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A study on the morphology and the morphometry of the human placenta and its clinical significance in rural population in Eastern India

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ABSTRACT

Background: The placenta is a dynamic organ which is unique in its development and functions. It is the only organ in the body which is derived from two separate individuals, the mother and the fetus. The aim of the present study was to study the morphology, morphometry, and site of umbilical cord insertion in the placenta of women with normal, hypertensive, and diabetic pregnant women. **Materials and Methods:** A total number of 150 cases were included in this study. **Results:** In our study, we found that hypertensive placentae tend to be slightly smaller in size, weight, volume, area, thickness, diameter, circumference, and feto-placental ratio than normal placentae, but the parameters were found to be significantly greater than that of normal placentae in case of diabetic placentae. **Conclusion:** An adequate knowledge of the morphometry of the placenta and its clinical relevance can prove to be valuable in the early assessment of the fetal well-being.

Key words: Feto-placental ratio, morphology, morphometry, outcome, placenta

INTRODUCTION

Placenta is membranous vascular organ that develops in female mammals from the chorion of the embryo and decidua basalis of maternal uterus and connects the fetus with maternal wall that facilitates nutrient and gas exchange between the maternal and fetal compartments.[1]

It has a rough, shaggy looking maternal surface, which is mapped out in 15–20 cotyledons separated by intervillous septae and a smooth, shiny fetal surface covered by chorion and amnion, with the insertion of umbilical cord either centrally, marginally, or eccentrally.[2]

In conclusion, it will be of great clinical importance since if the variations in dimensions such as weight, volume, thickness, diameter, and area of placentas are studied along with the birth weight, birth length of babies, and neonatal complications if any and a relation established between the placental and fetal parameters. This study will serve greatly the interest of both the mother and her baby. The information gathered by this study will certainly help obstetricians and pediatricians to take further precautions before, during, and after labor to modify the course of pregnancy as well as the perinatal outcome.

The aim and objectives of the present study were as follows:

1. Study of the morphology, morphometry, and site of umbilical cord insertion in the placenta of women with normal pregnancy.
2. Study of the morphology, morphometry, and site of umbilical cord insertion in the placenta of women with:
   - Hypertension-pregnancy induced or chronic hypertension aggravated by pregnancy.
   - Diabetes-gestational diabetes and overt diabetes mellitus.
3. Correlation of the changes observed in morphology, morphometric measurements, and sites of umbilical cord insertion with the perinatal outcome.

MATERIALS AND METHODS

After acquiring local ethical approval and informed patient consent, the materials of the present study, i.e., placentae were collected at random from pregnancy cases attending the Department of Obstetrics and Gynaecology at MGM Medical College and LSK Hospital, Kishanganj, Bihar, during the period from January 2012 to December 2012.

Selection of Cases

A total number of 150 cases were included in this study. All the cases included in this study were booked cases. In each case, antenatal checkup was done routinely. The cases were then divided into three main groups:

A. Pregnancy cases without any complication = 50

Normal pregnancy

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B. Pregnancy cases with pregnancy-induced hypertension (PIH) = 50
C. Pregnancy cases with gestational diabetes = 50

Each group comprised of patients having known last menstrual period, expected date of delivery, blood pressure, blood sugar levels, and gestational period ranging from 36 to 40 weeks. In each case, antenatal record having patient's name, identification, age, parity, height, and weight was recorded.

Method of Study

Clinical studies were done during pregnancy as well as in labor and postpartum period. At labor room, placentae were collected as fresh specimen after delivery and then examination was carried out in the following way: Morphological and morphometrical.

Morphological Study

Following facts were kept in mind while examining the gross anatomical features of placenta.[3-5]

1. Placental completeness - placental completeness is very important in labor room. If some amount of placental tissue is missing, then it may be suspected that there is retention of placenta. Retention of placenta is mostly associated with postpartum hemorrhage and subsequent infection.
2. Placental shape - most commonly placentae are either circular or ovoid in shape. It may also be irregular in shape. There may be the presence of accessory or succenturiate lobe of placenta.
3. Placental consistency - whether it is soft or firm or friable to touch.
4. Placental parenchyma - it is diffusely soft, but thickened placenta may represent pre-existing infection to mother. A thick ring of membranes on the fetal surface of placenta indicates circumvallate placenta which is often associated with prematurity, multiparity, and abruptio placentae. Placenta may have fibrin deposits or infracted zones. Fibrin deposits appear grayish or yellowish, whereas infracts if fresh are red but turn grayish when they are old or long-standing ones. In a term infant without anemia, the maternal surface should be dark maroon colored. In case of preterm, it is pale and lighter in color. Hence, pallor of maternal surface of placenta indicates fetal hemorrhage and anemia.
5. Umbilical cord insertion - cord may be inserted centrally, eccentrally, or marginally or velamentous insertion of cord may also be seen.

Morphometric Study[3,4]

Weight

At first, an empty plastic container was weighed on electronic scale used for weighing baby in the labor room. Then, the freshly collected placenta was weighed after placing it in that container on the same scale. The weight of placenta was obtained by subtracting the weight of the container from the reading.

Volume

The volume of the placenta was estimated by the water displacement method. One 3 L graduated plastic bucket was taken and filled with 2 L of water. The placenta was then immersed into the water of the bucket. The increase in the volume of water in the bucket was the volume of placenta.

Thickness

A thin long graduated needle was inserted into the placenta, first one at the center, second one at the margin, and third one at the midway between the center and the margin. Average of the three reading is the placental thickness.

Diameter

The diameter of placenta was measured with a measuring tape twice. The average of maximum and minimum diameter is the diameter of the placenta.

Area

The placental area was estimated by the following formula:

$$\pi \times \frac{(\text{Maximum diameter (cm)}}{2} \times \frac{\text{Minimum diameter (cm)}}{2}$$

Or 3.14 × r1 × r2

[r1=maximum diameter; r2=minimum diameter]

Circumference

Circumference was calculated by the following formula:

$$\pi \times \frac{\text{maximum + minimum diameter (cm)}}{2}$$

Or $$3.14 \times \frac{\text{Average diameter}}{2}$$

Cord insertion percentage/site

The minimum distance of the site of cord insertion and the margin of the placenta was measured and denoted as "x." Assuming the placenta to be a perfect circle, the mean radius "r" was obtained and then the insertion percentage = x/r × 100.

A low insertion percentage indicates marginal insertion, while high value indicated centrally inserted cord.

According to this calculation, placenta was divided into four groups:[3,4]

I. Central cord insertion (76–100 insertion percentage)
II. Medial cord insertion (51–75 insertion percentage)
III. Lateral cord insertion (26–50 insertion percentage)
IV. Marginal cord insertion (0–25 insertion percentage)

Examination of the Baby

The time and mode of delivery were noted in each case. Live-born or stillborn baby was also noted. The birth weight, Apgar score, sex, and length of the baby were noted in the labor room. Determination of feto-placental ratio (FPR): In each case, the ratio was calculated by dividing the baby's birth weight by placental weight and this was also recorded.

RESULTS

The collected placentae (for study) were divided into three groups [Table 1]:
Group A: Normal uncomplicated pregnancy
Group B: Pregnancy associated with pregnancy-induced hypertension
Group C: Pregnancy associated with diabetes mellitus

The cases were divided into three groups.

Mother included in this study was from different age groups starting from 19 to 38 years. Percentage of participants in age groups of 19–24 years, 25–30 years, and 31–38 years was 30%, 46.66%, and 23.33%, respectively [Table 2]. They were divided into three groups.

Majority of the study subjects 60 (40%) were between 50 and 59 kg followed by 33.33% in 60–69 kg category [Table 3]. Mean gestational age in normal, hypertensive, and diabetic groups was 38.4, 36.1, and 37 weeks, respectively.

FPR

The greatest calculated FPR recorded in our studies was 6.69, and least FPR recorded was 5.2 with an average of 5.96. From Table 7, we got the insertion of umbilical cord on the fetal surface of placentae in normal, hypertensive, and diabetics mothers. In normal pregnancy groups, 50 placentae were studied, of which 15 (30%) had central type insertion, 16 (32%) had medial, 3 (6%) had lateral type, and 16 (32%) had marginal type of cord insertion [Figure 1].

In hypertensive pregnancy groups, 50 placentae were studied, of which 16 (32%) had central type, 13 (26%) had medial type, 2 (4%) had lateral type, and 19 (38%) had marginal type of cord insertion [Table 8].

In diabetic pregnancy groups, 50 placentae were recorded, of which 10 (20%) had central type, 20(40%) had medial type, 5 (10%) had lateral type, and 15 (30%) had marginal type of cord insertion [Table 9]. In the overall 150 cases, 41 (27.33%) had central type of cord insertion, 49 (32.66%) had medial type of cord insertion, 10 (6.66%) had lateral cord insertion, and 50 (33.33%) had marginal type of cord insertion. Hence, we come to the conclusion that marginal and medial types are more common [Tables 10 and 11].

Table 1: Division of different groups in the present study

Groups	Case types	Case no	Percentage
Group A	Normal	50	33.33
Group B	Hypertensive	50	33.33
Group C	Diabetic	50	33.33

Table 2: Age distribution of study participants

Groups	Age range	Number of mothers (%)
Group A	19–24	45 (30)
Group B	25–30	70 (46.66)
Group C	31–38	35 (23.33)

Table 3: Body weights of the mother among three study groups

Groups	Weight range	Number of mothers (%)
Group A	50–59 kg	60 (40)
Group B	60–69 kg	50 (33.33)
Group C	70–80 kg	40 (26.66)

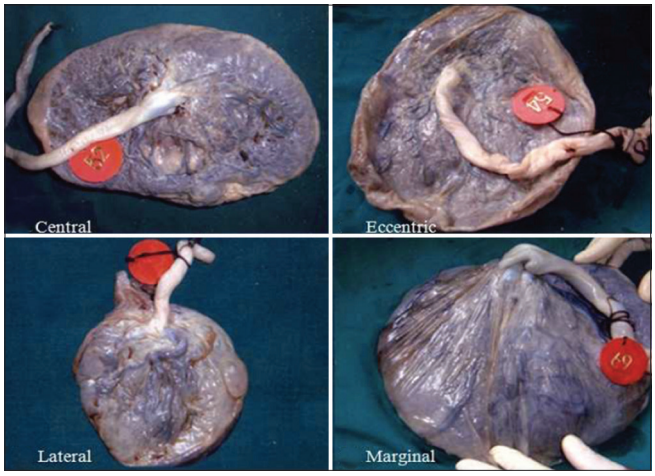

Figure 1: Different sites of umbilical cord insertion[19]

DISCUSSSION

The present study was carried out in the Department of Anatomy as well as in the Department of Obstetrics and Gynecology, MGM Medical College and LSK Hospital, over a period of 1 year (from January 2012 to December 2012). Subjects of this study were selected at random from mothers attending antenatal clinic and also coming for delivery at the Department of Obstetrics and Gynecology. For the purpose of this research works, 150 cases of placentae were collected from the labor room and operation theater as well. Of these specimens, 50 were collected from normal uncomplicated pregnancy cases, 50 from cases complicated by hypertension, and remaining 50 cases were complicated by gestational diabetes mellitus. About 33.33% of the total cases were from normal pregnancy group (50) and 33.33%, and of total cases, each was from hypertensive and diabetic mothers (50 cases in each group).

In our study, youngest mother was 19 years and oldest mother was 38 years. In 19–24 years of age group, 45 (30%) mothers; in 25–30 years of age group, 70 (46.66%) mothers; and in 31–38 years of age group, 35 (23.33%) mothers were included in this study. Hence, we find maximum number of cases in 25–30 years of age groups. Body weight observed great variation with maximum 80 kg and minimum 50 kg, 60 mothers (40% cases) ranges between 50 and 59 kg, 50 mothers (33.33% cases) ranges between 60 and 69 kg, and 40 mothers (26.66%) ranges between 70 and 80 kg.

Normal Pregnancy Cases

Placental weight

Placental weight may become the single most important factor in determining the fetal maturity. In this study, the mean placental weight seen in case of normal pregnancy series was 510.1 g with a maximum weight of 570 g and a minimum weight of 340 g. This finding is similar to the findings of Gunapriya *et al.* (2011)[6] [Table 4] who studied the morphology and morphometry of placenta and its clinical relevance in a population in Tamil Nadu.They studied 101 placentae and were found average weight of placenta 528.55 g.

Placental volume

In normal case studies, the maximum volume of placenta was 515 cc and minimum 300 cc with an average of 431.84 cc [Table 4].

Table 4: Placental morphometry in case of normal uncomplicated pregnancies along with birth weight and feto-placental ratio

Total number of normal pregnancies	Placental parameters	Maximum	Minimum	Average
50	Placental weight (g)	570	340	510.1
	Placental volume (cc)	515	300	431.84
	Placental area (sq cm)	211.2	112.2	183.65
	Placental thickness (cm)	2.2	0.9	1.68
	Placental diameter (cm)	17.6	12	15.44
	Placental circumference (cm)	55.4	37	48.36
	Birth weight of baby (kg)	3	1.7	2.58
	Feto-placental ratio	5.76	4.76	5.07

Table 5: Placental morphometry in case of pregnancy with hypertension, along with birth weight and feto-placental ratio

Total number of hypertensive pregnancies	Placental parameters	Maximum	Minimum	Average
50	Placental weight (g)	560	395	493.18
	Placental volume (cc)	510	310	406.8
	Placental area (cm^2)	251	105.5	179.54
	Placental thickness (cm)	2	0.9	1.54
	Placental diameter (cm)	18	11.4	15.08
	Placental circumference (cm)	55.1	35.2	46.58
	Birth weight of baby (kg)	2.55	1.6	2.37
	Feto-placental ratio	5.67	4	4.82

Table 6: Placental morphometry in case of pregnancy with diabetes along with birth weight and feto-placental ratio

Total number of diabetic cases	Placental parameters	Maximum	Minimum	Average
50	Placental weight (g)	670	500	577.9
	Placental volume (cc)	565	410	494.1
	Placental area (cm^2)	265.5	167.5	219.3
	Placental thickness (cm)	3.1	1.6	2.32
	Placental diameter (cm)	18.5	14.7	16.74
	Placental circumference (cm)	59	44.61	52.06
	Birth weight of baby (kg)	3.9	2.9	3.44
	Feto-placental ratio	6.69	5.2	5.96

Table 7: Number of cases in each group with percentages in relation to insertion of umbilical cord on the fetal surface

Number of cases in group	Central type 76–100%	Eccentric type		
		Medial type 51–75%	Lateral type 26–50%	Marginal type 0–25%
Normal 50 cases	15 (30)	16 (32)	3 (6)	16 (32)
Hypertensive 50 cases	16 (32)	13 (26)	2 (4)	19 (38)
Diabetic 50 cases	10 (20)	20 (40)	5 (10)	15 (30)
Total=150 cases	41 (27.33)	49 (32.66)	10 (6.66)	50 (33.33)

This value is slightly higher than the value observed by Aherne and Dunhill (1966).[7]

Placental area

Maximum placental area was recorded in our studies was 211.02 sq.cc, and minimum was 112.02 sq.cc, with an average of 183.65 sq.cc. This value is slightly lower than the value observed by Younoszai and Howorth (1969).[8]

Placental thickness

In our studies, maximum thickness of placenta was observed 2.2 cm and minimum thickness was 0.9 cm with an average of

Table 8: Comparison between normal and hypertensive mothers

Placental parameters	Normal cases	Hypertensive cases	*P* value	Comments
Placental weight (g)	510.1	493.18	0.164	IS
Placental volume (cc)	431.84	406.8	0.789	IS
Placental area (cm^2)	183.65	179.54	0.632	IS
Placental thickness (cm)	1.68	1.54	0.211	IS
Placental diameter (cm)	15.44	15.08	0.694	IS
Placental circumference (cm)	48.36	46.58	0.704	IS
Birth weight of baby (kg)	2.58	2.37	0.001	HS
Feto-placental ratio	5.07	4.82	0.003	S

HS: Highly significant, S: Significant, IS: Insignificant

Table 9: Comparison between normal and diabetics mothers

Placental parameters	Normal cases	Diabetic cases	*P* value	Comments
Placental weight (g)	510.1	577.9	0.001	HS
Placental volume (cc)	431.84	494.1	0.001	HS
Placental area (cm^2)	183.65	219.3	0.004	HS
Placental thickness (cm)	1.68	2.32	0.001	HS
Placental diameter (cm)	15.44	16.74	0.025	HS
Placental circumference (cm)	48.36	52.06	0.001	HS
Birth weight of baby (kg)	2.58	3.44	0.001	HS
Feto-placental ratio	5.07	5.96	0.001	HS

HS: Highly significant

Table 10: Comparison between hypertensive and diabetic mothers

Placental parameters	Hypertensive cases	Diabetic cases	*P* value	Comments
Placental weight (g)	493.18	577.9	0.001	HS
Placental volume (cc)	406.8	494.1	0.001	HS
Placental area (cm^2)	179.54	219.3	0.002	HS
Placental thickness (cm)	1.54	2.32	0.001	HS
Placental diameter (cm)	15.08	16.74	0.01	HS
Placental circumference (cm)	46.58	52.06	0.01	HS
Birth weight of baby (kg)	2.37	3.44	0.001	HS
Feto placental ratio	4.82	5.96	0.001	HS

HS: Highly significant

Table 11: Comparison between normal, diabetic and hypertensive cases

Placental parameters	Normal cases	Hypertensive cases	Diabetic cases	*P* value	Comments
Placental weight (g)	510.1	493.18	577.9	<0.001	HS
Placental volume (cc)	431.84	406.8	494.1	<0.001	HS
Placental area (cm^2)	183.65	179.54	219.3	<0.003	HS
Placental thickness (cm)	1.68	1.54	2.32	<0.001	HS
Placental diameter (cm)	15.44	15.08	16.74	<0.018	HS
Placental circumference (cm)	48.36	46.58	52.06	<0.019	HS
Birth weight of baby (kg)	2.58	2.37	3.44	<0.001	HS
Feto-placental ratio	5.07	4.82	5.96	<0.001	HS

HS: Highly significant

1.68 cm. This value is also slightly lower than that of the value observed by Younoszai and Haworth (1969).[8]

Placental diameter

In our cases, the maximum diameter was observed 17.6 cm and minimum was 12 cm with an average of 15.44 cm.

Placental circumference

In this case series, the maximum placental circumference was 55.4 cm and minimum circumference was 37 cm with an average circumference of 48.36 cm.

Birth weight of babies

In normal case study groups, the maximum birth weight of the babies was 3 kg and minimum birth weight was 1.7 kg with an average birth weight of the baby of 2.58 kg. This value is slightly lower than the value (2.64 kg) observed by Udainia and Jain (2001),[9] and by Younosazi and Haworth (1969),[8] but the value is similar to a study found by Rath and Garg (1994).[10]

FPR

In this study, we found the maximum ratio of 5.76 and minimum ratio of 4.76 with the average ratio of 5.07. These findings are

lower than that observed by Rath and Garg (1994)[10] but similar to the value observed by Shah (1985).[11] Table 6 shows the results of placental morphometry and values of birth weight of babies and the FPRs in case of mothers with PIH.

Hypertensive Pregnancy Cases

Placental weight

The maximum placental weight was recorded in our studies which was 560 g, and minimum weight was 395 g, with an average of 493.18 g [Table 5]. This value is slightly lower than that found by Damania and Salvi (1989)[12] and slightly higher than that seen by Rath (1994).[10]

Placental volume

The maximum placental volume measured was 510 cc and minimum was 310 cc, with an average of 406.8 cc. This value was closed to that observed by Younoszai and Haworth (1969).[8]

Placental area

In hypertensive mothers, the maximum placental area recorded was 251 cm^2 and minimum area was 105.5 cm^2, with an average of 179.54 cm^2. This value is slightly lower than that found by Younoszai and Haworth (1969).[8]

Placental thickness

In these studies, the maximum placental thickness founded was 2 cm and minimum thickness was 0.9 cm, with an average of 1.54 cm [Table 5].

Placental diameter

In our studies, the maximum placental diameter was 18 cm and minimum diameter was 11.4 cm, with an average placental diameter of 15.08 cm.

Table 12: Comparison of perinatal outcome in normal, hypertensive and diabetic mothers

Perinatal outcome	Normal cases	Hypertensive cases	Diabetic cases
Live birth	50	48	46
Term	45	45	40
Preterm	5	3	6
Still birth		2	4
Term	-	-	1
Pre term		2	3
Early neonatal death	-	2 (LBW, birth asphyxia)	2 (RDS, MAS)
Term		-	-
Preterm		2	2
	Total=50 cases	Total=50 cases	Total=50 cases

RDS: Respiratory distress syndrome, LBW: Low birth weight baby, MAS: Meconium aspiration syndrome

Placental circumference

In hypertensive cases, the highest circumference of placentae calculated was 55.1 cm and least circumference calculated was 35.2 cm with an average circumference of 46.58 cm.

Birth weight of babies

The maximum birth weight of babies was recorded 2.55 kg and minimum was 1.6 kg with an average birth of 2.37 kg, which is nearly similar to that observed by Rath and Garg (1994).[10]

FPR

The greatest FPR recorded was 5.67 and minimum ratio was 4, with an average FPR of 4.82. From Table 7, we came to know the results of placental morphometry and values of birth weight of babies and FPRs in case of mothers suffering from diabetes mellitus.

Diabetic Pregnancy Cases

Placental weight

Diabetic placentae tend to be heavier than normal or hypertensive placentae as stated by White (1971)[13] andSaha *et al.* (2014).[14] In our studies, the maximum placental weight was 670 g and minimum placental weight was 500 g, with an average of 577.9 g.

Placental volume

The highest calculated value of placental volume was 565 cc, and least calculated value was 410 cc with an average 494.1 cc.

Placental area

The highest calculated value was 265.5 sq cc and least value was 167.5 sq cc, with an average of 219.3 sq cc.

Placental thickness

The maximum thickness in our cases was 3.1 cm and minimum thickness was 1.6 cm with average of 2.32 cm.

Placental diameter

The maximum diameter of placenta was 18.5 cm and minimum diameter was 14.7 cm with an average of 16.74 cm.

Placental circumference

The maximum placental circumference of this case series was 59 cm and minimum placental circumference was 44.61 cm with an average circumference of 52.06 cm.

Birth weight of babies

Diabetic mothers usually give birth to a large baby. The highest birth weight recorded in these studies was 3.9 kg and least birth baby was 2.9 kg, with an average birth weight of babies of 3.44 kg.

We came to know the perinatal outcome in different groups of pregnancy cases. Here, we studied 150 cases in all. In normal

Table 13: Comparison of gross morphological changes in placental in mothers of different age group

Groups	Average number of cotyledons	Averagenumber of infracted areas	Average number of calcified regions	Presence of hemorrhage
Normal (*n*=50)	16	3	5	3
Hypertensive (*n*=50)	15	15	26	19
Diabetic (*n*=50)	18	17	37	3

case groups, of 50 babies, 45 were born in term and 5 were born in preterm. In hypertensive cases of 50 cases, 45 were born in term, 3 were born in preterm, and 3 were stillborn (all were preterm). In diabetic cases of 50 cases, 40 were born in term, 6 were born in preterm, and 4 were stillborn (1 term and 3 preterm) [Table 12]. Mirchandani *et al*. (1979), Masodkar *et al*. (1985), and Avasthi *et al*. (1991) observed 12%, 11.9%, and 12.5% stillbirths associated with PIH.[15-17]

Woods and Malan (1978)[18] studied 940 placentae and found no correlation between the birth weight and site of cord insertion. However, Rath (1994) showed statistical significant between marginal attached of cord and low birth weight. From Table 13, we find that the average numbers of cotyledons were 16 in the normal groups, 15 in hypertensive groups, and 18 in diabetic groups. Infracted region was 3 in normal groups, 15 in hypertensive groups, and 17 in diabetic groups. Area of calcified region was 5 in normal cases, 26 in hypertensive cases, and 37 in diabetic cases. The presence of hemorrhage was 3 in normal groups, 19 in hypertensive groups, and 3 in diabetic groups.

Normal Pregnancy Groups

The average gestational age at the time delivery was 38.4 weeks, and placental morphometry was as follows: Placental weight (average) was 510.1 kg, volume (average) was 431.84 cc, placental area (average) was 183.65 cm^2, placental thickness (average) was 1.68 cm, placental diameter (average) was 15.44 cm, placental circumference (average) was 55.4 cm, birth weight of the baby (average) was 2.58 kg, and average FPR was 5.07. Of 50, 45 were born at term and 5 were born at preterm. Average number of cotyledons was 16.

Hypertensive Pregnancy Groups

The average gestational age at the time of delivery was 36.1 weeks. The placental morphometry was as follows - all were average, the placental weight was 493.18 g, placental volume was 406.8 cc, placental area was 179.54 cm^2, placental thickness was 1.54 cm, placental diameter was 15.08 cm, placental circumference was 46.58 cm, birth weight of the baby was 2.37 kg, and FPR was 4.82. Of 50, 45 were born at term, 3 at preterm, 3 was preterm, and 2 were stillborn. An average number of cotyledons was 15 [Table 13]. Kaur *et al.* (2014)[19] showed that central and eccentric insertions of umbilical cord are the common types. Marginal cord insertion, though rare, when associated with hypertension can lead to poor fetal outcome.

Diabetic Pregnancy Groups

The average gestational age at the time of delivery was 37 weeks. The placental morphometry was as follows - all were average, the placental weight was 577.9 g, placental volume was 491.1 cc, placental area was 219.3 sq cm, placenta thickness was 2.32 cm, placental diameter was 16.74 cm, placental circumference was 52.06 cm, birth of the baby was 3.44 kg, and FPR was 5.96. Of 50, 40 were born at term, 6 were preterm, and 4 were stillborn. An average number of cotyledons was 18.

CONCLUSION

The present study was carried out in the Department of Anatomy as well as in the Department of Obstetrics and Gynaecology, MGM Medical College and LSK Hospital over a period of 1 year. The subjects of this study were selected at random from mothers attending at antenatal clinic and also coming for delivery. 150 cases of placentae were collected for morphometric, morphologic, and histological studies. In this study, 50 placentae were collected from normal uncomplicated pregnancy, 50 were from pregnancy complicated with hypertensive disorder, and remaining 50 were from pregnancy complicated with diabetes mellitus.

In our study, we found that hypertensive placentae tend to be slightly smaller in size, weight, volume, area, thickness, diameter, circumference, and FPR than normal placentae, but the parameters were found to be significantly greater than that of normal placentae in case of diabetic placentae. No significant differences were found in umbilical cord insertion. Gestational age at the time of delivery was maximum in normal, moderate in diabetic, and minimum in hypertensive cases. In all cases, birth weight of the baby was strongly associated with placental weight, volume, area, and thickness.

If the mother gets proper antenatal care and treatment for pregnancy-related complications in time, then mother can give birth to a normal healthy baby and we also get normal morphology, morphometry, and histological changes in placenta.

REFERENCES

1. Panigel M. The human placenta. Anatomy and morphology. Clin Obstet Gynaecol 1986;13:421-45.
2. Boyd JD, Hamilton WJ. The Human Placenta. Cambridge: Heffer and Sons; 1970. p. 365.
3. Salafia CM, Vintzileos AM. Why all placentas should be examined by a pathologist in 1990. Am J Obstet Gynecol 1990;163:1282-93.
4. College of American Pathologists. Conference XIX on the examination of the placenta: Report of the working group on indications for placental examination. Arch Pathol Lab Med 1991;115:660-721.
5. Yetter OF. Examination of the placenta. Am Fam Physician 1998;57:1045-54.
6. Raghunath G, Vijayalakshmi, Shenoy V. A study on the morphology and the morphometry of the human placenta and its clinical relevance in a population in Tamil Nadu. J Clin Diagn Res 2011;5:282-6.
7. Aherne W, Dunnill MS. Quantitative aspects of placental structure. J Pathol Bacteriol 1966;91:123-39.
8. Younoszai MK, Haworth JC. Placental dimensions and relations in preterm, term, and growth-retarded infants. Am J Obstet Gynecol 1969;103:265-71.
9. Udainia A, Jain ML. Morphological study of placenta in pregnancy induced hypertension with its clinical relevance. J Anat Soc India 2001;50:24-7.
10. Rath G, Garg K, Anand C, Kawle M. Vascular pattern of human placenta in complicated pregnancy, a corrosive cast study. Ann Nat Acad Med Sc (Ind) 1994;30:17-22.
11. Shah YG, Miller RK. The pharmacokinetics of phenytoin in perfused human placenta. Pediatr Pharmacol (N Y) 1985;5:165-79.
12. Damania KR, Salvi VS, Ratnaparkhi SK, Daftary SN. The placenta in hypertensive disorders of pregnancy. J Obstet Gynaecol India 1989;39:28-31.
13. White P. Pregnancy complicating diabetes. Am J Med 1949;7:609-16.
14. 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;119:1-9.

15. Mirchandani JJ, Bazaz MG, Chitra S. Correlation of foetal outcome with some pathological changes of placenta. J Obstet Gynaecol India 1979;29:1131-8.
16. Masodkar AR, Kalamkar LR, Patki PS. Histopathology of placenta and its correlation with foetal outcome. J Obstet Gynaecol India 1985;35:294-300.
17. Avasthi K, Midha U, Sabharwal BD, Devi K. Histopathology of placenta and its correlation with foetal outcome. J Obst Gynae India 1991;41:317-28.
18. Woods DL, Malan AF. The site of umbilical cord insertion and birth weight. Br J Obstet Gynaecol 1978;85:332-3.
19. Kaur P, Kaushal S, Sharma A, Singh K. To study relationship of umblical cord insertion with fetal outcome in PIH and normotensive pregnancies. Int J Pure App Biosci 2014;2:108-11.

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