

Research Article

Foeto-placental weight relationship in normal pregnancy and pregnancies complicated by pregnancy induced hypertension and abruption of placenta

Pushpa Goswami^{1*}, Samreen Memon¹, Muhammad Imran Rathore²

¹Department of Anatomy, Liaquat University of Medical and Health Sciences, Jamshoro, Sindh, Pakistan

²Department of Anatomy, Muhammad Medical College, Mirpurkhas, Sindh, Pakistan

Received: 04 March 2015

Accepted: 22 March 2015

*Correspondence:

Dr. Pushpa Goswami,

E-mail: Pushparamesh1998@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: The aim of this study was to study the effects of pregnancy induced hypertension and abruption of placenta on foeto-placental weight ratio and its comparison with normal group.

Methods: In this comparative study hundred and twenty placentae were collected from labor room and gynecology operation theatre of Liaquat University hospital. Forty placentae from parturient that had pregnancy induced hypertension & forty placentae from parturient with history of Abruptio of placenta & forty cases belonged to normal pregnancy (Control group). Fetal weights in all groups were taken along with the weights of placenta and foeto-placental weight was calculated in all groups.

Results: Placental parameter weight and diameter of placenta in abruption of placenta and PIH group when compared with control group show highly significant ($P < 0.001$) difference. The weight of the new born in abruption of placenta and PIH group also differs from control group significantly ($P = 0.001$). The foeto-placental ratio is also significant statically in abruption of placenta but not in PIH.

Conclusion: Both PIH and abruption of placenta are associated with remarkable changes in placenta such as small placental weight and diameter and as a result low birth weight babies and so altered foeto-placental ratio.

Keywords: Placenta, Pregnancy induced hypertension, Abruptio of placenta, Fetal weight

INTRODUCTION

The placenta is a distinctive, endocrine organ, which facilitates the supply of oxygen and nutrients to the fetus through placental microcirculation. Placenta is a window providing insight vision for understanding maternal dysfunction and its impacts on fetal well-being. So it is an effective index by examination of which we can predict the status of fetus in utero as well as in neonatal life. It may act as an indicator to the overall development of the fetus in cases of pregnancy induced hypertension and in abruption of placenta. These complications of

pregnancy are reflected in structure and function of the placenta.^{1,2}

In normal pregnancies, placental separation occurs soon after birth, while in pregnancies complicated by abruption, the placenta begins to detach before birth and causes bleeding from the genital tract known as Ante Partum Hemorrhage (APH). Pregnancy-Induced Hypertension (PIH) is defined as hypertension during pregnancy when associated with new-onset proteinuria. Both conditions are major cause of perinatal mortality and maternal morbidity in the developing countries like Pakistan. The etiology of both conditions remains

unknown. It is supposed to be that abnormal trophoblast invasion leading to rupture of the spiral arteries and premature separation of the placenta followed by death of placental tissue. In case of abruption and in PIH abnormal trophoblast invasion of maternal spiral arteries which fails to dilates and results in decreased uteroplacental perfusion causing placental dysfunction resulting in fetal growth restriction, reduced fetal length, and preterm delivery.^{3,4}

In normal pregnancy not complicated by any disease, the placental weight maintains a linear relationship with the weight of developing fetus. Placental weight and fetal weight will increase proportionately. The ratio between placental and fetal weight in uncomplicated pregnancy is 1:6. As pregnancy induced hypertension and abruption of placenta is the disorder of the chorionic villi, it causes various changes in the placenta which affect the fetus and alter the feto placental ratio.⁵

Our aim of this study is to examine placenta of Pregnancy-Induced Hypertension (PIH) and abruption of placenta and correlate the placental weight with fetal weight, calculate feto placental ratio and compare with normal.

METHODS

This comparative study was conducted at the department of anatomy of Liaquat University of medical & health sciences Jamshoro Sindh Pakistan. Hundred and twenty placenta were collected from labor room and gynecology operation theatre of Liaquat University hospital. Forty placenta from parturient that had pregnancy induced hypertension having blood pressure ranged 140/90 mm of Hg or above were included. Forty placenta from parturient with history of Abruption of placenta & forty cases belonged to normal pregnancy (Control group). Age of all parturients was between 17 to 32 years.

Method of sample collection

Placenta 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 placenta 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 by authors in the same way as they did in their previous studies. Once fixed, placenta 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.⁶

Statistical analysis

Statistical analysis was performed by statistical package of social sciences SPSS Version 16. Student's t test and Dunnett test was used to compare the data. In all cases $P < 0.05$ was considered as significant.

RESULTS

Following Tables shows the observations made during the study.

Table 1: Showing age groups and parity of parturients.

	Control	PIH	Abruption placenta
Age groups			
17-20 years	10 (25%)	20 (50%)	0 (0%)
21-24 years	07 (17.5%)	12 (30%)	06 (15%)
25-28 years	15 (37.5%)	16 (40%)	12 (30%)
29-32 years	08 (20%)	08 (20%)	22 (55%)
Parity			
P0	08 (20%)	20 (50%)	04 (10%)
P1-2	12 (30%)	12 (30%)	10 (25%)
P3-7	20 (50%)	08 (20%)	26 (65%)

In both control and PIH groups 80% and 45% in abruption placenta were between 17-28 years age. The primiparous in control group were 20%, in abruption placenta were 10% while it was 50% in PIH group. Gravida 1-2 were equal in control and PIH groups and representing 30% for each group whereas 10 cases / 25% seen in abruption placenta. Gravida 3-7 were 50% for control group while it was 20% for PIH group and 65% in abruption placenta group.

Table 2: Showing placental parameters.

	Min.	Max.	Mean \pm SEM	P value
Placental weight (gm)				
In control	450	650	526.25 \pm 8.414	
In PIH	200	550	432.25 \pm 11.889	<0.0001
In abruption placenta	180	400	284.88 \pm 9.084	<0.0001
Placental diameter (cm)				
In control	19	24	21.225 \pm 2148	
In PIH	10	16	14.208 \pm 1914	<0.0001
In abruption placenta	10	16.5	13.070 \pm 0.2504	<0.0001

The variables of placenta are shown in Table 2. The weight and diameter of study groups were compared using t test. The results show statistically significant ($P < 0.001$) difference in weight and diameter of placenta in PIH and abruption placenta groups as compared to control group. The weight of placenta in control group ranges from 450 to 650 gm with a mean weight of 526.25

± 8.414 gm (Mean \pm SEM). In PIH group weight of placenta ranges from 200 to 550 gm with a mean weight of 432.25 ± 11.889 gm (Mean \pm SEM). In abruptio placentae group the weight of placenta ranged from 180 to 400 gm with a mean weight of 284.88 ± 9.084 gm (Mean \pm SEM).

The diameter of placenta in control group ranges from 19 to 24 cm with a mean of 21.225 ± 0.2148 cm (Mean \pm SEM). In PIH group diameter of placenta ranges from 10 to 16 cm with a mean 14.208 ± 0.1914 cm (Mean \pm SEM) and in abruptio placentae diameter ranges from 10 to 14 cm with mean 13.070 ± 0.2504 cm (Mean \pm SEM).

The weight of the new born in mothers of placental abruption and PIH group and control group differs from each other significantly ($P < 0.001$) on statistical analysis shown in Table 3.

Table 3: Showing weight of new born.

Newborn weight (kg)	Min. wt.	Max. wt.	Mean \pm SEM	P value
In control	1.8	3.6	2.790 ± 0.0689	
In PIH	1.4	3.0	2.195 ± 0.0703	<0.0001
In abruptio placentae	1.0	2.8	1.898 ± 0.0660	<0.0001

Table 4: Showing feto placental ratio statics.

Dunnett's multiple comparison test	Mean diff.	q	Significant $P < 0.05?$	Summary	95% CI of diff.
Control vs. APH	-1.382	7.253	Yes	***	-1.809 to -0.9550
Control vs. PIH	0.2977	1.563	No	ns	-0.1291 to 0.7245

Table 4 is showing Feto Placental Ratio (FTP). Mean of FTP ratio in control is 1.382, in PIH 5.097 whereas in abruptio placentae it is 6.7. When control is compared with APH on Dunnett test it is showing highly significant difference whereas in this study control vs. PIH is insignificant.

DISCUSSION

Normal growth and survival of fetus depends on appropriate development and function of the placenta. It is a maternal-fetal interference for the exchange of blood gases, nutrients, and waste. The placenta has been described as a "diary of intrauterine life" and it may elucidate many aspects of intra uterine life. 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 aim of this study is to assess the foeto-placental weight relationship in normal pregnancy and pregnancies complicated by pregnancy induced hypertension and abruption of placentae.⁷

In pregnancies complicated by hypertension and abruption placental weight decreases this study shows reduced placental weight (66%) in patient of abruptio placentae and PIH then placentae of parturient in control group, which was also observed by Sultana S, Hossain GA in 2006 and by Rahman MA, Rahman MH in 2007. In both studies they found reduced placental weight in (50%) of cases.^{8,9}

The diameter of placenta is also reduced in PIH ranges from 10 to 16 cm and in abruptio placentae group the diameter of placenta ranges from 10 to 14 cm from

control group which ranged from 19 to 24 cm. In this study less placental diameter was seen in 66% of cases more or less same was seen by Sultana S, Hossain GA, Rahman MH, Hassan N, Sultana SZ, Khalil M in 2007 they reported less placental diameter in (55%) of cases in patient of PIH.¹⁰

In this study and study performed by Udaina A in 2001 and Sarwar I in 2006 uteroplacental insufficiency is found to be the leading cause of low birth weight of the new born. The weight of new born baby in control group ranges from 1.8 kg to 3.6 kg in abruptio placentae group fetal weight ranges from 1.0 kg to 2.8 kg. Similarly in PIH group the fetal weight ranges from 1.4 kg to 3.0 kg. The study conducted by Rahman LA, Hairi NN, Salleh N shows, that pregnancy-induced hypertension was found to be an independent risk factor for low birth weight.^{1,11,12}

During pregnancy, the placental mass maintains a dynamic relationship with the weight of developing fetus. In this study mean of FTP ratio in control is 5.38, in PIH 5.097 whereas in Abruptio of placentae it is 6.7. When control is compared with APH on Dunnett test it is showing highly significant difference whereas in this study control v PIH is insignificant. The increased ratio noted in the present study groups also.

Morphologically placentae of hypertensive disorders of pregnancy are lighter in weight, lesser in diameter, thickness and the fetoplacental ratio is diminished because the rate of reduction of baby weight were less than that of the rate of reduction of placental weight in PIH as in such disease conditions placenta worked extensively for its function with limited tissue. Placental insufficiency in these conditions associated with preterm

birth, neonatal morbidity and altered placental dimensions. Palaskar observed mean foeto-placental ratio in normal pregnancy was 5.8 and 7:1 in PIH the mean foeto-placental ratio was increased to 6.04:1. While Gunapriya in 2011 observed foeto-placental ratio 5.35:1 in normal and in PIH, 6.03:1 and Usha Nag observed FPR in normal 5.94 and in PIH 6.02.¹³⁻¹⁵

According to study conducted by Rath G, FPR is 7.11 in normal and 6.05-6.84 depending on severity of PIH. More or less our findings are parallel with the studies conducted in past. The difference in the values to some extent may be due to ethnicity, diet especially mothers who are strict vegetarian, difference in economical class.¹⁶

Ananth CV observed in abruption of placenta mean birth weight and placental weight were lower especially in preterm births with placental ratio <10th centile risk ratio 0.4, 95% CI 0.2-0.8). Several studies show reduced placental weight in abruption also low birth weight of new born but foeto placental ratio was not calculated which is shown significant in our study.¹⁷

ACKNOWLEDGEMENTS

We would like to acknowledge Professor Mrs. Pushpa Srichand head of the department of gynecology and obstetrics for her kind help in collection of placenta for this study.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Placenta is discarded as waste so no ethical approval required

REFERENCES

1. Udainia A, Jain ML. Morphological study of Placenta in pregnancy induced hypertension with its clinical relevance. J Anat Soc India. 2001;50(01):01-6.
2. Anca M, Anna A, Penn P. The placenta: the lost neuroendocrine organ. Neoreviews. 2010;11:64-77.
3. Elsasser DA, Ananth CV, Prasad V, Vintzileos AM. Diagnosis of placental abruption: relationship between clinical and histopathological findings. Eur J Obstet Gynecol Reprod Biol. 2010;148(2):125.
4. Singh S, Gugapriya TS. Micro anatomical analysis of hypertensive placenta. A retrospective case control study. Natl J Clin Anat. 2013;2(1):5-10.
5. Gupta S, Gupta P. Correlation of placental weight and fetal outcome in pregnancy induced hypertension. Indian J Appl Basic Med Sci. 2012;14:76-82.
6. Goswami P, Memon S, Pardeep K. Histological and radiological study of calcified placenta. IOSR-JDMS. 2013;7(4):37-41.
7. Devi CK, Neelam S, Raghupathy NS. The histological findings in human placenta at different gestational ages. IOSR-JDMS. 2013;6(1):29-31.
8. Sultana S, Hossain GA, Rahman H, Hasan N, Manan S, Zannat S. Gross morphometry of human placenta in eclampsia. Mymensingh Med J. 2006;15(1):10-4.
9. Rahman MA, Rahman MH, Habib MA, Selimuzzaman SM. Placental changes in eclampsia and fetal outcome. Mymensingh Med J. 2007;16(2):191-6.
10. Sultana S, Hossain GA, Rahman MH, Hasan N, Sultana SZ, Khalil M. Changes of placental diameter thickness and cotyledon in eclampsia. Mymensingh Med J. 2007;16(2):127-31.
11. Sarwar I, Abbasi A, Islam A. Abruptio placentae and its complications at Ayub teaching hospital Abbottabad. J Ayub Med Coll Abbottabad. 2006;18(1):27-31.
12. Rahman LA, Hairi NN, Salleh N. Association between pregnancy induced hypertension and low birth weight: a population based case-control study. Asia-Pac J Public Health. 2008;20(2):152-8.
13. Palaskar PA, Chaudhary KR, Mayadeo NM. Foeto-placental weight relationship in normal pregnancy and preeclampsia-eclampsia: a comparative study. Bombay Hosp J. 2001;43(3):361-3.
14. Raghunath G, lakshmi V, Shenoy V. A study on the morphology & morphometry of human placenta & its clinical relevance in a population in tamilnadu. J Clin Diagn Res. 2011;5(2):282-6.
15. Nag U, Chakravarthy VK, Rao DR. Morphological changes in placenta of hypertensive pregnant women. IJRRMS. 2013;3(2):1-4.
16. Ananth CV, Berkowitz GS, Savitz DA, Lapinski RH. Placental abruption and adverse perinatal outcomes. JAMA. 1999;282(17):1646-51.
17. Rath G, Garg K, Sud M. Insertion of umbilical cord on the placenta in hypertensive mothers. J Anat Soc India. 2000;49(2):149-52.

DOI: 10.5455/2320-6012.ijrms20150510

Cite this article as: Goswami P, Memon S, Rathore ML. Foeto-placental weight relationship in normal pregnancy and pregnancies complicated by pregnancy induced hypertension and abruption of placenta. Int J Res Med Sci 2015;3:1081-4.