

Morphometry of placenta in pregnancy induced hypertension

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Abstract

Introduction: Well being of Fetus is mainly dependent on the efficiency of Placenta, as it is the only connection between the mother and fetus. Examination of Placenta can give an idea about prenatal experiences of Fetus. As hypertensive disorders are very common in pregnancy present study is carried out to compare the morphometric changes occurring in placenta in normotensive and hypertensive group of mothers. (Pregnancy induced Hypertension). A total of 100 Placentae, 50 from normotensive and 50 from PIH mothers studied with respect to their surface area, Volume, and weight. Fetal weight was also noted in each case. It was found that as compared to Normal / Control group Placenta of PIH was significantly small. All the dimensions including its surface area, Volume and weight were significantly decreased. And this in turn significantly decreased the weight of fetus at birth

Keywords: Placenta, pregnancy induced hyper tension (PIH), morphometry.

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INTRODUCTION

The term Placenta means “circular cake”, a Latin word introduced by Realdus Columbus in 1559. Later Mossman in 1937 defined Placenta as a portion of Fetal Membrane that was in opposition with or fused to the Uterine Mucosa.¹ Placenta is a unique characteristic of Higher Mammals. Human placenta is said to be Haemochorionic, which connects the Fetus and the Mother serving many functions like transfer of nutrients, gasses, waste products, heat, hormones and other regulatory molecules. It also prevents the rejection of the fetal allograft. Placental morphology, blood flow and nutrient transport functions primarily determine the growth trajectory of the fetus. The well being of fetus is affected by many factors but a healthy placenta is the single most important factor in producing the healthy

baby. Though the placenta is the most accessible organ of human body, it is often neglected, as most of the attention is focused on the mother and new born infant. But study of Placenta can give vital information about maternal and infant's health and predictive information concerning future pregnancies. It can also give fare record of infant's prenatal experience. Placental morphometry can give fairly adequate idea about the birth weight of fetus.^{2,3} Hypertensive disorders on the other hand are one of the commonest problems complicating pregnancy apart from Haemorrhage and infection.(Chestely 1985) has reported that Hypertensive disorders alone are responsible for majority of maternal mortality and perinatal mortality and sever morbidity⁴. Minerva, Thame and his colleagues (2014) have found that there is strong association between Placental Volume and abdominal circumference in 2nd trimester and child hood blood pressure suggesting that the initiating events of blood pressure programming occur in early pregnancy⁵. Studies have proven that there is strong correlation between surface area of placenta and hypertension in offspring's in later life⁶, present study has been carried out with the view that morphometry of placenta will be helpful to determine the morbidity and mortality of fetus and mothers with (Pregnancy Induced Hypertension) PIH and will help to plan the future pregnancies.

MATERIAL AND METHODS

A total of 100 placentae were collected from the department of OBGY where mothers were delivered normally or by cesarean section. 50 placentae were collected from the mothers who had normal full term pregnancy, not suffering from PIH or any other disease or pathology, affecting the blood pressure of mother or fetal outcome in anyway. This group was labeled as control group or normal group. 50 placentae were collected from the mothers with blood pressure of 140/90 or above with edema or proteinurea or both. None of the case had hypertension prior to pregnancy. This group was labeled as PIH Group. Placentae were collected immediately after the delivery. Blood was allowed to drain out by keeping them flat in a tray. Then each Placenta was washed under running tap water and dried with blotting paper. Umbilical cord was cut at a distance of 5cms. from the site of insertion and membranes were resected. Weight of the Placenta with 5cms of cord was recorded on the same scientific weighing machine on which fetal weight was

recorded. Surface area of placentae were calculated by taking an imprint on the graph paper. Volume of placentae were calculated by using Archimedes principle. Weight of babies was recorded in each case. Age of mother and parity was also noted in each case.

OBSERVATION

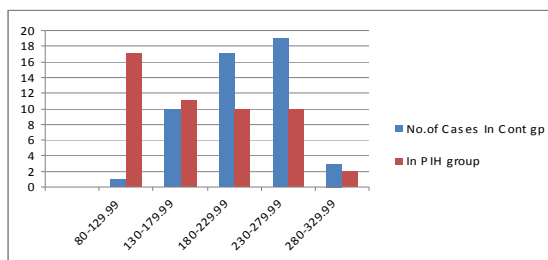
Placentae of both the normotensive and PIH group were studied. This study revealed that PIH is common in young age group and in Primipara. Morphometry of placenta showed following observations –

Surface area of Placenta

The Mean surface area in normal group was $212.14 \pm 47.36 \text{ cm}^2$ where as in PIH group it was $174.30 \pm 62.32 \text{ cm}^2$. Surface area in PIH group was more variable (CV 35.75) as compared to control group. (CV 22.32). (As shown in Table 2) Surface area was found to be significantly less in PIH group (P value <0.05).

Table 1: Surface area of placenta

Sr. No.	Surface are cm^2	No. of Cases			
		Control group		PIH group	
			%		%
1	80-129.99	1	2%	17	34%
2	130-179.99	10	20%	11	22%
3	180-229.99	17	34%	10	20%
4	230-279.99	19	38%	10	20%
5	280-329.99	3	6%	2	4%



Bar Diagram 1: Surface area of Placenta

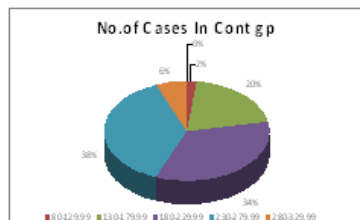


Diagram 1 a): Surface area in Control Group

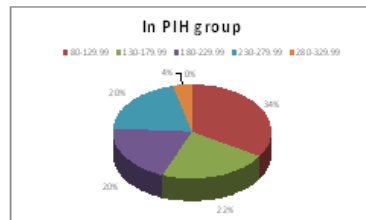


Diagram 1 b): Surface area in PIH Group

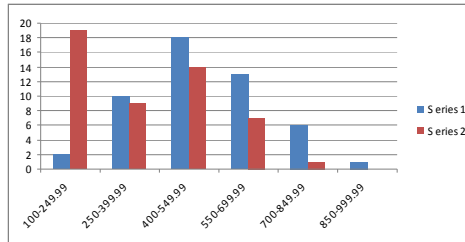
Table 2: Surface area of placenta

	Control Group	PIH Group
Mean Sur. Area	212.14	174.30
Maximum Sur. Area	314.29	283.64
Minimum Sur. Area	98.56	81.75
S.D.	47.36	62.32
CV	22.32	35.75

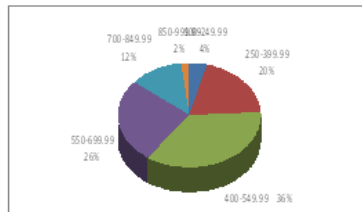
Volume of Placenta

Table 3: Volume of placenta (in ml.)

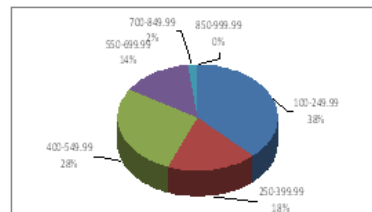
Sr. No.	Vol. of Placenta		No. of Cases		
	In ml	Control group	%	PIH group	%
1	100-249.99	2	4%	19	38%
2	250-399.99	10	20%	9	18%
3	400-549.99	18	36%	14	28%
4	400-549.99	13	26%	7	14%
5	700-849.99	6	12%	1	2%
6	850-999.99	1	2%	NA	NA



Bar Diagram 2: Volume of Placenta



Bar Diagram 3a: Volume of Placenta in Control



Group Bar Diagram 3b: Volume of Placenta in PIH Group

Table 4: Volume of Placenta

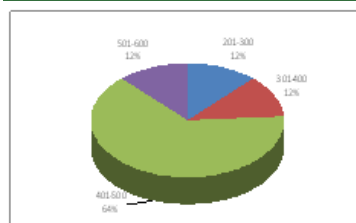
	Control Group	PIH Group
Mean Vol.of Placenta	520.48	364.27
Max.Vol.of Placenta	850.93	833.11
Min.Vol.of Placenta	172.62	112.32
S.D.	170.61	174.87
CV	32.77	48.00

Volume of Placenta in PIH group was also more variable (CV is 48) as compared to control group (CV is 32.77). The mean volume of placenta in control group was 520.48 ± 170.61 ml. whereas in PIH group it was 367.27 ± 174.87 (Table 4) ml. The decrease in the volume of placenta in PIH group was statistically significant (p value <0.05)

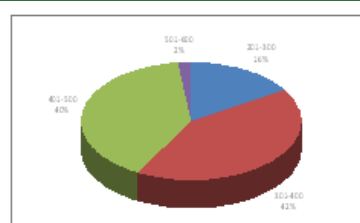
Weight of Placenta

Table 5: Weight of placenta

Sr. No.	Weight in gms.	No of Cases			
		Control group	%	PIH group	%
1	201-300	6	12%	8	16%
2	301-400	6	12%	21	42%
3	401-500	32	64%	20	40%
4	501-600	6	12%	1	2%



Weight of Placenta in Control Group



Weight of Placenta in PIH Group

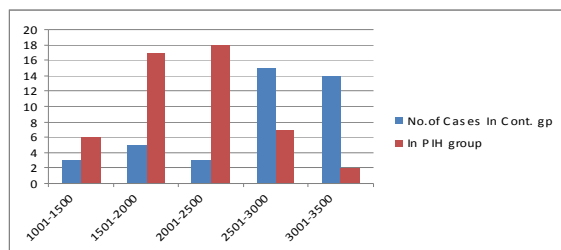
Table 6: Weight of Placenta

	Control Group	PIH Group
Mean Placental weight	439.8 gms	387.6 gms.
Max. Placental weight	570 gms	510 gms.
Min. Placental weight	250 gms	210 gms.
S.D.	78.75	79.73
CV	18.23	20.57

The mean Placental weight in PIH group was 387.6gms.±79.73gms as compared to 439.8gms ±78.75gms in control group. In PIH the weight of Placenta is found to be less as compared to control group.(Table 6) The difference in the weight of Placenta in both the groups is statistically significant (P value < 0.05).

Table 7: Fetal Weight

Sr. No.	Weight in gms	No. of Cases			
		Control Group	%	PIH	%
1	10001-1500 gms	3	6%	6	12
2	1501-2000 gms	5	10%	17	34
3	2001-2500 gms	3	6%	18	36
4	2501-3000 gms	15	30%	7	14
5	3001-3500 gms	14	28%	2	4



Bar Diagram 4: Fetal Weight

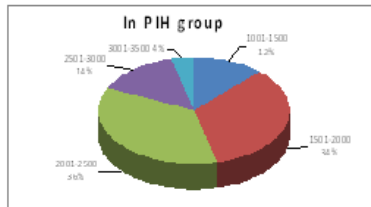
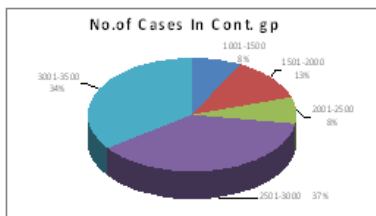


Table 8: Fetal Weight

	Control Group	PIH Group
Mean Fetal weight	2677.6 gms	2112.2 gms.
Max. Fetal weight	3400 gms	3200 gms.
Min. Fetal weight	1420 gms	1150 gsm.
S.D.	520.6	511.23
CV	19.44	24.20

Fetal Weight

Present study showed that there was a significant decrease in the fetal weight in PIH group as compared to control group. The mean fetal weight in PIH group was 2112.2gms.± 511.23gms. as compared to 2677.6gms.± 520.6gms. in control group.(Table 8) Moreover the fetal weight showed more variability in PIH group.(CV = 24.20) as compared to control group (CV = 19.44).

DISCUSSION

Placenta is a mirror which reflects intrauterine status of the Fetus. It also reflects any change in normal anatomical and physiological uterine environment

following the conception. Hypertensive disorders have definite adverse influence on morphometry of placenta. The present study was undertaken to analyze and access the morphometric variations found in normal and PIH group in placenta like surface area, volume, weight and its effect on fetal weight in both the groups..The present study showed that PIH is common in young age group. and significantly common in primipara.52% of PIH cases were found in the range of 16-20 years of age and 62% of cases were found in Primipara as compared to 38% in multipara. These finding are in conformity with Chesley (1985)⁴, who also noted that PIH commonly affects teen agers and is common in nulliparaous women. Philip J (2004)⁷ also found that the incidence of pre eclampsia is higher in younger age group. Dutta (1989)⁸ stated that PIH is common in primigravida. Present study has shown significant decrease in the surface area of placenta in PIH group. This is in conformity with Rath (2000)⁹ who stated that the mean surface area of placenta

of hypertensive group was shorter than normotensive group. The mean surface area of control group in the present study was $212.14 \pm 47.36 \text{ cm}^2$ as compared to only $174.30 \pm 62.32 \text{ cm}^2$ in PIH group.(Table 1,2 and Bar Diagram 1) Udania. A, Bhagwat S.S. and Mehta, C.D.(2004) and Majumdar (2005) also found decrease in surface area in PIH group as compared to control group. Sharmishtha Godhke (2012) also confirms that there is significant decrease in surface area of Placenta in PIH group.^{10,11,12} A significant decrease in the Volume of Placenta in PIH group as revealed by this study (Table 3,4 and Bar Diagram 2) is comparable with Majumdar, S. (2005) and Sharmishtha Godke (2012) who observed similar decrease in Volume of Placenta in PIH group as compared to control group. Slightly lower values in present study in control group may be because of regional variation or variation in socio economic status.^{11,12} In the present study mean placental weight in control group was $439.8\text{gms} \pm 78.75\text{gms}$. Whereas $387.6\text{gms} \pm 79.73\text{gms}$. in PIH group.(Table 5,6 and Bar Diagram 3)There was significant decrease in Placental weight in the PIH group. This observation of decrease in Placental weight in PIH group is in conformity with Fox H (1978)¹⁵ Rath. G, Garg. K, and Sood. M, (2000)⁹ who stated that Placentae from preeclamptic women tend on an average to be smaller than from uncomplicated pregnancy. Udania and Jain (2001)¹⁴ found the mean placental weight 495gms. in control group,435.63 gms in mild PIH 371.43 in severe PIH. Majumdar, S.(2005)¹¹ also found that mean placental weight is 48.85 ± 47.31 in control group and $399.10 \pm 90.31\text{gms}$ in PIH group. The findings in present study are comparable with both the above observations of Udania and Jain (2001)¹⁴ and Majumdar S. (2005)¹¹. Nobis and Das(1991)¹⁵ showed decrease in the placental weight in PIH group as compared to control group though his findings are slightly on the lower side, may be because of regional or socio economic differences. Significantly low birth weight of fetus in PIH group in this study (Table VII,VIII and Bar Diagram IV) is comparable with the findings of Udania and Jain (2001) Rath, Garg and Sood (2000), Majumdar S (2005) and Sharmishtha Godke (2012).^{9,11,12,14}

CONCLUSION

Thus in conclusion PIH has an adverse influence on Placenta. The Placenta becomes smaller and smaller as the severity of PIH increases. This in turn affects the Fetal Weight. Study of such Placentae is helpful to evaluate the

frequency of PIH, to decrease the morbidity and mortality of fetus and mother and to plan the future pregnancies.

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