THE RELATIONSHIP BETWEEN THE WEIGHT OF THE PLACENTA AND BIRTH WEIGHT OF THE NEONATE

Laxmi Bhattarai,[1] Bishnu Gautam,[2] Pradip Chhetri[3]

ABSTRACT

INTRODUCTION

Weight of placenta has long been associated with fetal growth and perinatal well-being. Low placental weight (standardized for sex and gestational age) is more common among stillbirths whereas high placental weight is associated with neonatal death, serious neonatal morbidity, low 5-min Apgar score, and respiratory morbidity. Low placental weight is believed to reflect an inadequate placental surface area for nutrient and gas exchange, leading to fetal compromise. However, it has also been proposed that the increased risk associated with high placental weight is the result of villous oedema, which may compress blood vessels and reduce transfer of gas and nutrients to the fetus.

MATERIAL AND METHODS

A descriptive cross-sectional study of the total, 798 subjects met the inclusive criteria. After consent, age, sex, prepregnancy weight, weight of mother at the time of delivery, neonatal weight and trimmed placental weight were recorded.

RESULTS

The mean birth weight was 2818±447.19 gm while the placental weight was 489.29±59 gm with mean placental-fetal weight ratio of 17.63. The mean birthweight of male was 2823.97±451.12 gm whereas female was 2811.69±442.93 gm. Similarly, mean placental weight of male was 490.37±57.7 gm and female was 487.98±60.58 gm. As gestational age increases placental and birth weight also increases whereas placental-birth weight ratio decreases.

CONCLUSION

There is a positive relation between placental weight and weight of the neonate at the time of birth. However, the ratio of the placental and neonatal birth weights at term decreases with advancing gestational age. Thus, prolongation of pregnancy at term may adversely affect the fetus.

KEYWORDS

Fetal weight, placental weight, placental-birth weight ratio

1. Department of Anatomy, Universal College of Medical Sciences, Bhairahawa, Nepal
2. Department of Gynaecology, Lumbini Zonal Hospital, Butwal, Nepal
3. Department of Community Medicine, Universal College of Medical Sciences, Bhairahawa, Nepal

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For Correspondence
Dr Laxmi Bhattarai
Department of Anatomy
Universal College of Medical Sciences
Bhairahawa, Nepal
Email: gautambriana6876@gmail.com

INTRODUCTION

Placenta "the life of fetus in utero" interacts with the mother and developing fetus. Placental weight is a summary measure of placental and fetal growth.[1] Small placenta may be associated with trisomies, whereas large placenta may be associated with maternal diabetes. Low placental-fetal weight ratio could reflect acute placental injury, maternal anaemia or malnutrition whereas high placental-fetal weight ratio may be seen in maternal hypertension. [2,3]

Careful examination of the placenta can provide insight regarding the environment of the fetus before delivery. Altered growth of the placenta is a predictor of maternal medical diseases including cardiovascular disease, hypertension and diabetes mellitus. Other factors such as race and socioeconomic status also affect the placental weight.

The objective of the current study is to identify maternal placental determinants of high or low placental weight for gestational age. This study provide the baseline data about the relationship between placental and birth weight.

MATERIAL AND METHODS

Study Design

Present study was hospital based cross sectional study. After admission of mother for delivery, an interview was conducted to determine the predictors of birth and placental weight: age, weeks of gestation, obstetric background, habits such as alcoholism and tobacco use during pregnancy. To confirm inclusion criteria clinical files was examined. Of the total, 798 patients met the inclusive criteria. Pre-gestational weight was identified. In cases where the file did not have the pre-gestational weight, the patient was questioned directly and weight was determined. Precise working proforma was used to collect the information needed from the file of the patient. The weight of the placenta was taken after trimming the placental disk of membrane and umbilical cord, immediately after delivery in calibrated weight by the health worker.

Place and Duration of Study

The study was conducted in Lumbini Zonal Hospital, Butwal, Rupandehi, Nepal. The duration of study was 6 month (1st January- 31st August 2019).

Ethical Approval

The ethical clearance was obtained from UCMS-IRC (Ref: UCMS/IRC/238/18).

Patient Consent

Patients were informed about the purpose of the study and written consent was taken.

Exclusion Criteria

Multiple pregnancy, unknown gestational age, gestational age less than 37 weeks or more than 42 weeks, abnormal placenta (retain placenta, morbidly adherent placenta, abruptio placenta, placenta praevia), congenital anomaly, stillbirth, syphilis, hypertensive disorder in pregnancy and diabetic mellitus.

Sample Size

Pregnant women admitted in Lumbini Zonal Hospital at the time period of 1st January to 31st August 2019 who fulfilled the inclusive criteria were included in the study.

Statical Analysis

The data obtained from working proforma were recorded in MS excel and analysed by SPSS Vs.20. Descriptive statistics like frequency, percentage, mean and standard deviation were used to analyse the data. Categorical data were compared by chi-square test. ANOVA test and independent t-test were applied. Level of significance for all analytical tests was set at 0.05 and p value <0.05 was considered significant.

RESULTS

The age of mother ranged between 16-40 years. Pre-pregnancy weight was minimum 31 kg and maximum 85 kg. The mean maternal weight gain at the time of birth was 59.77±8.35kg. The average gestational age at the time of delivery was 38.86±1.22 weeks. The mean neonatal birth weight was 2818±447.19 gm while the average placental weight was 489.29±59 gm with mean placental-fetal weight ratio of 17.63. The mean birthweight of male was 2823.97±451.12 gm whereas female was 2811.69±442.93 gm. Similarly, mean placental weight of male neonate was 490.37±57.7 gm and female was 487.98±60.58 gm. As gestational age increases placental and fetal weight also increases whereas placental-birth weight ratio decreases with gestational age. There was significant effect of mother's age, pre-pregnancy, weight at the time of delivery and period of gestation on weight of placenta and birth weight (p=0.000).

DISCUSSION

Placental weight and birth weight of the neonate are widely available measures. The ratio of these two variables is a useful marker of foetal nutrition and utero-placental function.[4] Henceforth, placental growth directly influences the growth of the fetus.

The mean placental weight and birth weight in this study was 489.29 gm and 2818 gm that was lower than 540.98 gm and 3000 gm respectively, reported in eastern part of Nepal.[5] Likewise, another study conducted in tertiary hospital of Nepal, reported mean placental weight 455.76 gm and mean birth weight 2939.93 gm. The variations in the mean weight of the placenta may be due to variations in the methodology

Table 1. Maternal characteristics and perinatal outcome

Age Group	Number (%)
16-20	161 (20.2%)
21-25	367 (46%)
26-30	213 (26.7%)
31-35	48 (6%)
Above 53	9 (1.1)%
Mode of Delivery	
Spontaneous vaginal delivery	728 (91.1%)
Cesarean Section	62 (7.8%)
Vaccum	8 (1.1%)
Parity	
0	502 (62.9%)
1	231 (28.9%)
2	50 (6.3%)
3	11 (1.5%)
4	3 (0.4%)
Parity	
Brahmin	352 (44.1%)
Janjati	219 (27.4%)
Madesi	54 (6.8%)
Dalit	128 (16%)
Others	33 (4%)

Table 2. Mean neonatal birth weight (gm), placental weight (gm) and placental-birth weight ratio (PWBR) by gestational age at birth

Week of Gestaton	N	Birth wt. mean (SD)	Placental wt. mean (SD)	PBWR
37	98	2629.08 ± 447.78	476.53 ± 66.272	18.13
38	212	2722.4 ± 411.28	484.86 ± 57.164	17.81
39	243	2856.79 ± 420.45	489.75 ± 54.188	17.14
40	184	2918.64 ± 451.35	496.47 ± 61.191	17.01
41	53	2994.33 ± 513.53	500.94 ± 64.667	16.73
42	8	3043.75 ± 326.71	506.25 ± 32.043	16.63

of preparing and weighing the placenta. Study also emphasized the cause of variation may also be due to differences in nutritional status of mothers in different parts of world.[6] The birth weight of male neonates was slightly greater than that of females. Previous study also showed a non-significant influence of gender on placental weight and a negligible difference in placental–fetal weight ratio. However, lateral chorionic disk expansion was generally greater in male than female placentas. This pattern suggests the male placenta grows faster earlier in pregnancy and may be related to the mechanism by which male fetus are heavier at birth.[7,8] Previous studies reported birth weight 3036 gm in Asia and 3103 gm in the Afro-Caribbean region, more than present study.[3,9] These differences in mean birth weight may be due to altitude, maternal nutrition and maternal diseases.[10] The mean placental weight in this study is lower than 643 and 630 gm reported in western Europe.[11] Low placental weight was associated with fetal distress.[12]

The decline in placental birth weight ratio with increase gestational age at term observed in the present study has been reported by previous authors.[11-13] This result suggest that prolongation of pregnancy at term may adversely affect the fetus.[14] Low PBWR indicates fetus with presumed reduced placental reserves. Such fetus tend to show asymmetric growth restriction, suggesting that the small placenta limits optimal foetal growth.[15] High PBWR indicate an abnormal placenta with impaired function as in human immune deficiency virus infection, obesity, maternal anemia, cigarettes smoking and low socioeconomic status. Infants with such abnormal ratios are at increased risk of perinatal death.[16,17]

Present study was conducted in a part of Nepal and hence cannot be taken as representative of whole population. Weight of the placenta is amongst the simplest parameters that can be recorded easily and relate with pregnancy abnormality. Study also showed that various factors may influence the placental and fetal weight. Thus, large multicentric study is proposed for better results.

CONCLUSION

Further studies about relationship between morphology and gross detailed study of placenta as well as continuous education program regarding the use of standard guideline for examination of placenta should be done. Examination of placenta by obstetrician and pediatrician can be very helpful to throw light into prenatal life and provide information for proper management and care of mother and her offspring. It is also important to know the ideal method for placental preparation so that errors could be minimized.

CONFLICT OF INTERESTS

There is no conflict of interest.

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