

DOES THE PLACENTAL WEIGHT AFFECT FOETAL OUTCOME FINDINGS FROM CENTRAL NIGERIA

*Daru, Patrick Haruna¹., Egwuda, Kenneth¹., Madziga, Isa Gemace¹., Ocheke, Amaka Ngozi¹., Okpe, Sylvanus Edache².

¹Department of Obstetrics & Gynaecology, Faculty of Medical Sciences, University of Jos, and Jos University Teaching Hospital, Jos, Plateau state, Nigeria.

²Department of Paediatrics, Faculty of Medical Sciences, University of Jos, and Jos University Teaching Hospital, Jos, Plateau state, Nigeria.

ABSTRACT

Placental weight has been shown to have some correlation with fetal outcome. However, this relationship has not been closely studied in our environment. Hence the aim of this study is to determine the mean placental weight and its ratio to birth weight in normal pregnancy, and to determine whether abnormal placental weight and its ratio are associated with poor pregnancy outcome.

Methodology: This prospective cross-sectional study of all singleton deliveries in 2011 looked at the birth weights, placental weights, foetal: placental ratio, and Apgar scores in the 1st and 5th minutes in the labour suite of the Department of Obstetrics & Gynaecology, of the Jos University Teaching Hospital (JUTH), Jos, Plateau state, in North Central Nigeria.

Result: The mean placental weight was 623.0g (SD 145.6). The mean placental weight to birth weight ratio was 20.24%, (SD=4.836).

There was a positive correlation between placental weight and birth weight ($r=0.411$) $P<0.0001$.

There was an association between placental weight below the 10th percentile and foetal distress ($P<0.0001$) for the 1st and 5th minute Apgar scores. The same association holds true at the ratio 90th percentile. Perinatal motility was high at placental weight to birth weight ratio 10th percentile $P<0.0001$.

Conclusion: The placental weight increased with increasing birth weight. Abnormal placental to birth weight ratio were significantly associated with some adverse pregnancy outcomes.

Keywords: Placenta weight: Birth weight ratio, foetal outcome.

INTRODUCTION

Foetal growth and development are complex processes that are influenced by a series of multiple interacting environmental, genetic, maternal and utero-placental factors that ultimately determine the size of the foetus¹. The placenta is a complex organ, producing and releasing numerous hormones and enzymes into the maternal bloodstream and also serves as the organ of transport for all fetal nutrients and metabolic products as well as for the exchange of oxygen and CO₂.^{1,2} The ability of the foetus to grow and thrive in-utero depends a lot on the function of the placenta.

The ratio of placental weight to newborn weight has been reported to be 1:6^{3,4}. Also foetal anthropometry and placental weight at term show slight variations from one region to another^{6,7}. Studies have shown some association between placental weight and foetal/pregnancy outcome. There is a correlation between placental weight and fetal weight. Also, high placental weight has been shown to be associated with poor perinatal outcome, a low Apgar

score, respiratory distress, and perinatal death, while low placental weight is associated with medical complications in the mother and in the foetus in later life²⁻⁴.

There is currently no data from this centre on the placental weight, and its ratio to birth weight, hence the need for this study, which is aimed at determining the mean placental weight and its ratio to birth weight in normal pregnancy, and to determine if abnormal placental weight and its ratio are associated with poor pregnancy outcome.

METHODOLOGY

This was a prospective cross sectional study conducted over 12 months (January 1 –December

*Corresponding Author: Dr. Patrick Haruna Daru, Department of Obstetrics & Gynaecology, Faculty of Medical Sciences, University of Jos, & Jos University Teaching Hospital, Jos, Plateau State, Nigeria.

31, 2011) in the labour ward suite of the department of Obstetrics and Gynaecology of the Jos University Teaching Hospital, Jos, Plateau state, Nigeria.

Ethical clearance was obtained from the Ethics Committee of the Jos University Teaching Hospital. Informed consent was obtained from the parturients. The bio data, relevant medical and social histories were obtained from the consenting women.

All newborns with known gestational ages, or with early first trimester ultrasound scan dating were included while those whose mothers had medical diseases affecting placental weight such as diabetes mellitus, hypertensive disorders, maternal anaemia, vascular diseases, or those mothers who were not sure of their gestational ages, or were unwilling to participate in the study were excluded. Also multiple gestations and babies with congenital anomalies were excluded.

The weight of the newborn was identified from the anthropometric data, and the placentae were weighed untrimmed within 30 minutes of delivery. The Apgar scores in the 1st and 5th minutes were recorded. All other complications were recorded within 48 hours after birth including admission to the Special Care Baby Unit (SCBU).

A total of 2074 deliveries occurred during the period under review. However, 1947 (94%) deliveries met the inclusion criteria and formed the subjects of the study.

The data was analyzed with SPSS version 18.0 to generate frequency tables and evaluate relationships between variables. Significance of tested relationships between variables is assumed at p value <0.05.

General categorical data were described as percentages. The placental weight ratio (PWR) was defined as the ratio of placental weight to newborn birth weight multiplied by 100 (%). Placental weight and PWR were described as median, the 10th and the 90th percentiles for each gestational age group. The Pearson product moment correlation coefficient was used to test the magnitude and significance of any relationship between placental weight and birth weight. Fisher's exact test was used to compare abnormal placental weight and abnormal PWR with adverse outcomes of the newborn for the intrapartum and perinatal periods. P values of less than 0.05 were considered statistically significant.

RESULTS

The mean placenta weight (Figure I), mean birth weight, and mean placental weight ratio were 623.0g (SD 145.6), 3314g (SD 9.24) and 20.24%(SD 4.836) respectively.

The median placental weight varied in the different gestational age groups. It was 500g in the < 36 weeks group, 600g in the 36-40 weeks group and 650g in the >40 weeks group. Figure II.

The median placental weight at the 10th and 90th percentile for <36, 36-40, and >40 weeks groups were 300g & 700g; 500g & 800g and 500g & 850g respectively. Figures II, and III.

The mean placental weight ratio was 20.23 % (SD 4.83) Figure IV, the mean birth weight was 3314g (SD 9.24), while the mean placental weight to birth weight ratio (PWR) was 20.23%(SD 4.83). Figure V. One thousand five hundred and eighty six (81.5%) deliveries occurred within the 36-40 weeks gestational age group, 294 (15.1%) of neonates had <7 one-minute Apgar scores, 116(6.0%) had <7 five-minute Apgar scores and 63(3.2) neonatal deaths were recorded. Table 1

Figure V shows the relationship between the placental weights to birth weight, which indicate near normal distribution placentae across the gestational age groups.. One hundred and ninety seven patients had PWR < 10th percentile of which 46(23.4%) had Apgar scores < 7 in the 1st minute (p < 0.0001); 29(14.7%) had Apgar scores < 7 in the 5th minute (p < 0.0001), while 19(9.6%) neonates died,(p<0.0001).

One hundred and ninety two cases had their PWR 90th percentile of which 51(26.6%) and 20(10.4%) had Apgar scores < 7 in the 1st and 5th minutes respectively,(p<0.0001). Eight (4.2%) neonates died (p= 0.192) and were not statistically significant. Table 1.

In the placenta weight group, 397 had placental weights of 10th percentile of which 102(25.7%) had Apgar scores of < 7 in the first minute and 57(14.4%) had Apgar scores of < 7 in the 5th minute (p< 0.0001) while 36(9.1%) neonates died (p<0.0001).

DISCUSSION

The mean placental weight in this study was 623g, which is higher than those reported in Thailand (519g) and India (578g)⁹⁻¹¹. This may be due to racial, environmental, or demographic differences. Additionally, our placentae were weighed untrimmed, which would positively affect the weight. At placental weight of 90th percentile, no

immediate foetal complications were observed., while at 10th Percentile, there was a significant increase in perinatal mortality, and neonatal asphyxia ($p < 0.0001$), which agrees with earlier studies¹⁰⁻¹², but differs from the Mymensingh study, where there was no association with foetal asphyxia¹⁰.

This study indicated placental weight increases were associated with increased birth weight in normal pregnancy as seen in many studies^{3,4,7-12}. The placental weight increased with increasing birth weight and was shown to be statistically significant (Pearson Product Moment correlation coefficient $r = 0.411, p < 0.0001$).

Abnormal placental weight and PWR were associated with some adverse intrapartum and perinatal outcomes, including lower Apgar scores and perinatal mortality ($p < 0.0001$), which also agrees with other studies, although most of these other studies had a more expanded views in terms of perinatal outcomes like admission into SCBU for various indications and maternal characteristics like the body mass index^{5,7,9,11,12-14}.

It is observed in this study that the PWR had more impact on the foetal outcome than the placental weight alone, and higher placental weight ratios were associated with more adverse foetal outcomes compared to the Thai, British Colombian, and other East Asian studies^{3,9,10,12-14}.

Using these findings, the distribution curves of normal placental weight and PWR for each gestational age group were constructed, and normograms for this environment obtained.

Some limitations of this study were that the placentae were weighed untrimmed, with no differentiation between the sexes, and adverse foetal outcomes were restricted to foetal asphyxia, and perinatal mortality alone. Future studies to compare differences between the sexes, more expanded foetal outcomes such as admission for neonatal jaundice, sepsis, amongst others, will be necessary for a firm conclusion to be drawn on the relationship between the placenta weight ratio to be made.

In conclusion, this study shows that there is a positive correlation between placental weight and birth weight at term, and, abnormal placental to birth weight ratio were significantly associated with some adverse pregnancy outcomes.

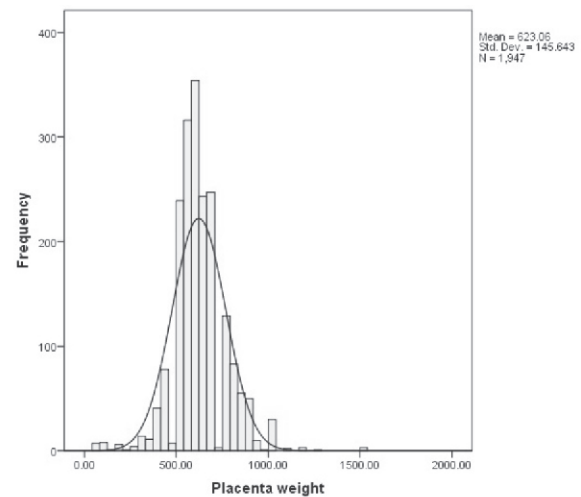


Figure 1. Placental weight

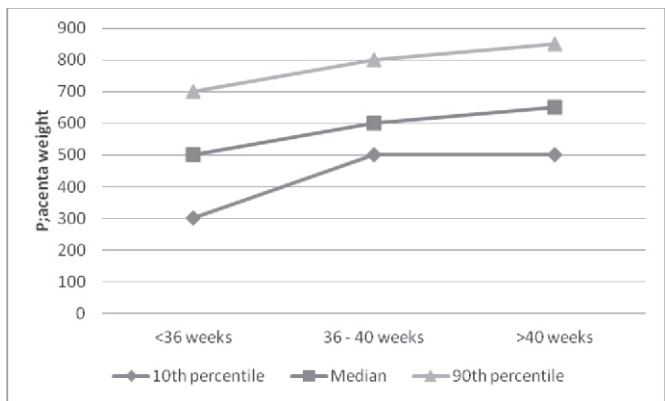


Figure II. Placental Weight at 10th, median, and 90th percentiles

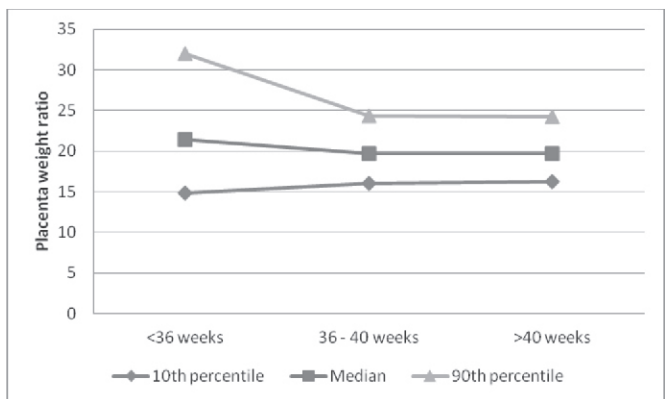


Figure III. Placental Weight Ratios at the 10th, median, and 90th Percentiles

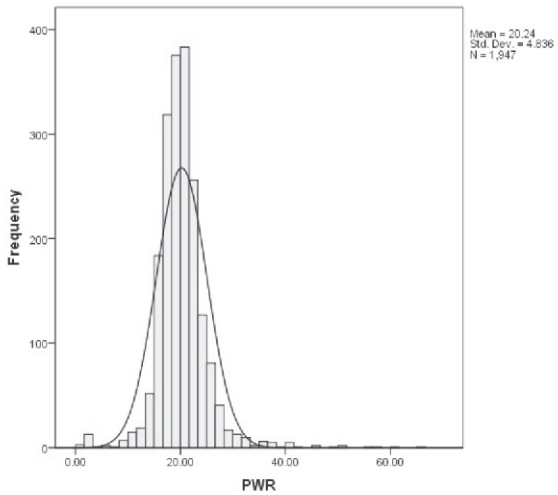


Figure IV. Placental Weight Ratio

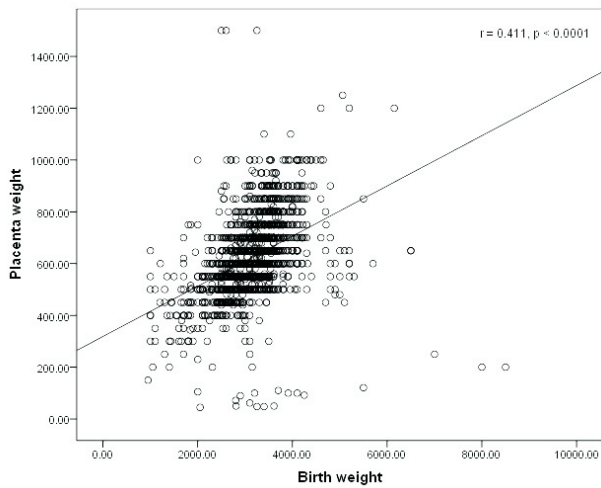


Figure V. Placenta Weight: foetal weight ratio.

There is a significant positive correlation between placenta weight and birth weight. Pearson's correlation coefficient ($r = 0.411$) $p < 0.0001$.

Characteristics	Number (%)
	(N=1947)
Age group	
• <20 years	34 (1.7)
• 20 - 34 years	1564 (80.3)
• =35 years	348 (17.9)
Parity	
• Nulliparous	537 (27.6)
• Multipara	1407 (72.3)
Gestational age	
• <36 weeks	156 (8.0)
• 36 - 40 weeks	1586 (81.5)
• >40 weeks	205 (10.5)
APGAR at 1 minute	
• <7	294 (15.1)
• =7	1653 (84.9)
APGAR at 5 minutes	
• <7	116 (6.0)
• =7	1831 (94.0)
Fetal outcome	
• Alive	1884 (96.8)
• Dead	63 (3.2)

REFERENCE:

1. Sailesh K. Foetal and Placental Physiology. In: Phillip B, Catherine W (eds), Basic sciences in obstetrics and gynaecology, 4th Edition. UK: Churchill Livingstone, Elsevier, 2010; 49-56
2. Cunningham FG, Leveno KG, Bloom SL, Hauth JC, Gilstrap LC III, Wenstrom KD. Implantation, embryogenesis, and placental development. In: Williams Obstetrics. 22nd Edition. New York: McGraw-Hill; 2005:39-90
3. Naeye RL. Do placenta weight have clinical significance? Hum Pathol 1987; 18:387-91.
4. Barker DJP, Gulkman PD, Godfrey KM, Hardin JE, Foetal and infant growth rates and adult pathology. In: Williams P, Fergusson M. Gray's Anatomy. London: ELBS, Churchill Livingstone. 1995: 1-100.
5. Onwuanaku CA, Okolo SN, Ige KO, Ope SE, Toma BO. The effects of birth weight and gender on neonatal mortality in north central Nigeria. BMC Res. Notes 2011. 4:562.
6. Onyiriuka AN. Trends in the incidence of delivery of low birth weight infants in Benin City, southern Nigeria. Niger. Postgrad. Med. J 2006. 13(3): 189-94
7. Donelle L, Robert AK. Maternal-Placental-Foetal Unit; Foetal & Early Neonatal Physiology. In: Decherney AH and Nathan L (Ed), current Obstetric and Gynaecologic Diagnosis and Treatment, 9th Edition, USA: McGraw-Hill companies Inc. 2003; 163-165
8. Robert AA, Mckinney ET. Development and Physiology of the placenta and Membranes. In: Sciarra JJ (author) Obstetrics and Gynaecology Lippincott Williams & Wilkins; 2001. (1-6), 11 Viupaxi RD, Poturri BR, Shirol VS, Desai SP, Hukkeri VB. Morphology of Placenta and its Relation with Small for Date babies in 950 live Births. *Recent research in Science and Technology*. 2011, 3(2): 123-126.
9. Kabir N, Kawser CA, Rahman F, Kabir ML, Rahman A. The relationship of placental weight with birth. Mymensingh medical journal (MMJ). 2007;(2): 177-180.
10. Manop J, Ounjai K, Alan G. Placental weight and its ratio to Birth Weight in Normal Pregnancy at Songkhlanagarind Hospital. *J Med Assoc Thai* 2006; 89(2) 130-7.
11. Molten RA, Stys SJ, Battaglia FC. Relationship of foetal and placental weight in foetal/ placental weight ratios at various gestational ages and birth weight distributions. *J Reprod Med* 1978; 21:327-34
12. Leary SD *et al.* contribution of the umbilical cord ad membranes to untrimmed placental weight. *Placenta* 2003; 24: 276-8.
13. Tilo Burkhardt, Leonhard Schäffer, Christoph Schneider, Roland Zimmermann, Juozas Kurmanaviciu J. Reference values for the weight of freshly delivered term placentas and for placental weight–birth weight ratios.. *European Journal of Obstetrics & Gynecology and Reproductive Biology*. 2006, 128, (1–2): 248-252