

Original Research Article

A morphology and histological study of placenta in normal and diabetic pregnancies

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ABSTRACT

Background: The placenta is a vital organ for developing foetus, and it is also the most accessible organ of human body, pregnancy in a diabetogenic state by virtue of various physiological changes which cause insulin resistance. In normal pregnancy, glucose tolerance decreases by third trimester, though plasma levels of insulin increase. Aim was to study comparison of placenta of normal pregnancy with placenta of diabetic pregnancy and its possible outcome of pregnancy.

Methods: The present study was case-control and conducted on cases of 50 Specimens of placenta with intact umbilical cord were collected from the Department of Obstetrics and Gynecology.

Results: Variation in the shape and weight of the placenta were observed. The mean placenta weight in control group was found to be 452.80 grams with standard deviation 140.93 grams while in the case group; it was 406.00 grams with standard deviation of 210.31 grams. The random blood sugar of mother in control group was significantly higher than cases ($t=2.91$, $p<0.01$).

Conclusions: The present study shown that there was a tendency of increase in placental weight and weight of new born in complicated pregnancies as compared to the normal pregnancies. This indicated the earlier diagnosis and strict to treatment plan in diabetic pregnancies.

Keywords: Diameter, Gestational diabetes, Histology, Morphology, Pregnancies, Placenta

INTRODUCTION

The placenta is a vital organ for developing foetus, and it is also the most accessible organ of human body. After delivery if the placenta is examined minutely it provides much insight into the prenatal health of the baby and the mother. It is mirror of maternal and foetal status, it is a membranous vascular organ that develops in female mammals and mediates materno-foetal exchange. In humans it is developed from two sources-foetal and maternal. Pregnancy in a diabetogenic state by virtue of

various physiological changes which cause insulin resistance. In normal pregnancy, glucose tolerance decreases by third trimester, though plasma levels of insulin increase. Gestational diabetes mellitus. The placentae from class A (GDM) diabetic mothers might be expected to weigh about 600-900 grams.¹ Histological abnormalities such as the presence of nucleated fetal red blood cells, fibrinoid necrosis, villous immaturity and chorangiomas were observed more often in the diabetic placentae compared with control placentae.² GDM is defined as any degree of glucose intolerance with onset

or first recognition during pregnancy.³ In gestational diabetes usually there is delivery of large babies and large placentae.^{4,5} The mothers also have high risk of hypertensive disorder, abortion, still birth, preterm labour, puerperal sepsis etc. Infants born to mothers with glucose intolerance are at an increased risk of morbidity and mortality related to respiratory distress, growth abnormalities, hypoglycaemia and congenital malformations.⁶ The placenta of diabetic women tends to be heavier and paler due to villous oedema.⁷ The placenta of poorly controlled diabetic women is enlarged, thick, and plethoric.⁸

METHODS

This was a case-control study, A total of 50 subjects (25 normal fullterm pregnancies and 25 fullterm cases of pregnancy induced Diabetics) admitted in labour room in the Department of Obstetrics and Gynecology in Integral Institute of Medical Sciences and Research, Lucknow (UP) were included in the study after giving informed consent. Study was conducted in the Department of Anatomy, Integral Institute of Medical Sciences and Research, Lucknow (UP) Lucknow, in which the shape and weight of placenta were recorded and photographed.

Inclusion criteria

Singleton pregnancy, Maternal age between 22 -35 Year, Diabetes mellitus, Prematurity, Post maturity. In the collected placenta these following parameters were studied: weight of placenta, maximum diameter of placenta, right angle to maximum diameter of placenta, shape of placenta.

Exclusion criteria

Exclusion criteria includes Rh-isoimmunisation, Cardiac disease, Renal disorders, Rhesus incompatibility.

Placenta was collected from primary and multi gravida mothers, both from normal and diabetic pregnancies. Just after delivery all the placenta were collected in a clean tray. The membranes and cord at their attachment to the placenta were cut off. The placenta was gently expressed so as to remove its blood content and then washed thoroughly under tap water, mopped with dry cotton pad. The specimen was transported to the department of anatomy in formalin (10%) filled containers.

Histology

For histological examination, whole-thickness placental section was taken from the central and one from the peripheral part of each placenta, fixed in 10% formol-saline for 3-4 days and routinely processed for histology. 5µm thick sections was stained with haematoxylin and eosin and examined under a light microscope at different magnifications to analyse the basal plate, amnion, chorionic plate, chorionic villi and intervillous spaces.

RESULTS

The weight of placenta in normal cases was ranged between 312gm to 592gm, whereas in cases of pregnancy induced Diabetes it ranged between 196gm to 616gm. The measurements were noted, categorized and then tabulated (Table 1). The mean weight was calculated and compared in both groups. The difference in mean weight in two groups was statistically significant.

Table 1: Maternal parameters in normal pregnancy and diabetic pregnancy.

Study variable	Normal (n=25)	Diabetic (n=25)	p-value
Age of mother (in years)	27.04±3.22	27.40±27.40	0.71
Weight of mother (kg)	59.80±7.74	60.40±5.28	0.75

Table 2: Comparison of morphometric parameters between normal pregnant women and diabetic pregnant women.

Study variable	Normal (n=25)	Diabetic (n=25)	p-value
Weight of placenta (gm)	452.80±140.93	406.00±210.31	0.36
Placenta diameter (cm)	18.02±2.40	18.09±2.50	0.92
Right angle to maximum diameter of placenta (cm)	14.22±1.84	14.53±2.51	0.63



Figure 1: Measure meant of weighting of placenta.

Table 2 and Figure 1 shows the comparison of weight of placenta in diabetic pregnancy and normal pregnancy the mean placenta weight in normal group was found to be 452.80gram with standard deviation 140.93gram while in diabetic, it was 406.00gram with standard deviation 210.31gram. The difference in placenta weight between Normal group and diabetic group was not statistically significant (t=0.92, p=0.36). Table 2 also shows the

comparison of diameter of placenta in normal pregnancy and diabetic pregnancy. The mean placenta diameter in normal group was 18.02cm with standard deviation 2.40gram while in diabetic it was 18.09cm with standard deviation 2.50cm. The difference in placenta weight between Normal group and diabetic group was not statistically significant ($t=-0.10$, $p=0.92$). Table 2 and Figure 2 shows the comparison of right angle to maximum diameter of placenta in diabetic pregnancy and normal pregnancy. The mean right angle to maximum diameter of placenta in normal was 14.22cm (± 1.84) and in diabetic 14.53cm (± 2.51). The difference in right angle to maximum diameter of placenta in diabetic pregnancy and normal pregnancy was not statistically significant ($t=-0.48$, $p=0.63$).

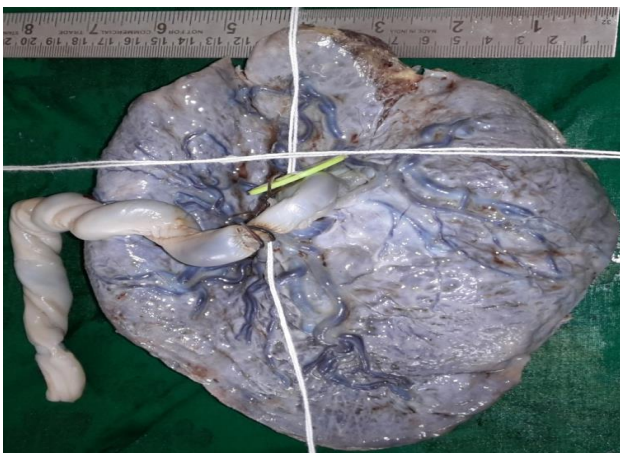


Figure 2: Measurement of placental diameter and right angle to maximum diameter of placenta.

Table 3: Distribution of shape of placenta in normal and diabetic pregnant women.

Shape of placenta	Normal (n=25)		Diabetic (n=25)		p-value ¹
	No.	%	No.	%	
Circular	9	36.0	12	48.0	0.59
Heart	2	8.0	4	16.0	
Irregular	3	12.0	3	12.0	
Kidney	3	12.0	2	8.0	
Oval	6	24.0	4	16.0	
Round	2	8.0	0	0.0	

Table 3 and Figure 3 depicts the distribution of different shape of placenta in diabetic pregnancy and normal pregnancy. The majority placenta shape was circular in both normal pregnancy and diabetic pregnancy. Further, statistical analysis showed that types of pregnancy had no association with shape of placenta (Chi Square =3.69, $p=0.59$).

Shows the that types of pregnancy were not associated with gender of baby (Chi square =2.03, $p=1.56$), the Table 5 also shows the weight of baby in diabetic pregnancy and normal pregnancy group. The weight of

baby in normal pregnancy group was found to be lower in Normal pregnancy than diabetic pregnancy ($t=-2.57$, $p<0.05$).



Figure 3: The Circular shape of placenta in both normal pregnancy and diabetic pregnancy.

Histology

The histological features remarked were syncytial knots cytotrophoblastic cell proliferation, fibrinoid necrosis, fibrosis of villous stroma, calcified and hyalinised spots within villi. Calcifications appeared as intracellular as well as extracellular basophilic deposits when stained with haematoxylin and eosin. Hyalinisation of villi appeared as an acellular, avascular, homogeneous area within villi. Also, endothelial proliferation and fibromuscular sclerosis of stem arteries and the presence of Hofbauer cells were noted. These features were seen in both groups of placentae, but their frequency was higher in the diabetic group.

DISCUSSION

In the present study, an attempt was made to study the morphometri of placenta in normal verses diabetic pregnancies among hospital deliveries. Placenta is the most accurate record of the infant's prenatal experience. In the present study, the general characteristics of placenta in normal pregnancies, gestational diabetes's mellitus pregnancies were studied, and we also represented their inter relationships by correlation matrix. In this study, the age and weight of the cases and controls were similar showing the comparability of both groups.

Gestational diabetes is multitude metabolic derangement which has profound effects on both mother and baby. Prevalence of GDM is about 2-5% of all pregnancies.⁹ People with GDM have more morbidity than normal pregnancies.¹⁰ Uncontrolled GDM causes several pathological structural and functional changes leading to decreased exchange capacity between mother and fetus, fetal anoxia.¹¹ In the present study, out of the total 25 cases, 32% were gestational diabetes mellitus (GDM).

Normal placental findings are difficult to define and differentiate from the abnormal, because structure of the placenta is complex, and evolution is rapid. Fox and Neil suggested that placental pathology is quantitative rather than qualitative. Benirschke et al, stressed the significance of placental findings only when these had a bearing on the fetal outcome.

The weight of placenta is an important and functionally significant parameter to villous area and fetal metabolism. In this study, the difference in placenta weight between control group and cases group was not statistically significant. This is in contrast to the other studies in which there was significant difference in the placenta weight between cases and controls.¹² This might be due to that these studied were conducted mostly in urban setting and in the present setting, most of cases were from rural areas.

The majority of placenta was circular in both control and cases. There was significance difference in the baby birth weight among diabetic pregnancy. The difference in the placenta weight was also statistically significant in diabetic pregnancy. The diameter of placenta is significantly positively associated with weight of placenta and weight of baby. The weight of placenta is significantly positive correlation with weight of baby.

CONCLUSION

The present study was concluded that there was tendency of discus in placental weight and weigh of new born in diabetic pregnancy as compared to the normal pregnancies. This indicated the need of early diagnosis and strict compliance of treatment plan in diabetic pregnancy so as to decrees the morbidity and mortality.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Saha S, Biswas S, Mitra D, Adhikari A, Saha C. Histologic and morphometric study of human placenta in gestational diabetes mellitus. Ital J Anat Embryol. 2014 Jan 1;119(1):1.
2. Evers IM. Placental pathology in women with type 1 diabetes and in a control group with normal and

- large-for-gestational-age infants. Placenta. J of Obst and Gynaec. 2003;24:819-25.
3. Van Katwijk C, Peeters LL. Clinical aspects of pregnancy after the age of 35 years: a review of the literature. Human reproduction update. 1998 Mar 1;4(2):185-94.
4. Saha S, Biswas S, Mitra D, Adhikari A, Saha C. Histologic and morphometric study of human placenta in gestational diabetes mellitus. Ital J Anat Embryol. 2014 Jan 1;119(1):1.
5. Lao TT, Lee CP, Wong WM. Placental weight to birthweight ratio is increased in mild gestational glucose intolerance. Placenta. 1997 Mar 1;18(2-3):227-30.
6. Saha S, Biswas S, Mitra D, Adhikari A, Saha C. Histologic and morphometric study of human placenta in gestational diabetes mellitus. Ital J Anat Embryol. 2014 Jan 1;119(1):1.
7. Thomson AM, Billewicz WZ, Hytten FE. The weight of the placenta in relation to birthweight. BJOG: An International J Obstetrics & Gynaecology. 1969 Oct 1;76(10):865-72.
8. De Falco S. The discovery of placenta growth factor and its biological activity. Experimental & molecular medicine. 2012 Jan;44(1):1.
9. Crowther CA, Hiller JE, Moss JR, McPhee AJ, Jeffries WS, Robinson JS. Effect of treatment of gestational diabetes mellitus on pregnancy outcomes. N Engl J Med. 2005 Jun 16;352(24):2477-86.
10. Platt MJ, Stanisstreet M, Casson IF, Howard CV, Walkinshaw S, Pennycook S, et al. St Vincent's Declaration 10 years on: outcomes of diabetic pregnancies. Diabetic Medicine. 2002 Mar 1;19(3):216-20.
11. Evers IM. Placental pathology in women with type 1 diabetes and in a control group with normal and large-for-gestational-age infants. Placenta. J of Obst and Gynaec. 2003;24:819-25.
12. Udainia A, Jain ML. Morphological study of placenta in pregnancy induced hypertension with its clinical relevance. J Anat Soc India. 2001;50(1):24-7.

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