Correlation of birth and placental weights amongst Hausa parturients in Kano

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The aim of this study is to establish the relationship of birth weight to the placental weight of our ethnic community which until now is to our knowledge unavailable. All the studied 500 live births and their placentas were products of single gestation at term. This is a prospective study of 500 healthy term placentae of the Hausa ethnic group parturients. Each of the placentas was cleansed of blood clots and trimmed of umbilical cord near its attachment and its weight determined using the triple beam balance. The weight of each new born was determined using birth weight weighing balance. The data were recorded and analyzed using Minitab 16 software and Pearson’ Correlation Coefficient was used to determine the relationship between the weights. Regression equation was also developed. The placental weight had a mean of 471.2 g (SD: 70.9 g), mean of birth weight was 2862.6 g (SD: 443 g). The results showed a statistically significant correlation between the placenta and the birth weight using the Pearson’s correlation (r = 0.845, P < 0.001). Birth weight-placenta ratio was 6.1 (SD: 0.6). From the scatterplot (birth weight versus placenta), the birth weight has a linear relation to the placental weight. We therefore conclude that the Hausa ethnic group parturients have a lower placental weight birth/weight ratio (as compared to those reported in the literature), possibly due to socio-economic, environmental or racial differences.

Key words: Placenta, birth, weight, Hausa, Kano.

INTRODUCTION

Since placenta is essential for maintenance of pregnancy and fetal growth (Salafia et al., 2006), its complete examination and anthropometric measurements are therefore very helpful to healthcare providers. Some of the measures, for example weight of the placenta is among the simplest that can be recorded easily with accuracy and its association with pregnancy abnormality is of great interest to clinicians (Sedlis et al., 1967). The placenta and birth weights have since been reported to correlate closely with each other in normotensive parturients (Sibley, 1994; Jaya et al., 1995; Kabir et al., 2007; Thompson et al., 2007; Salafia et al., 2008). Association between the placental and birth weights with future risk of chronic diseases were reported and low birth weight increases the risk of high blood pressure, stroke and coronary heart diseases (Barker et al., 2009). In addition, disproportion between placental weight and birth weights as well as placental weight/birth weight ratio was reported in parturients who had assisted reproductive technology (ART) pregnancy (Haavaldsen et al., 2012). Therefore, since larger placentas and larger placental weight/birth weight ratio was found in parturients who had ART, it is logical to have lower placental weight and lower placental weight/birth weight ratio in people who spontaneously delivered. The correlation of placenta weight birth weight was not done on Hausa ethnic group of Nigeria and therefore the aim of the study was to make this correlation.

MATERIALS AND METHODS

The study was conducted amongst Hausa people in Kano, a city in
The placental weight in this study ranges between 330 to 562 g in males and 340 to 650 g in females. Its mean weight was 471.2 g (SD 70.9) irrespective of sex, but slightly higher in males (483.8 g ± 74.8) than in females (458.6 g ± 64.5). Table 1. The mean birth weight was 2862.6 g (SD 443) slightly higher than found in females (2766.8 ± 396.8) but less than recorded for males (2958.4 g ± 466.4) (Table 1). Mean placental weight-birth weight ratio was 6.1 with standard deviation of 0.6 (Table 1). The Pearson’s correlation coefficient was 0.845, and the P-value was < 0.001 which shows statistically significant correlation between the placental weight and the birth weight of the Hausa ethnic group (Table 2). The scatterplot showed a linear relationship when birth weight was plotted against the placental weight (Figure 1). This indicates that as the placental weight increases, the birth weight also increases (meaning positive correlation). Regression analysis was also done to find a regression equation for birth weight and placental weight (indicating another mathematical relation between the two measures), Tables 3 and 4. The formula is given below as:

Regression analysis: Placental weight (Pwt) (g) versus weight placental (Bwt) (g)

The regression equation is:

Birth weight in gram = 375 + 5.28 Pwt/g
OR
Placental weight in gram = 83.9 + 0.135 Bwt/g

**RESULTS**

The mean placental weight, mean birth weight and the mean placental/birth weight ratio were calculated by us. Placental weight and birth weight correlation were also determined using Pearson’s correlation and regression equation was also developed to show another correlation between the birth and placental weights.

### Table 1. Descriptive statistics of placental weight, birth weight and placental weight/birth weight ratio of Hausa (n = 500).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SE Mean</th>
<th>StDev</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placental weight (g)</td>
<td>471.2</td>
<td>3.2</td>
<td>70.9</td>
<td>303.0</td>
<td>661.0</td>
</tr>
<tr>
<td>Birth weight (g)</td>
<td>2862.6</td>
<td>19.8</td>
<td>443.0</td>
<td>1300.0</td>
<td>4000.0</td>
</tr>
<tr>
<td>Birth weight / Placental weight</td>
<td>6.1</td>
<td>0.0</td>
<td>0.6</td>
<td>3.1</td>
<td>10.9</td>
</tr>
</tbody>
</table>

### Table 2. Pearson’s correlation between placental weight and birth weight of Hausa (n = 500).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>r</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth weight /Placental weight ratio</td>
<td>0.845</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Placental weight / Birth weight, sex</td>
<td>0.080</td>
<td>0.075</td>
<td></td>
</tr>
</tbody>
</table>

### Table 3. Regression analysis birth weight versus placental weight.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coef</th>
<th>SE Coef</th>
<th>T</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>374.80</td>
<td>71.29</td>
<td>5.26</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Placental weight (g)</td>
<td>5.2792</td>
<td>0.1496</td>
<td>35.29</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

**S = 236.978  R² = 71.4%  R² (adjusted) = 71.4%**

### Table 4. Regression analysis placental weight versus birth weight.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coef</th>
<th>SE Coef</th>
<th>T</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>83.89</td>
<td>11.11</td>
<td>7.55</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Birth weight (g)</td>
<td>0.135316</td>
<td>0.003834</td>
<td>35.29</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

**S = 37.9398  R² = 71.4%  R² (adjusted) = 71.4%**

### DISCUSSION

The birth weight placental weight ratio is useful because it is considered to be more relevant than placental weight alone when considering fetal and neonatal death during the perinatal period (Nummi, 1972). Again, it has been said to be associated with chronic high blood pressure and other serious heart diseases in the future if its larger than normal (Risnes et al., 2009). The normal range was given as 6.5 to 7.1 at term 37 to 42 weeks (Kraus et al., 2004), but values between 6.3 to 8.46 at 34 to 43 weeks was also reported (Salafia et al., 2007). The mean birth weight placental weight ratio in this study is 6.1, lower than the ranges given in those two studies. In another UK
based study, value of 7.2 at 37 to 42 weeks gestation was reported (Pathak et al., 2010) which was still higher than the mean value we derived but within the range of the ratio (of 3.1 to 10.9) that we reported. The birth weight placental ratio in our study has been completely different from the values derived in those studies which were for the Caucasians. The difference may not be unconnected with racial variability or purely socio-economical and possibly environmental. Higher ratio may also be due to prematurity (Sedlis et al., 1967) because of large placenta associated with preterm babies but none of our participants was preterm. In addition, an outlier in any of the weights may be responsible for the wide range but there was no outlier in our results. We believe therefore the wide range to be due to the wide range of fetal weight of as low as 1.3 kg and as high as 4 kg that we recorded. Many studies reported the relationship of birth weight placental weight in different ways either placenta: birth weight ratio (Alwasel et al., 2011) or birth weight placental weight ratio (Risnes et al., 2009; Pathak et al., 2010), in fractional form (Williams et al., 1997) or in percentage (Perry et al., 1995; Alwasel et al., 2011) but in any way presented, the correlation will be the same.

This study showed linear correlation (scatter plot Figure 1) between the birth weight and the placental weight which is in agreement with what was obtained in the UK based study (Pathak et al., 2010) and agreed with the reported direct proportionality of birth weight to placental weight (Jaya et al., 1997). We are indeed grateful to all the participants and staff of Murtala Muhammed Specialist Hospital Kano, Nigeria who assisted tirelessly during the conduct of the study. Special thanks also go to Professors A. A. Tadros and H. Ahmed, College of Health Sciences, Usmanu Danfodiyo University Sokoto, and Professor Nicholay Dimitrov Dimitrov for their guide and support.

ACKNOWLEDGMENTS

We also did a linear regression to get an equation of relationship between the birth weight and placental weight. This is important in approximating birth weight in cases where only placental weight is known, or alternatively, placental weight if only birth weight is known. This is in cases where there was a retained placenta which could not be delivered as a whole to allow measurement or in certain rare but possible cases of stolen placenta or the new born, or mixing of placentas together by the delivering personnel. In such case, identification of placenta to which baby it belongs, is going to be difficult especially in villages where DNA analysis is not available.

Conclusion

We were able to establish a linear birth weight placental weight correlation and regression equations to estimate either birth or placental weight for the ethnic group. The values we recorded were lower than in Caucasians which we believe to be due to socio-economic, environmental or racial differences. We therefore recommend similar study to be performed in different ethnic groups in the same country for easy comparison.

REFERENCES


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