Journal of Cardiovascular Disease Research

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 03, 2023

Original research article

A study on relation between maternal characteristics with fetal and placental weight at a tertiary care hospital

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Abstract

Background: Function of placenta decides fetal growth. There are studies which relate size of infant at birth with placenta weight. If placenta weight is >normal, then infants are affected with respiratory distress syndrome and even death. Higher weight is associated with complications in child, and low placenta weight is associated with maternal complications

Objective: To study relation between maternal characteristics with fetal and placental weight

Methods: Hospital based prospective study was carried out among 475 mothers. Birth weight of newborn was measured with standard instrument and standard technique. Placenta was removed, umbilical cord removed, trimmed and weighed as per standard guidelines.

Results: Majority (62.3%) belonged to 18-24 years. Majority (64.4%) were high risk. As the gestational age increased, the mean birth weight and the placental weight also increased (p<0.05). Birth weight to placental weight ratio did not increase or decrease (p>0.05). Birth weight was significantly more in those without high risk pregnancy compared to those with high risk pregnancy (p<0.05). Placental weight was also more in those without high risk pregnancy compared to those with high risk pregnancy but it was not significant (p>0.05). Birth weight was slightly more in male babies compared to the female babies, but this difference was not found to be statistically significant (p>0.05). Similarly the placental weight was slightly more in male babies compared to the female babies, but this difference was not found to be statistically significant (p>0.05).

Conclusion: As the gestational age increased, the birth weight and placental weight increased but the their ratio remained same. It was not related with the parity and fetal gender.

Keywords: parity, placenta, fetus, mother

Introduction

The function of the placenta decides the fetal growth. At 37 weeks of gestation, the placental weight on an average is 508 gm. It is 1/6th of the newborn weight at birth [1].

The weight of the placenta should be on an average as per the gestational age. There are problems if the weight of the placenta is either more or less. After the placenta is removed, it is prepared and its weight is measured. So, it all depends on how the placental preparation was done and it affects the weight measurement of the placenta. There are studies which relate the size of the infant at the time of the birth with that of the weight of the placenta. If the weight of the placenta is more than normal, then there are complications like infants with respiratory distress syndrome, having a low score of the Apgar and even death during the perinatal period. The higher weight is found to be associated with the complications in the child, the low weight of the placenta has been found to be associated with the maternal complications [2].

The race to which the mother belongs as well as the socio-economic status affect the weight of the placenta. If the mother is suffering from certain diseases like diseases of the cardiovascular system, diabetes etc. then also the weight of the placenta is affected [3].

The fetus nutrition and growth depends on the condition of the placenta. All nutrients from the circulation of the mother goes to the fetus via placenta. But, it is not simply the passive role player as it also takes active part in the metabolism of the nutrients before they are given to the fetus [4].

The size of the placenta is also significantly associated with the perinatal outcome. If the size of the placenta is small, it is found to be associated with the congenital abnormalities like trisomy. Diabetes in the mother can lead to the large size of the placenta. If the ratio of the fetal and placental weight is low, it shows that there was some injury due to anemia in mother that lead to edema of the villous. If the ratio of the fetal and the placental weight is high, it may be due to high blood pressure in the mother and it may

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 03, 2023

lead to fetal distress [5, 6].
With this background, the present study was carried out to study the relation between maternal characteristics with fetal and placental weight at a tertiary care hospital

Methods

A hospital based single center prospective study was carried out at Department of Obstetrics and Gynecology, Malla Reddy Medical College for Women from August 2017 to December 2019.
Institutional Ethics Committee permission was obtained (IEC No. MRMCW/OBGY/ICMR/68/2017 dated 28 July 2017). Written informed consent was taken from all participating mothers. Confidentiality in terms of their identity was ensured. All mothers were given appropriate medical care as per the standard treatment guidelines.
During the study period, a total of 475 mothers were included. All mothers who were admitted in the study hospital for delivery were included irrespective of their gestational age, parity, booking status, age, fetal outcome, high risk status. But, if the mother was not willing to participate in the study, their data was excluded from the present study. If the mother was suffering from any severe systemic disorder, then also her data was not included.
The age of the mother was noted from her identity card. Fetal outcome was recorded as alive or dead based on the outcome of the delivery. If the mother was having the antenatal registration card irrespective of place, she was considered as booked otherwise un-booked. Mother with any systemic disease, previous cesarean section, short stature primi, anemia, malpresentation etc. i.e. any high risk was noted as having high risk pregnancy and special care was given accordingly. Gestational age was determined from the combination of last menstrual period with abdominal and sonographic examination. Parity was determined based on the history. Immediately after delivery, the birth weight of the newborn was measured to the nearest of 10 gm with the standard instrument and standard technique as per the guidelines. The placenta was removed, umbilical cord removed, trimmed and weighed as per the standard guidelines to the nearest gm [7]. The birth weight was divided by placental weight to get the birth weight-placental weight (BW/PW) ratio.
The data was entered in the Microsoft Excel worksheet. Proportions were used to describe the data. For comparison of mean values in more than two groups, one-way analysis of variance was used. The calculated f value and its p value has been reported. For comparison of mean values in two groups, the student's t test was used. P value less than 0.05 was considered as statistically significant.

Results

Table 1: Distribution of study subjects as per different characteristics

Characteristics		Number	Percentage
Maternal age	18-24	296	62.3
	25-29	145	30.5
	30-34	32	6.7
	35 and above	2	0.5
Fetal outcome	Alive	472	99.4
	Dead	3	0.6
Booking status	Booked	464	97.7
	Un-booked	11	2.3
Fetal gender	Male	213	44.8
	Female	262	55.2
High risk pregnancy	Yes	306	64.4
	No	169	35.6
Gestational age	31-36	118	24.8
	37	169	35.6
	38	103	21.7
	39	64	13.5
	40	21	8.4
Mode of delivery	Vaginal	111	23.4
	Cesarean section	359	75.6
Parity	Primi	169	35.6
	1	188	39.6
	2	73	15.4
	3	33	6.9
	4	10	2.1
	5	2	0.5

Table 1 shows distribution of study subjects as per different characteristics. Majority of women (62.3%) belonged to the age group of 18-24 years followed by 30.5% who belonged to the age group of 25-29 years. Only three deliveries in the present study had dead fetal outcome. Only 2.3% of the women were not booked. 55.2% of the newborns were female. Majority of the pregnancies i.e. 64.4% were high risk.

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 03, 2023

Majority i.e. 35.6% of the women were at 37 completed weeks of gestation at the time of delivery. Almost 2/3rd of women had previously undergone cesarean section. 35.6% of them were primi.

Table 2: Relation of gestational age with birth weight (BW), placental weight (PW) and BW/PW ratio

Gestational age (weeks)	N	Birth weight (gm) (Mean ± SD)	Placental weight (gm) (Mean ± SD)	BW/PW ratio (Mean ± SD)
31-36	118	2654.95±440.29	442.68±74.43	6.00±0.32
37	169	2756.58±433.44	460.74±74.18	5.94±0.32
38	103	2847.32±435.56	474.38±73.44	6.00±0.31
39	64	2936.48±438.49	491.18±74.12	5.98±0.32
40	21	3012.14±434.22	501.67±72.94	6.00±0.31
Statistics		F=6.6791; p=0.00003	F=6.477; p=0.000004	F=0.8917; p=0.4683

Table 2 shows relation of gestational age with birth weight (BW), placental weight (PW) and BW/PW ratio. It has been observed that as the gestational age increased, the mean birth weight also increased from 2654.95±440.29 gm at 31-36 weeks of gestation to 3012.14±434.22 at 40 weeks of gestation. This increase was found to be statistically significant (p<0.05). Similar was the case with the weight of the placenta. As the gestational age increased, the placental weight also increased from 442.68±74.43 gm at 31-36 weeks of gestation to 501.67±72.94 at 40 weeks of gestation. This increase was also statistically significant (p<0.05). But, the birth weight to placental weight ratio did not increase or decrease and it remained stable at six.

Table 3: Relation of parity with birth weight (BW), and placental weight (PW)

Parity	N	Birth weight (gm) (Mean ± SD)	Placental weight (gm) (Mean ± SD)
Primi	169	2766.80±439.62	462.83±30
1	188	2793.04±433.51	469.52±74.14
2	73	2767.30±439.67	459.88±74.07
3	33	2853.88±439.23	475.30±74.05
4	10	2589.00±435.01	431.2±73.06
5	2	2630±438.55	438±73.99
Statistics		F=0.6937; p=0.6284	F=0.8337; p=0.5261

Table 3 shows relation of parity with birth weight (BW), and placental weight (PW). Neither the birth weight not the placental weight differed across the parity. Irrespective of parity the birth weight as well as the placental weight remained similar (p>0.05).

Table 4: Relation of high risk pregnancy with birth weight (BW), and placental weight (PW)

High risk pregnancy	N	Birth weight (Mean ± SD)	Placental weight (Mean ± SD)
Yes	306	2734.87±432.85	461.43±74.15
No	169	2830.01±439.62	471.82±74.31
Statistics		t=2.28068; p=0.02301	t=1.46093; p=0.1447

Table 4 shows relation of high risk pregnancy with birth weight (BW), and placental weight (PW). The birth weight was significantly more in those not having the high risk pregnancy compared to those having the high risk pregnancy (p<0.05). The palcental weight was also more in those not having the high risk pregnancy compared to those having the high risk pregnancy but this difference was not found to be statistically significant (p>0.05).

Table 5: Relation of fetal gender with birth weight (BW), and placental weight (PW)

Fetal gender	N	Birth weight (Mean ± SD)	Placental weight (Mean ± SD)
Male	213	2788.85±433.21	467.36±74.21
Female	262	2767.76±439.26	463.30±74.24
Statistics		t=0.5236; p=0.6008	t=0.5928; p=0.5536

Table 5 shows relation of fetal gender with birth weight (BW), and placental weight (PW). The birth weight was slightly more in male babies compared to the female babies, but this difference was not found to be statistically significant (p>0.05). Similarly the placental weight was slightly more in male babies compared to the female babies, but this difference was not found to be statistically significant (p>0.05).

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Discussion

Majority of women (62.3%) belonged to the age group of 18-24 years followed by 30.5% who belonged to the age group of 25-29 years. Only three deliveries in the present study had dead fetal outcome. Only 2.3% of the women were not booked. 55.2% of the newborns were female. Majority of the pregnancies i.e. 64.4% were high risk. Majority i.e. 35.6% of the women were at 37 completed weeks of gestation at the time of delivery. Almost 2/3rd of women had previously undergone cesarean section. 35.6% of them were primi. It has been observed that as the gestational age increased, the mean birth weight also increased from 2654.95±440.29 gm at 31-36 weeks of gestation to 3012.14±434.22 at 40 weeks of gestation. This increase was found to be statistically significant (p<0.05). Similar was the case with the weight of the placenta. as the gestational age increased, the placental weight also increased from 442.68±74.43 gm at 31-36 weeks of gestation to 501.67±72.94 at 40 weeks of gestation. This increase was also statistically significant (p<0.05). But, the birth weight to placental weight ratio did not increase or decrease and it remained stable at six. Neither the birth weight not the placental weight differed across the parity. Irrespective of parity the birth weight as well as the placental weight remained similar (p>0.05). The birth weight was significantly more in those not having the high risk pregnancy compared to those having the high risk pregnancy (p<0.05). The palcental weight was also more in those not having the high risk pregnancy compared to those having the high risk pregnancy but this difference was not found to be statistically significant (p>0.05). The birth weight was slightly more in male babies compared to the female babies, but this difference was not found to be statistically significant (p>0.05). Similarly the placental weight was slightly more in male babies compared to the female babies, but this difference was not found to be statistically significant (p>0.05).

Panti AA *et al*, [8] found from their study that the range in the weight of the placenta was 300 to 890 gm and the average weight was 590±82 g. In the present study, it was slightly on a lower side with weight of the placenta ranging from 233 to 693 gm and mean was 465.12±74.21. They noted that the birth weight range was 2030 to 5020 gm with mean of 3275±469 g. This was also on a slightly lower side in the present study with range of 1360 to 4160 gm with a mean of 2783.87±438.95 gm. They noted that the mean gestational age at delivery was 38.8 weeks which is almost similar to that what we found of 37.25 weeks. They noted that as the birth weight increased, the placental weight also increased with a positive correlation between them. We also noted similar positive significant correlation of 0.9812.

Taricco E *et al*, [9] compared the birth weight and placental weight in normal and gestational diabetes mothers. They noted that the mothers with gestational diabetes were significantly elder. Their weight before the pregnancy was significantly more than those of normal mothers. Their body mass index was also significantly more. The mean weight of the fetus in mothers with gestational diabetes was 3287.1 gm compared to 3274.2 gm from normal mothers which was significantly more. Similarly, the weight of the placenta was also significantly more in mothers with gestational diabetes compared to normal mothers. The fetal to placental weight ratio was significantly lower in mothers with gestational diabetes compared to normal mothers.

Roland MCP *et al*, [10] carried out a prospective study among 1031 healthy pregnant women. They found that the parity had a positive effect on the placental weight. But, in the present study, we found that the parity had no effect on the placental weight. It was similar across all parity. They also noted that the gestational weight gain was also positively associated with the placental weight. We also found that as the gestational age increased, the placental weight also increased significantly. They also studied the other factors like the body mass index of the mother and its effect on the weight of the placenta as well as fasting blood glucose and its effects on the weight of the placenta which we did not study.

Perrone S *et al*, [11] did the histopathology study of 105 placenta and studied their association with the perinatal diseases. They noted that the incidence of the histological chorioamnionitis was 51%. They also observed that the risk of getting the bronchopulmonary dysplasia as well as that of the patent ductus arteriosus was greater in the histological chorioamnionitis group compared with the normal placenta group. Similarly the risk of getting the other diseases like retinopathy of prematurity, intraventricular hemorrhage was also greater in the histological chorioamnionitis group compared with the normal placenta group.

Adesina KT *et al*, [12] studied 428 singleton deliveries. They found that the range in the weight of the placenta was 125 to 1500 gm and the average weight was 580±8 g. In the present study, it was slightly on a lower side with weight of the placenta ranging from 233 to 693 gm and mean was 465.12±74.21. The incidence of abnormalities of the placenta was 1.2%. They found a weak but significant correlation between the weight of the placenta with that of the birth weight. While, in the present study, we also found a significant but strong correlation between the weight of the placenta with that of the birth weight.

Conclusion

As the gestational age increased, the mean birth weight also increased. As the gestational age increased, the placental weight also increased. But, the birth weight to placental weight ratio did not increase or

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 03, 2023

decrease and it remained stable at six. Neither the birth weight not the placental weight differed across the parity. The birth weight was significantly more in those not having the high risk pregnancy compared to those having the high risk pregnancy

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