ORIGINAL ARTICLE

Comparison of Morphological Changes in Placentae from Pre-Eclamptic Pregnancies and Normal Pregnancies

ABDULLAH KHILJI, SYED MEESAM IFTIKHAR RIZVI*

ABSTRACT

Aim: To assess the morphology of placenta from mothers having pre-eclampsia and to correlate with those from normal pregnancies.
Study design: Study type; Prospective study
Research design: Case Control study
Place of study: Department of Anatomy, Basic Medical Sciences Institute (BMSI), Jinnah Postgraduate Medical Centre (JPMC), Karachi.
Methods: Total of 50 placentae were collected, divided into two groups, Control (Group A) and Pre-eclamptic (Group B) groups. Each group consisted of 25 placentae. All the placentae were observed for morphological features.
Results: In this study, shape of placenta showed no changes in both pre-eclamptic and control groups. Pre-eclamptic placentae showed a highly significant decrease (P<0.001) in weight, diameter, thickness and number of cotyledons as compared to normal placentae.
Conclusion: The present study concluded that pre-eclampsia is associated with remarkable morphological changes in the placentae.
Keywords: Placenta, Pre-eclampsia

INTRODUCTION

Placenta is a chorio-decidual structure through which mother and fetus come in close contact with each other and is the vital organ through which physiological exchange occurs. The placenta reflects macroscopically and microscopically the complications of pregnancy which are associated with high perinatal morbidity and mortality[1].

The placenta is essential for maintaining pregnancy and promoting normal fetal development. It is a fetomaternal organ that is developed from two components, the fetal part which develops from the trophoblast and extra embryonic mesoderm (the chorionic plate) and a maternal part that is derived from the uterine endometrium[2]. The placenta is responsible for the respiratory, nutritional, excretory, endocrinal and the immunological functions of the fetus[3].

Preeclampsia is a severe pregnancy complication affecting between 3-5% of pregnant woman worldwide[4]. This disease presents after 20 weeks of pregnancy and is characterized in pregnant women without previous hypertension by a diagnosis of elevated blood pressure in excess of 140 mmHg systolic over 90 mmHg diastolic accompanied by proteinuria, edema or both[5]. The incidence of pre-eclampsia is slightly lower 6-7% in the USA as compared to 10-12% pregnancies in Pakistani population[6]. According to one study, prevalence of pre-eclampsia is around, 19% in Pakistan, while studies from USA reported its prevalence about 1-24%[7].

The etiopathogenesis of preeclampsia is multifactorial and the placenta plays an important role in the development of preeclampsia[8]. There are various theories to clarify pre-eclampsia and is suggested that it is present till the placenta is present; once it is removed the situation improved[9]. Placental ischemia and hypoxia act as a central causative factor in the etiology of the disorder and results from the reduced uterine perfusion. Placental ischemia causes secondary maternal effects which include oxidative stress, immunological dysfunction, angiogenic imbalance and endothelial dysfunction[10].

PATIENTS AND METHODS

This study was conducted in the department of Anatomy BMSI, JPMC, Karachi. For this purpose 50 placentae, 25 from normal (group A) and 25 from pre-eclamptic patients (group B) were used in this study. These placentae were obtained from the department of Gynaecology and Obstetrics unit, JPMC, Karachi. The written informed consent was obtained from each patient.

Department of Anatomy, Basic Medical Science Institute, Jinnah Postgraduate Medical Centre Karachi.
**Associate Professor, Department of Anatomy, Jinnah Medical and Dental College, Karachi.*
Correspondence to Dr. Abdullah Khilji, Email: abdullahkhilji2005@yahoo.com, Cell: 0334-3400896

Pregnant women between the age of 25-35 years, with parity between 0-4 and the blood pressure of 140/90 mmHG to 160/100 mmHG at two different occasions six hours apart after 20 weeks of pregnancy were included. All the patients included in our study were registered cases and follow up was done from the time of diagnosis till the date of cesarean section. Mothers having pre-gestational hypertension, diabetes, smoker, renal disease, cardiovascular disease and multiple pregnancies were excluded from our study.

Just after expulsion of placenta, it was washed in tap water; clots were removed, mopped with dry cotton pad. The umbilical cord was cut 5 cm away from disc margin. Membranes were trimmed at disc margin and placenta was placed in 10% formalin filled jar with cover. All the placentae were collected in similar manner. The gross features of all the placentae in each group were noted, including weight of placenta, shape of placenta, thickness of placenta, diameter of placenta and number of cotyledons.

The statistical significance of the difference of quantitative variables between the pre-eclamptic and control groups was evaluated by independent sample t-test. Mean and standard deviation was reported for each group. The difference was regarded statistically significant if the P-value was equal to or less than 0.05. The statistical analysis was carried out using the statistical package for social sciences (SPSS) version 16.

RESULTS

Statistical analysis of Gross features of placentae in group A and group B were observed and compared. These features include the shape of placenta, weight of placenta (gm), diameter of placenta (cm), thickness of placenta (mm), and number of cotyledons. The shapes of placentae were observed in our study, these were found roughly oval or rounded in both the groups.

The mean values of weight of placentae in control group A and pre-eclamptic group B were 540.32±16.74 (gm) and 392.12±39.88 (gm) respectively. This data showed a highly significant decrease (P< 0.001) in weight of placentae in group B when compared with weight of placentae in group A (table-1, figure-1).

The mean values of diameter of placentae in control group A and pre-eclamptic group B were 16.72±1.31 (cm) and 11.06±0.97 (cm) respectively. This data showed a highly significant decrease (P< 0.001) in diameter of placentae in group B when compared with diameter of placentae in group A (table-1, figure-2).

The mean values of thickness of placentae in control group A and pre-eclamptic group B were 14.89±1.73 (mm) and 9.26±2.59 (mm) respectively. This data showed a highly significant decrease (P< 0.001) in thickness of placentae in group B when compared with thickness of placentae in group A (table-1, figure-3).

The mean values of number of cotyledons in control group A and pre-eclamptic group B were 19.01±1.34 and 13.08±1.57 respectively. This data showed a highly significant decrease (P< 0.001) in number of cotyledons in group B when compared with number of cotyledons in group A. (table-1, figure-4).

Fig. 1: Weight of placenta

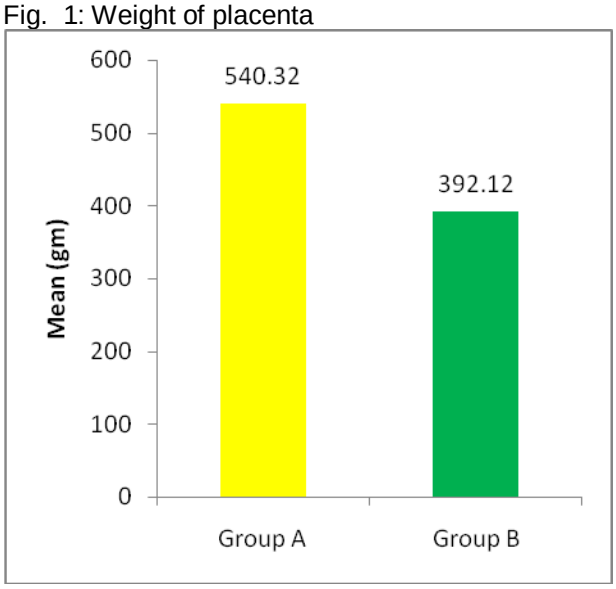

Fig. 2: Diameter of placenta

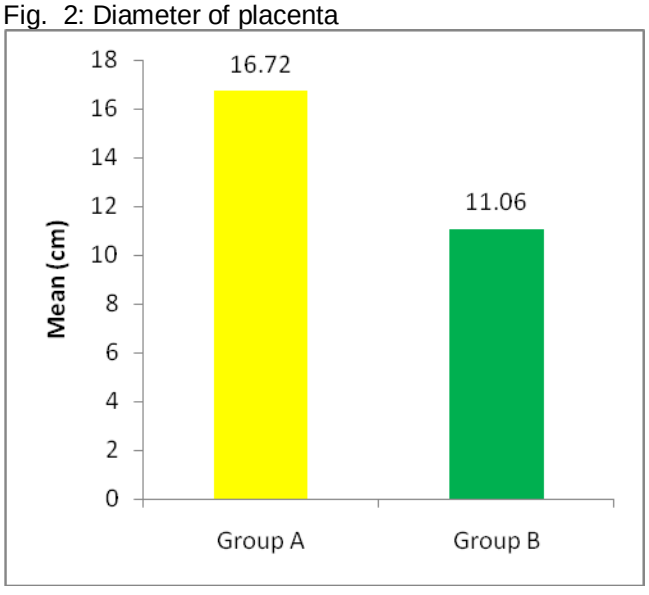

Fig. 3: Thickness of placenta

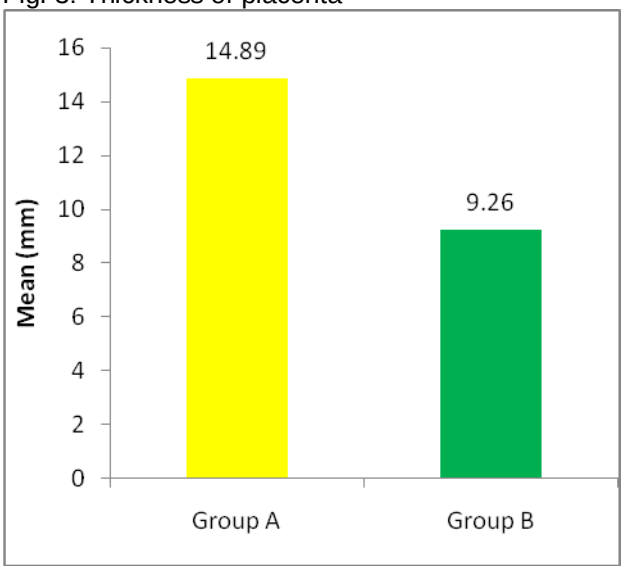

Fig. 4: Number of cotyledon

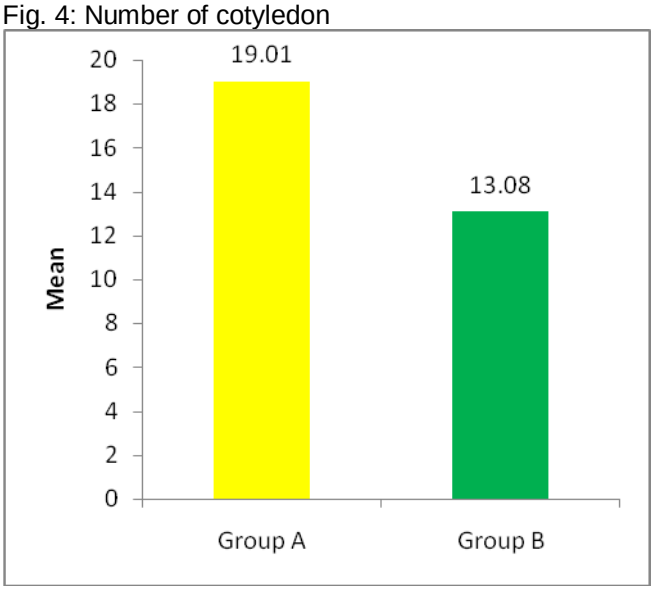

Table 1: Mean values of weight of placenta (gm), diameter of placenta (cm), thickness of placenta (mm) and number of cotyledons in group A and group B

Parameters	Group-A		Group-B	
	Mean	St. Dev.	Mean	St Dev.
Weight of Placenta (gm)	540.32	16.74	392.12	39.88
Diameter of Placenta (cm)	16.72	1.31	11.06	0.97
Thickness of Placenta (mm)	14.89	1.73	9.26	2.59
Number of Cotyledons	19.01	1.34	13.08	1.57

Statistical analysis of mean values of weight of placenta, diameter of placenta, thickness of placenta and number of cotyledons between group A and group B

Parameters	p-value	Significance
Weight of Placenta	<0.001	H.S*
Diameter of Placenta	<0.001	H.S*
Thickness of Placenta	<0.001	H.S*
Number of Cotyledons	<0.001	H.S*

*= Highly Significant

DISCUSSION

Pre-eclampsia is a pregnancy complication with serious consequences for mother and infant[11]. It can lead to higher frequency of induced labor, fetal growth restriction, neonatal respiratory difficulties, and increased frequency of admission to neonatal intensive care unit as well as increased risk for perinatal or fetal death[12].

Placenta is the vital organ for the development of fetus in the uterus[13]. Following delivery, most attention is focused on the mother and the new born infant, particularly if maternal or fetal complications have occurred during the pregnancy, labor or delivery. The placenta is consequently set aside, forgotten or put into storage for subsequent disposal[14].

The observations of present study in group A (control) and B (pre-eclamptic) showed rounded to oval shape placentae. Sudha et al (2012)[15] stated that the placenta is a flattened discoidal mass with an approximately circular or oval outline formed partly from deciduas basalis and chorion frondosum. Our findings were in conformity with Baloch et al (2012)[16] and Kishwara et al (2009)[17] who observed no significant change in shapes of placentae in both the groups. The findings of the present study were in disagreement to Sudha et al (2012)[15] who found kidney and triangular shaped placentae in pre-eclamptic group.

In the pre-eclampsia, vasospasm, apoptosis and compensatory hyperplasia of the placental parenchyma that result in placental insufficiency, loss and fibrosis of parenchymal tissue as explained by Queenan (1999)[18], these changes result in decreased size of placentae which cause to decrease in weight, diameter, thickness and number of cotyledons.

In the present study, weight of placentae was decreased highly significantly in the pre-eclamptic group as compared to control group. This finding was in accordance to Saeed et al (2011)[19] who observed significant reduction in placental weight in pre-eclamptic group as compared to control group. In our study, the diameter of placentae was decreased highly significantly in the pre-eclamptic group as

compared to control group. This finding was in agreement with Kishwara et al (2009)[17] who observed significant decrease in diameter of placentae in pre-eclamptic group as compared to control group. The results of this study were in disagreement to Sankar et al (2012)[20], who observed no significant difference in the diameter of placentae in normal and pre-eclamptic group.

In our study, thickness of placentae was decreased highly significantly in the pre-eclamptic group as compared to control group. This finding was in accordance to Manjunatha et al (2012)[21] who observed in their study, significantly decreased thickness of placentae in the pre-eclamptic group as compared to control group. In contrast to our finding, Kishwara et al (2009)[17] found no significant difference in the thickness of placentae in both control and pre-eclamptic groups.

In the present study, number of cotyledons was decreased highly significantly in the pre-eclamptic group as compared to control group. This finding was in accordance to Saeed et al (2011)[19] who observed significant decrease in number of cotyledons in pre-eclamptic group as compared to control group. Nag et al (2013)[22] in their study observed no significant difference in number of cotyledons in both control and pre-eclamptic groups.

CONCLUSION

Pregnancy associated complications like pre-eclampsia influence the morphology of placenta which adversely affects the perinatal outcome.

REFERENCES

1. Gupta S, Gupta P. Correlation of placental weight and fetal outcome in pregnancy induced hypertension. Indian Journal of Applied Basic Medical Sciences 2012; 14(19):76-82.
2. Saga Z, Minhas LA. Morphometry of villous membrane of placenta at high and low altitudes. JRMC 2008; 12(2):52-56.
3. Raghunath G, Lakshmi V, Shenoy V. A study on the morphology and the morphometry of the human placenta and its clinical relevance in Tamillnadu. J Clin Diagno Res 2011; 5(2):282-286.
4. Berg CJ, Mackay AP, Qin C, Callaghan WM. Overview of maternal morbidity during hospitalization for labor and delivery in the united states: 1993-1997 and 2001-2005. Obstet Gynecol 2009; 113:1075-1081.
5. Alladin AA, Harrison M. Preeclampsia: Systemic Endothelial Damage Leading to Increased Activation of The Blood Coagulation Cascade. Journal of Biotech Research 2012; 4:26-43.
6. Pervene K, Baig M. Influence of blood pressure changes with and without proteinuria outcome of pregnancy. The Professional 2000; 7:62-65.
7. Tariq M, Rehman H, Tayab M, Kamal F, Yasmeen N, Sultan F. Clinicopathological study of pre-eclampsia. Biomedica 2000; 16:60-65.
8. Hupertz B. Placental origin of preeclampsia: Challenging the current hypothesis. Journal of the American Heart Association 2008; 5:970-975.
9. Roberts JM, Cooper DW. Pathogenesis and genetics of pre-eclampsia. Lancet 2001; 357: 53–56.
10. George EM, Granger JP. Recent insights into the pathophysiology of preeclampsia. Expert Rev Obstet Gynecol 2010; 5(5):557-566.
11. Roberts JM, Gammill HS. Preeclampsia: recent insights. Hypertension 2005; 46:1243–1249.
12. Hauth JC, Ewell MG, Levine RJ, Esterlitz JR, Sibai B, Curet LB, et al. Pregnancy outcomes in healthy nulliparas who developed hypertension: Calcium for Preeclampsia Prevention Study Group. Obstet Gynecol 2000; 95:24-28.
13. Navbir P, Alka N, Antima G. Histological changes in placentae in pregnancies complicated by pre-eclampsia and correlation with foetal outcome. Int J Pharm Bio Sci 2012; 3(2): 551-560.
14. Benirschke K. The placenta in the context of history and modern medical practice. Arch Pathol Lab Med 1991; 115:663-667.
15. Sudha R, Sivakumar V, Christilda FJ. Study of shape of placenta and its relation to placental weight in normal complicated pregnancies. National Journal of Basic Medical Sciences 2012; 2(4):307-311.
16. Baloch AH, Memon SF, Ansari AK. Comparison of placentae from hypertension associated pregnancies and normal pregnancies. JLUMHS 2012; 11(1):3-6.
17. Kishwara S, Ara S, Rayhan KA, Begum M. Morphological changes of placenta in pre-eclampsia. Bangladesh J Anat 2009; 7(1):49-54.
18. Queenan JT. Management of high risk pregnancy. Blackwell Science England 1999; 4:261-270.
19. Saeed I, Qamar K, Arshad H, Yasmeen L, Iqbal I, Noor U. Feto-placental weight relationship in normal pregnancy and pre-eclampsia. JRMC 2011; 15(1):53-55.
20. Sankar KD, Bhanu PS, Kiran S, Ramakrishna BA, Shanthi V. Vasculosyncytial membrane in relation to syncytial knots complicates the placenta in pre-eclampsia: a histomorphometrical study. Anat Cell Biol 2012; 45:86-91.
21. Manjunatha HK, Kishan parsad HL, Ramaswamy AS, Aravinda P, et al. Study of histomorphological changes in placenta in pregnancy induced hypertension. Int J Cur Res 2012; 2(1):255-258.
22. Nag U, Chakravarthy VK, Rao DR. Morphological changes in placenta of hypertensive pregnant women. IJRRMS 2013; 3(2):1-4.