majority subjects in control group (42%) and mild PIH (45.9%) were belonged to 25-28 age group while 35.71% in severe PIH of 17-20 age group and 54.54% of eclampsia group belongs to 29-32 age group.

54.54% of eclampsia group was ranging between 301-400 grams.

Table 3 shows placental weight in 69% of normotensive group and 50.81% of mild PIH group was ranging between 501-600 grams while 42.85% of severe PIH and

Table 4 shows fetal weight in normotensive subjects was ranging between 2500-3000 grams in 79% and above 3000 grams in 12% while in mild PIH group 80.32% were ranging 2500-3000 grams. Fetal weight of majority patients of severe PIH group (64.28%) and eclampsia (72.72%) were below 2500 grams.

Table 3: Distribution of cases as per placental weight.

Placenta weight (gms)	Control		Mild PIH		Severe PIH		Eclampsia	
	n-100	%	n-61	%	n-28	%	n-11	%
<300	-	-	-	-	01	3.57	03	27.27
301-400	-	-	09	14.75	12	42.85	06	54.54
401-500	19	19	21	34.42	11	39.28	02	18.18
501-600	69	69	31	50.81	06	21.42	-	-
> 601	12	12	-	-	-	-	-	-

Table 4: Distribution of cases as per fetal weight.

Fetal weight (kg)	Control		Mild PIH		Severe PIH		Eclampsia	
	n-100	%	n- 61	%	n-28	%	n-11	%
<2.5	09	9	09	14.75	18	64.28	08	72.72
2.5-3	79	79	49	80.32	10	35.71	03	27.27
>3	12	12	03	4.91	-	-	-	-

Table 5: Comparison of mean fetal weight, mean placental weight, feto-placental ratio and placental coefficient.

Fetal weight (kg)	Control		Mild PIH		Severe PIH		Eclampsia	
	n-100	%	n- 61	%	n-28	%	n-11	%
<2.5	09	9	09	14.75	18	64.28	08	72.72
2.5-3	79	79	49	80.32	10	35.71	03	27.27
>3	12	12	03	4.91	-	-	-	-

Table 5 shows the average feto-placental weight ratio, in normal pregnancy is 5.50, whereas in mild PIH, severe PIH and eclampsia group, it is 6.01, 6.20 and 6.08 respectively.

In present study, average placental coefficient is 0.163 in pre-eclampsic group and 0.181 in control group, which coincides with the normal value.

DISCUSSION

A systematic examination of placenta is often ignored by the physician, gynecologist, pediatrician and pathologist in spite of its very useful role in the fetal development. The placenta has been described as a “diary of intrauterine life” and it may elucidate many aspects of intra uterine life.

Fetal birth weight can be influenced by both endogenous and exogenous factors. These factors include gestational age at delivery, physiological factors (altered glucose metabolism, hemoglobin concentration, macro vascular integrity), pathological factors (hypertension, uterine malformation), and complications of pregnancy (gestational diabetes mellitus, preeclampsia).⁹

Out of 200 placenta evaluated, 100 were from normotensive patients and 100 were from hypertensive group out of which mild PIH (61%) is found in majority compared to severe PIH and Eclampsia. On assessment of parity, hypertensive disorder more in primi-gravida especially in eclampsia group (54.54). This is in concordance with study done by Maqueo M et al, who observed that incidence of eclampsia is more common in primigravida.¹⁰

Majority subjects in control group and mild PIH were belonged to 25-28 age group while, in severe PIH 17-20 age group and in eclampsia group 29-32 age group. Maqueo M et al observed that increased incidence of hypertensive disorder seen in early age group, which is also seen in this study except eclampsia.¹⁰

In the present study, weight of the placenta is decreases as severity of hypertension increase when compared with control group. This is in accordance with Das B et al, who observed that placental weight was significantly reduced where the duration of hypertensive disorders were prolonged. Although the still births were not significantly observed in this study, Udania A et al observed that there was a significant lowering of placental weight in pregnancy induced hypertension. Low birth weight was associated with low placental weight.^{11,12} In placentae weighing less than 300 gms fetal birth weight was low and associated with fetal asphyxia which is significantly correlates with the severity of pregnancy induced hypertension. Present study shows, the mean birth weight and mean placental weight were low with increasing grades of hypertension compared to controls which is in accordance with the study of Das B et al and Mohan H et al.^{4,13}

The feto-placental unit was adversely affected in pregnancy induced hypertension. Due to placental insufficiency the fetal growth was affected. Correlation of the fetal weight and placental weight is assessed by feto-placental weight ratio. The ratio of the fetal weight to the placental weight is known as the feto-placental weight ratio, which is normally 6:1.¹⁴ In the present study, the

average feto-placental weight ratio in normal pregnancy is 5.50, whereas in mild PIH, severe PIH and eclampsia group, it is 6.01, 6.20 and 6.08 respectively. These values correlate with the study done earlier by Salmani D et al.¹⁵ In the present study, the mean feto-placental weight ratio is higher in hypertensive group as compared to normal group. Placental coefficient which calculated by correlating the weight of the baby and placenta. The normal placental coefficient is 0.12-0.20. In our study, average placental coefficient is 0.163 in pre-eclamptic group and 0.181 in control group, which coincides with the normal value. These values correlate with the study done earlier by Singh S et al and Raghunath G et al.^{16,17}

CONCLUSION

From the present study it can be concluded that, the pregnancy induced hypertension adversely influences the weight of the placenta and foetal outcome. Thus, placenta acts as an effective index by examination of which we can predict the status of foetus in neonatal life as it can act as an indicator to the overall development of the foetus in PIH cases. The early measurements of placenta by non-invasive technique like ultrasonography will be helpful in early identification of at risk fetus and better management of such pregnancies.

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