

Placental weight and perinatal outcome among parturients at a university teaching hospital in Lagos, Nigeria

CHIDINMA MAGNUS NWOGU¹, IMOLEAYO E ADETUYI¹, KEHINDE SHARAFADEN OKUNADE^{1,2}, GBEMISOLA ENIOLA OSANYIN^{1,2}, AYODEJI AYOTUNDE OLUWOLE^{1,2}

¹Department of Obstetrics and Gynaecology, Lagos University Teaching Hospital, ²Department of Obstetrics and Gynaecology, College of Medicine, University of Lagos, Lagos, Nigeria

ABSTRACT

Background: The growth and survival of the fetus are essentially dependent on formation, full development, and functions of the placenta. Examination of the placenta would demonstrate important information about whatever has happened to the fetus *in utero*.

Aim: The aim of this study was to determine the sociodemographic characteristics that affect placenta weight and then assess the association between placental weight and perinatal outcome among parturients in a tertiary hospital in Lagos, Nigeria.

Materials and Methods: This was a retrospective review of all women who delivered at the labor ward complex of the hospital between January 2014 and December 2015. The data of all parturients with uncomplicated singleton pregnancies were obtained from the labor ward register, and their case notes were subsequently retrieved from the medical records department for extraction of all relevant information. Descriptive statistics were computed for all data and analyses were done using Statistical Package for the Social Sciences version 22.0 for Windows (manufactured by IBM Corp., Armonk, New York, United States). The associations between groups of continuous variables were tested using the independent sample *t*-test or one-way analysis of variance where applicable. All significances were reported at $P < 0.05$.

Conclusion: Parity, maternal booking weight, gestational age at delivery, baby's birth weight, umbilical cord length, and neonatal 5-min Apgar score had positive correlations with placental weight. Further longitudinal studies are needed to examine the extent to which placental weight will affect the future growth and development, nutritional status, and health of newborns.

Result: The overall mean cord length was 59.6 ± 11.7 cm and the mean placental weight was 657.5 ± 96.1 grams with majority (46.3%) of the parturients having normal placental weight range of 500-749 grams. Placental weights at term have statistically significant positive correlations with the gestational age at delivery ($P = 0.041$), baby's birth weights ($P = 0.003$), 5-minute Apgar score ($P = 0.016$), and the umbilical cord length ($P = 0.035$).

Key words: Baby's weight; maternal booking weight; parity; placental weight.

Introduction

The growth and survival of the fetus are essentially dependent on formation, full development, and functions of the placenta. The placenta undergoes different changes in weight, volume, structure, shape, and function continuously throughout the gestation to support the prenatal life.^[1] The placenta is a unique organ to mammals which connects the developing

fetus to the uterine wall. It is the most important organ for maintaining and continuing healthy pregnancy. It transfers and exchanges oxygen and nutrition needed for the fetus.^[2]

Address for correspondence: Dr. Chidinma Magnus Nwogu, Department of Obstetrics and Gynaecology, Lagos University Teaching Hospital, PMB 12003, Lagos, Nigeria. E-mail: magnuschidi@yahoo.com

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The placenta, “the life of the fetus *in utero*,” functions diversely to support the growth of the fetus and interacts with the two individuals, the mother and the developing fetus. It is the most accurate record of the infant’s prenatal experiences.^[3]

The placenta plays a vital role in normal fetal development, and failure of the placenta to gain weight and insufficiency of its function can result in fetal disorders.^[4] Examination of the placenta would demonstrate important information about whatever has happened to the fetus *in utero*. Increase in placental size is significantly associated with maternal weight, and it is an independent predictor of birth weight.^[4] Placental weight reflects placental development and functions and is correlated with maternal age, gestational age, history of maternal diabetes, preeclampsia, birth weight, route of delivery, infants’ gender and Apgar score, and fetal distress. Other factors influencing placental weight include parity, maternal height and weight, and serum ferritin concentration.^[4-8]

A knowledge of the mean weight of the placenta in Nigerians and a determination of its impact on perinatal outcome would have an important implication for infants care and decision-making in obstetrics. This study will, therefore, aim to determine the sociodemographic characteristics that affect placenta weight and then assess the association between placental weight and perinatal outcome among parturients in a tertiary hospital in Lagos, Nigeria.

Materials and Methods

Study design and setting

This was a retrospective review of all women who delivered at the labor ward complex of a University Teaching Hospital in Lagos, Nigeria, between January 2014 and December 2015.

Data collection

The data of all parturients with uncomplicated singleton pregnancies who delivered were obtained from the labor ward register, and their case notes were subsequently retrieved from the medical records department for extraction of all relevant information. Extracted information included sociodemographic characteristics of the women (age, parity, booking status, and booking weight) and their delivery outcome (mode of delivery, 5 min-Apgar score, umbilical cord length, neonatal birth weight, neonatal birth status, and fetal gender). Excluded from the study were women with unknown gestational age and those with preexisting or newly diagnosed medical conditions in pregnancy.

Statistical analyses

Descriptive statistics were computed for all data and analyses

were done using the Statistical Package for the Social Sciences version 22.0 for Windows (manufactured by IBM Corp., Armonk, New York, United States). All the quantitative data were tested for normality of distribution using the Kolmogorov–Smirnov normality test. The associations between groups of continuous variables were tested using the independent sample *t*-test or one-way analysis of variance where applicable. All significances were reported at $P < 0.05$.

Ethical approval

Ethical approval for the study was obtained from the hospital’s Health Research and Ethics Committee of the Lagos University Teaching Hospital before the commencement of the study.

Results

The case notes of 750 eligible women were successfully retrieved for the study. The age range of the parturients was 19–43 years and the mean age was 32.5 ± 4.3 years. Majority of the women (82.5%) were booked and the mean booking weight was 70.3 ± 15.5 kg with the largest proportion (49.6%) of the women weighing between 50 and 69 kg [Table 1].

As shown in Table 2, an almost equal proportion of the women delivered vaginally and by cesarean section during the review period. Majority of the newborns were delivered at term (93.6%) with a mean gestational age of 37.7 ± 3.6 weeks. Most of the neonates (63.3%) were of average birth weight

Table 1: Sociodemographic characteristics of the parturients (n=750)

Characteristics	Frequency, n (%)
Age (years)	
<20	3 (0.4)
21-34	610 (81.3)
≥35	137 (18.3)
Mean age ±SD	32.5 ± 4.3
Age range	19-43
Parity	
0	296 (39.5)
1-2	336 (44.8)
3-4	112 (14.9)
≥5	6 (0.8)
Booking status	
Booked	619 (82.5)
Unbooked	131 (17.5)
Booking weight (kg)	
<50	21 (2.8)
50-69	372 (49.6)
70-89	280 (37.3)
≥90	77 (10.3)
Mean booking weight	70.3 ± 15.5

SD, Standard deviation

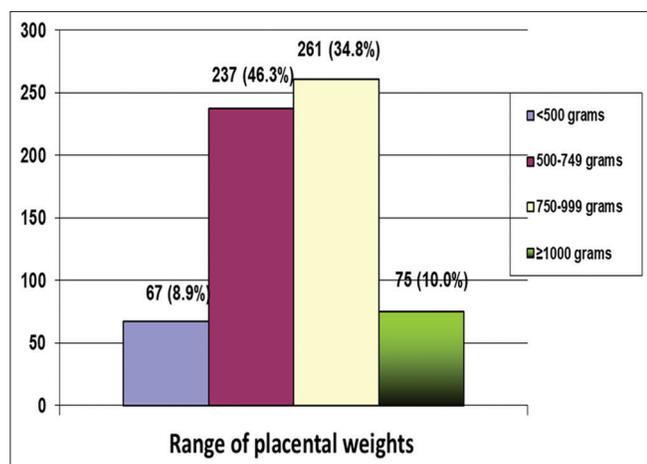


Figure 1: Distribution of parturients by categories of placental weights (mean weight of 657.5 ± 96.1 g)

with an overall mean birth weight of 3.3 ± 0.4 kg. Almost all of the deliveries (97.9%) resulted in live births with the largest proportion of these neonates (97.7%) having an optimal 5-min Apgar score of ≥7. There were more male neonates (54.4%) than females delivered during the review period. The overall mean cord length was 59.6 ± 11.7 cm. In Figure 1, the mean placental weight was 657.5 ± 96.1 g with the majority (46.3%) of the parturients having normal placental weight range of 500–749 g.

On analyses of the association between placental weights and the parturients' sociodemographic characteristics [Table 3], we found a positive trend for placental weight and parity ($P = 0.006$) and maternal booking weight ($P = 0.035$). There were no such relationships observed with maternal age ($P = 0.515$) and booking status ($P = 0.229$).

In Table 4, the placental weights at term were shown to have statistically significant positive correlations with the gestational age at delivery ($P = 0.041$), baby's birth weights ($P = 0.003$), 5-min Apgar score ($P = 0.016$), and the umbilical cord length ($P = 0.035$). There were, however, no statistically significant associations between placental weights and mode of delivery ($P = 0.077$), neonatal gender ($P = 0.720$), and neonatal birth status ($P = 0.592$).

Discussion

The placental mean weight of 658 ± 96 g reported in this study was greater than the mean weights obtained in large studies from the US (447 ± 92 g)^[9] and Iran (530 ± 113 g),^[2] but lower than the mean weight of 711 ± 156 g reported in a Norwegian cohort.^[10] The weight is also slightly higher than the mean of 590 ± 82 g obtained in a similar Nigerian study carried out in the North-Western part of the country.^[11] These

Table 2: Delivery outcome of the parturients (n=750)

Outcome	Frequency, n (%)
Mode of delivery	
Vaginal delivery	371 (49.5)
Cesarean delivery	379 (50.5)
Gestational age at delivery (weeks)	
<37	702 (93.6)
≥37	48 (6.4)
Mean gestational age	37.7 ± 3.6
Birth weight (kg)	
<2.5	40 (5.3)
2.5-3.49	475 (63.3)
3.5-4.49	229 (30.5)
≥4.5	6 (0.8)
Mean birth weight	3.3 ± 0.4
State of neonatal status at birth	
Live birth	734 (97.9)
Stillbirth	16 (2.1)
Neonatal 5-min Apgar score (n=734)	
1-3	1 (0.1)
4-6	16 (2.2)
7-10	717 (97.7)
Neonatal gender	
Male	408 (54.4)
Female	342 (45.6)
Cord length (cm)	
<50	184 (24.5)
50-74.9	513 (68.4)
≥75	53 (7.1)
Mean cord length	59.6 ± 11.7

Table 3: Placental weights and sociodemographic characteristics of parturients

Characteristics	Placental weight (g) Mean ± SD	P
Age (years)		
<20	698.3 ± 43.1	0.515
21-34	740.6 ± 184.7	
≥35	655.9 ± 37.8	
Parity		0.006 ^a
0	612.3 ± 164.2	
1-2	687.8 ± 95.8	
3-4	738.9 ± 43.1	
≥5	804.4 ± 23.3	
Booking status		0.229
Booked	715.9 ± 204.3	
Unbooked	707.6 ± 111.1	
Booking weight (kg)		0.035 ^a
<50	544.0 ± 22.7	
50-69	611.7 ± 84.6	
70-89	707.1 ± 56.5	
≥90	734.7 ± 17.2	

^aOne-way ANOVA. ANOVA, Analysis of variance; SD, Standard deviation

findings highlighted the important variations in placental weights based on the geographical, racial, nutritional, and genetic characteristics of the different study locations.^[12] The

Table 4: Placental weights and delivery outcomes

Outcome	Mean placental weight (g) Mean±SD	P
Mode of delivery		
Vaginal delivery	705.4±108.8	0.077
Cesarean delivery	692.7±56.3	
Gestational age at delivery (weeks)		
<37	430.5±87.2	0.041
≥37	786.9±107.1	
Birth weight (kg)		
<2.5	475.4±18.9	0.003 ^a
2.5-3.49	686±77.5	
3.5-4.49	792.8±105.3	
≥4.5	835.7±122.4	
State of neonate at birth		
Live birth	704.1±171.6	0.592
Stillbirth	681.7±59.4	
Neonatal 5-min Apgar score		
0	502.4±64.7	0.016 ^a
1-3	650.7±101.6	
4-6	715.5±18.9	
7-10	798.3±92.8	
Fetal gender		
Male	635.1±67.3	0.720
Female	643.9±107.5	
Umbilical cord length (cm)		
<50	607.3±31.1	0.035 ^a
50-74.9	713.6±5.9	
≥75	809±75.4	

^aOne-way ANOVA. ANOVA, Analysis of variance; SD, Standard deviation

mean umbilical cord length in this study (59.6 ± 11.7 cm) is comparable to the average umbilical cord length of 57.48 cm found in another Nigerian study carried out in a similar group of parturients.^[13]

The age range of 18–35 years is regarded as the period of optimal physiological adaptation to pregnancy,^[14] and this can explain why the mean placental weight of women in this age group was greater than that of women in the other age group categories in this study, even though we found no statistically significant relationship between maternal age and placental weight. This may be because, in the older women (≥ 35 years of age), the physiological changes of aging due to reduced compliance of the blood vessels with subsequent rise in both systolic and diastolic blood pressure may prevent the development of a totally healthy pregnancy and placenta.^[14]

Our study reported a positive linear correlation between parity and placental weight. This proportional increase in placental weight with increasing parity is in agreement with the previous reports that the placentae and babies from multiparous women from 32 weeks onward are heavier than those from primiparous women.^[15-17] We also found that there is an increase placental

weight in relation to increase in the maternal booking weight. This linear association between increasing maternal weight (or body mass index) in categories and placental weight was convincingly illustrated in the previous studies carried out in Scotland^[18] and the Netherlands.^[19]

Gestational age is a known determinant factor of placental weight,^[20] and this was corroborated by our study where we found a statistically significant relationship between the gestational age at delivery and mean weight of the placenta. Molteni *et al.* have shown that the average placental weight is related to the gestational age.^[21] They stated that placental weight increases in infants proportionately with gestational age; however, in sharp variation to these findings, Lo *et al.* have reported that there is no significant difference between placental weight and gestational age.^[22]

The placenta is essential for normal fetal development and failure of the placenta can result in fetal problems including fetal growth restriction and fetal distress at birth.^[15,22] We found a significant positive association between the weight of the placenta and improved Apgar score at birth in correlation to a previous Iranian study by Asgharnia *et al.*^[2] Even though our study reported a higher mean placental weight in the male fetuses, we did not demonstrate any statistically significant relationship between placental weight and the fetal sex in contrast to other previous studies that reported that the male fetuses gain significantly greater weight when compared to their female counterparts.^[7,10,23]

Placental weight increase in this study also showed a positive relationship with the baby's birth weight. Similar findings have been reported in the previous studies.^[10,20,21,24-26] These studies considered placental weight as a determinant of fetal growth in addition to the maternal factors because the placenta is believed to play a major role in fetal nutrition and fetal growth as nutrients from the maternal circulation need to be transported across the placenta to reach the fetal circulation.^[27,28] Limitations to this study include lack of reliable data on all deliveries that took place during the review period due to poor medical record-keeping system in the hospital. Placental weight measurements may be subjected to some interobserver errors.

Conclusion

We found in our study that parity, maternal booking weight, gestational age at delivery, baby's birth weight, umbilical cord length, and neonatal 5-min Apgar score had positive correlations with placental weight. Critical examination of

the placenta and umbilical cord immediately after delivery can, therefore, be used to determine the well-being of the baby as suboptimal placental weight and is significantly associated with some adverse pregnancy outcomes. Further longitudinal studies are, however, needed to examine the extent to which placental weight will affect the future growth and development, nutritional status, and health of newborns.

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Conflicts of interest

There are no conflicts of interest.

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