ORIGINAL ARTICLE

Placental Morphology And Feto-Maternal Outcomes In Gestational Diabetes

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ABSTRACT:

Objective: To observe the placental morphology and feto- maternal outcomes in patients having gestational diabetes mellitus.

Materials and Methods: In this descriptive pilot study placentae were collected from 20 patients having gestational diabetes. They received oral and or parenteral drugs along with diet control and exercise during pregnancy. After verbal informed consent of the patients, placentae were collected within 30-40 minutes of delivery and preserved in formalin. Gross examination was done including weight, size consistency of placental tissue, attachment, size and color of the cord, membranes complete or incomplete, retro-placental hemorrhages and any other gross abnormality in the placental tissue. Weight and health of the baby and mode of delivery were observed as determinants of fetal and maternal outcome.

Results: Mean placental size was 18.3±3.22 cm and 14.2±2.14 cm in two dimensions with mean placental width of 2.4±0.94 cm. Mean placental weight was 680± 122.9 grams, mean cord length was 19.55±7.22 cm and mean cord width 1.17±0.51cm. Out of 20 placentae, 13 placentae were disc shaped, 19 placentae were soft in consistency, 8 were blue in color, 7 had central insertion of umbilical cord, 14 had complete membranes and 16 had other gross pathologies such as hemorrhages, fibrinoid necrosis etc. Weight of the baby was 3.4±0.38 kg. There was 1 intrauterine death and out of 20 patients 13 had cesarean deliveries.

Conclusion: Gross morphology of placenta exhibited deformities with adverse fetal and maternal outcomes in patients with gestational diabetes mellitus

Key words: Gestational Diabetes Mellitus, Placenta, Placental morphology, Fetal outcome, Maternal outcome

INTRODUCTION:

Gestational diabetes is the type of diabetes that occurs in pregnancy. According to WHO criteria, females with pregnancy beyond first trimester having FBS equals to or more than 5.5 mmol/l(100mg/dl) and post prandial glucose levels greater than 7 mmol/l (126mg/dl) are diagnosed as having gestational diabetes mellitus (GDM).[1,2] Pregnancy is a potentially glucose intolerant condition and in all pregnancies insulin sensitivity decreases as the pregnancy advances predisposing the females to develop GDM.[3]

The prevalence of GDM is on the verge of rising, from 1995 to 2005, it is documented to have increased by 45% overall, that is from 3.0 to 4.4% worldwide. Women in South Asia are documented to be at the highest risk to develop GDM.[4, 5] It is seen in approximately 3-9% of pregnancies

Placenta plays an important role in fetal nutrition and growth as it is concern with supply of oxygen, nutrients, immunoglobins and also releases multiple hormones for the continuation of pregnancy.[6] It is a connecting unit between mother and the fetus thus provides the information regarding infants prenatal experiences[7]. Human placenta has a complex vascular system that allows exchange of different materials with fetal and maternal blood.[8] The successful development, growth and maturity of feto-placental vessels are important for normal fetal growth and survival.[9]

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Received: January 1, 2014
Revised: January 25,2014
Accepted: February 7, 2014

As glucose in the blood can cross placenta, the fetus gets exposed to hyperglycemic blood coming from the diabetic mother through umbilical cord. By the end of 12th week of gestation, fetal pancreas takes over the function of production and release of insulin[10]. Insulin is a very important metabolic hormone. It is necessary for proper entry and utilization of glucose in the cell. As large amount of glucose enter the fetal blood, excessive production of insulin occurs from fetal pancreas. Thus large amount of glucose gets stored in the form of glycogen in the cell, resulting in macrosomic babies and multiple complications. Hyper-insulinemia in utero affects fetus as well as placenta. [11]

Thus any metabolic change as in Gestational Diabetes Mellitus in maternal blood can affect placental morphology and functioning.[12] It is said that early diagnosis and prompt treatment of GDM females is very important so as to avoid multiple obstetric complications and adverse maternal and fetal outcomes such as cesarean section due to macrosomic babies, fetal distress,congenital abnormalities, respiratory distress syndrome, hyperbilirubinemia, polycythemia, and at times unexplained term intrauterine death and still births [13]. This study was carried out to observe thegross morphology of placentaand feto-maternal outcomein patients having gestational diabetes mellitus receiving oral and or parenteral therapy along with diet control and exercise.

MATERIALS AND METHODS:

This descriptive pilot study was carried out in June-July 2010,at Lyari General Hospital and Mamji Hospital, Karachi following approval by IRB and ERB of DowUniversity of Health Sciences, Karachi as a part to fulfill the requirement of M Phil.Verbal informed consent was taken and after delivery 20 placentae were collected from the GDM patients who received oral and

or parenteral treatment with diet control and exercise during pregnancy.The placentae were preserved in 10% formalin within 30-40 minutes of delivery.Placental gross findings were documented on a predesigned data form including name, age, weight and height of the patient, weight, size consistency of placental tissue, attachment, size and color of the cord, membranes complete or incomplete, retroplacental hemorrhages and any other gross abnormality in the placental tissue.Fetal and maternal outcome were observed by determinants as fetal health and weight and mode of delivery respectively.Data was evaluated by using SPSS version16.

RESULTS:

Mean patients age was 32.45±4.51years, mean patient weight was 80.62±5.83grams. Fasting and random blood sugar level were 115±35.1 mg/dl and 252±65.97 mg/dl respectively. (Table 1) Mean placental sizewas 18.3±3.22 cm and 14.2±2.14 cm in two dimensions with mean placental width of 2.4±0.94 cm. Mean placental weight was 680± 122.9 grams, mean cord length was 19.55±7.22 cm and mean cord width 1.17±0.51cm (Table 2a)Out of 20 placentae, 13 placentae were disc shaped, 19 placentae were soft in consistency, 8 were blue in color, 7 had central insertion of umbilical cord, 14 had complete membranes and 16 had other gross pathologies such as hemorrhages, fibrinoid necrosis etc. (Table 2b)Weight of the baby was 3.4±0.38 kg. There was 1 intrauterine death and out of 20 patients 13 had cesarean deliveries. (Table 3).

TABLE 1
MATERNAL CHARACTERISTICS
N=20

VARABLES	Mean± SD
Patient age (years)	32.45±4.51
Patient weight (kg)	80.62±5.83
FBS at the time of enrollment	115±35.1
RBS at the time of enrollment	252±65.97

TABLE 2a
GROSS EXAMINATION OF DIABETIC PLACENTA
N=20

Placental Variables	Mean ±SD
Placental size1(cm)	18.30±3.22
Placental size2(cm)	14.2±2.14
Placental width(cm)	2.4±0.94
Placental weight(gm)	680±122.9
Cord length(cm)	19.55±7.22
Cord width(cm)	1.17±0.51

TABLE 2b
GROSS EXAMINATION OF DIABETIC PLACENTA
N=20

Placental Variables	Number
Placental shape	
Disc-like	13
Non-disc like	7
Placental consistency	
Soft	19
Hard	1
Cord color	
Blue	8
Pale	12
Cord insertion	
central	7
peripheral	13
Membranes	
Complete	14
Incomplete	6
Gross deformity:	
Present	16
Absent	4

TABLE 3
FETAL AND MATERNAL OUTCOME
N=20

Weight of the baby (kg):	3.43±0.38
Condition of the baby	
Alive baby	19
IUD	1
Still births	0
Mode of delivery	
Normal vaginal	5
Assisted deliveries	2
Cesarean section	13

DISCUSSION:

Gestational diabetes is any degree of glucose intolerance that occurs in pregnant females after 1st trimester of pregnancy. Gestational diabetes is said to produce changes in placenta as placental tissues are liable to change with maternal metabolic issues.

In our results, patients mean age and weight were 32.45±4.51 years and 80.62±5.83kg respectively. Debelle took the similar gestational diabetics patients for her study[14]

Our results have shown that placental size and weight in GDM females 18.3×14.2cm and 694gms respectively. Kucuk had stated the same in his research that placental weight and size was 18 cm and weight 694 grams in GDM females and this is coinciding to our results[15]. These results also coincide with the work of Ashfaq[16] and Akhter[17] with similar diabetic placentae weight, central thickness and diameter and the results of both these studies are in favor of our findings.

Yalter has documented that in normal pregnancyan average placental length is 22 cm (9 inch) and width is 2-2.5 cm (0.8-1 inch). It typically weighs approximately 500 grams (1 lb). It has a pale, dark reddish or maroon color. It is connected to the fetus by an umbilical cord of approximately 55-60 cm (22-24 inch) in length that contains two arteries and one vein.[18] Placentae in our study had weight much higher than described by Yalter indicating that they were not normal.Umbilical cord length and thickness depends on the amount of whartson jelly present and the vessels luminal diameter.The results described by Predanicare in concurrence with our findings of placental cords length and thickness.[19]

Verma has discussed about major gross examination of placentae including membrane completeness, placental shape, consistency, cord insertion, cord color and gross pathologies such as fibrinoid necrosis and hemorrhages and the results are similar to ours [20] Villous fibrinoid necrosis is an established old coagulative infarcted tissue with fibrin deposition which probably is derived from plasma and has leaked out of necrotic villi. Villous necrosis was present in 16(80%) GDM placentae. It has been noticed that massive fibrin deposition can lead to fetal growth restriction and fetal death[21,22]. Tewari stated the similar figures (80%) regarding fibrinoid necrosis in diabetic placentae[23]

Fetal hyper-insulinemia had direct and indirect effects on placental tissue probably producing excessive growth and increase in placental weight. Increased placental volume compensates the need of growing babies to an extent and after that state of hypoxia generates leading to adverse fetal and maternal outcomes, even at times unexplained termed intrauterine deaths.[24]

When fetal outcomes were compared, it was seen that babies were good weight i.e3.43kgs which is similar to the fetal outcomes documented by Odar. The normal reference rang for a term baby at 97th percentile is 3.23kgs [25]. This shows that babies of our GDM females were heavier than documented facts. The reason behind thismight be the hyper-insulinemic state of the fetus affecting both the placental and fetal growth[26]. Jansson described that probably excessive fetal growth is the result of increase in substrate availability which stimulates fetal insulin secretion and its growth. Finally in diabetic pregnancies, the defect lies in altered placental nutrient transport and metabolism.[27]

In our study, cesarean section rate was high (65%). Goldman has stated the same with probable reason of increased fetal weight in GDM group.[28]

There was 1 intrauterine death out of 20 fetuses that is 5%.Excessive growth of fetus which increases the oxygen demands could be responsible for this outcome. It has been documented that placenta tries to compensate this to an extent but when the baby is grown enough and is near term, it cannot fulfill the requirements of fetus resulting in unexplained term intrauterine death in these patients.Gaunter has stated the same and his results are coinciding with our findings [29, 30]

CONCLUSION:

Gross morphology of placenta exhibited multiple deformities with adverse fetal and maternal outcomes. Future studies regarding placental and feto-maternal outcome should be undertaken to evaluate and compare the specific effects of drug.

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