Placental Weight and its Ratio to Birth Weight in Normal Pregnancy of Saudi Women Attending Abha General Hospital

MONA A. AL-MUSHAIT, J.B.O.G.; AZZA M. ALYAMANI, M.D. and JAMEELAH A. ABOUD, M.B.B.S.
The Department of Obstetrics & Gynecology, College of Medicine, King Khalid University* and Abha General Hospital**, Saudi Arabia

Abstract

Objectives: The aims of this study were to study placental weight (PW), birth weight (BW), and placental weight ratio (PWR) in normal pregnant Saudi women in Abha General Hospital (AGH) and to identify the relationship between PW and PWR to adverse neonatal conditions (ANC) of the subjects.

Material and Methods: This was a cross-sectional study from September 2010 to February 2011 conducted on 1025 women, full term, had normal delivery and singleton pregnancy without placental abnormalities. PW, BW, PWR and neonatal condition were estimated.

Results: The results showed that the range of PW was 200-1000 grams in male neonates and 200-1100 in female neonates. The mean PW of NICU admitted neonates in grams was 503.4 (161.9). The range of BW in males was 900-4100 grams and 1100-4800 grams in females. The range of PWR in male was 5.1% and 47.6% while it was 5.2% and 46.6% in female. The mean PWR for NICU admitted neonates was 18.1% (4.1). The difference between the mean PW and its ratio and the mean BW below 10th percentile and above 90th percentile is significant (p=0.01).

Conclusion: This study has shown that low PW can result in neonatal problems that indicate NICU admission also PW and placental weight ratio (PWR) at 10% and more than 90% percentile are associated with increased NICU admission.

Key Words: Birth weight — Placental weight — Placental weight ratio — Pregnancy outcomes.

Introduction

BIRTH weight (BW) is a simple measure of birth outcome with enormous implications for prenatal survival ill. The principal determinant of BW is the efficiency transfer of placental nutrients and oxygen, a mechanism highly dependent on a well-grown placenta 121. Measures that reflect the growth of the placenta, which enables fetal growth, might provide a window onto the underlying mechanism by which BW is associated with morbidity and mortality in infants, children, and adults ill.

The ratio of placental weight (PW) to BW is influenced by many factors such as maternal ethnic origin, obesity, hypertensive, abnormal nutritional patterns including iron deficiency anemia and life stresses [3]. As BW varies from one community to another, so also PW and placental weight ratio (PWR) are expected to vary.

The aim of the present research was to study PW and PWR in normal pregnant Saudi women who delivered at Abha General Hospital (AGH) to use a basic reference tool for future studies. It also evaluates the prevalence of low PW and determines its impact on infant's characteristics. The conclusions of this study would have a great influence on infant's care and many obstetricians' decisions.

Material and Methods

This was a cross-sectional study using a selected sample of 1025 Saudi pregnant women who delivered at Abha General Hospital (AGH) in Aseer region of Saudi Arabia during a 6-month period from September 1, 2010 to February 28, 2011. All were Saudi women in origin, classified as low to moderate socioeconomic status according to the Saudi Ministry of Economy and Planning Classification on 2006-2007 [4], non-smokers, and parity from P1 to P3. All are also full term between 37 to 42 weeks, singleton pregnancy and had normal spontaneous vaginal delivery. Accurate estimation of gestational age (AGA) was obtained.

Exclusion criteria ruled out patients with maternal diseases affecting placental weights (PW)s such as diabetes mellitus, hypertensive disorders, maternal anemia (having a hematocrite level less than 33%), vascular diseases and other relevant
medical problems. Congenital anomalies and abnormalities of the placenta including placenta adherence, placenta previa and placental abruption detected after delivery were also excluded from the study.

An approval was taken from the Ethical Committee of King Khalid University while a written permission was secured from the hospital Director to conduct the study.

Placenta preparation:

Each placenta was weighed 15-20 minutes after delivery with the membranes and umbilical cord. It was neither washed nor dried. The weight was estimated in grams. The PWR was defined as the ratio of PW to newborn BW.

Newborn protocol:

The details of the neonatal condition were collected using a specially designed data collection sheet that included the following: Apgar score at 1 & 5 minutes, neonatal asphyxia, respiratory distress syndrome (RDS), neurological disorders, congenital anomalies, neonatal intensive care unit (NICU) admission and perinatal death.

Statistical analysis was carried out using the arithmetic means and standard deviations to present the data. Mann-Whitney test was used to compare the mean of PW, BW, PWR and NICU admission in the study sample with a confidence interval of 95% and a p-value of equal or less than 0.05 was considered statistically significant.

BW was described as median, the 10th and the 90th percentiles (light BW was defined as BW below the 10th percentile, heavy BW is above the 90th percentile, and normal BW as between the 10th and 90th percentiles of the corresponding gestational age). All statistical analyses were performed with SPSS statistical software, version 16 for Windows (SPSS Inc. Chicago, IL, USA).

Results

During the study period, a total study sample of 1025 pregnant women had delivered male neonates 510 (49.7%) and 515 (50.2%) female neonates. As shown in Table (1), PW ranged between 200-1100 grams in females and 200-1000 in males. Also, it projected that BW ranged between 900-4100 grams for male neonates while it was 1100-4800 grams for females. In addition, the same table showed that PWR ranged between 5.1%-47.6% in male neonates and 5.2%-46.6% in female neonates.

Table (2) revealed that mean PW did not differ significantly (p=0.155) between females and males, as the values of PW were 545.4±123.4 and 554.6±128.5 grams in male and female neonates, respectively. The PWR were 18.6±3.7% and 19.3±4.3% in female and male neonates, respectively. This difference was statistically significant (p=0.001). On the other hand, males showed heavier BW than female neonates (2958.8±499.9 vs. 2908.8±495.9 grams, respectively), as shown in Table (1).

Furthermore, as shown in Table (2), the number of admitted neonates to NICU was not affected by PW (p=0.16; CI=0.291-0.349, respectively).

For the PWR of NICU admitted neonates to PWR of NICU not admitted neonates, the result showed that it was not significantly different (p=0.421 and a confidence interval of 0.391-0.452). PWR changed according to BW, as for the mean PW, the 10th and 90th percentiles were (436±29.6 and 682.5±136.7, respectively) and the PWR to them were (22.5%±6.4 and 18.1%±3.5, respectively). When the mean PW and PWR of the neonates allocated in the 10th percentile and the 90th percentile was compared to their BW, the result highlighted the presence of a highly significant difference (p<0.0001 and a confidence interval of 0.00-0.03, Table 2).

Table (1): Range and the corresponding mean standard deviation (SD) of birth weight (BW), placental weight (PW) and placental weight ratio (PWR) for male and female neonates.

<table>
<thead>
<tr>
<th>Item</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth weight range in grams</td>
<td>900-4100 grams</td>
<td>1100-4800 grams</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>2958.8 (499.9)</td>
<td>2908.8 (495.9)</td>
</tr>
<tr>
<td>Placental weight range in grams</td>
<td>200-1000 grams</td>
<td>200-1100 grams</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>545.4 (123.4)</td>
<td>554.6 (128.5)</td>
</tr>
<tr>
<td>Range of placental weight ratio</td>
<td>5.1%-47.6%</td>
<td>5.2%-46.6%</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>18.6%</td>
<td>19.3%</td>
</tr>
</tbody>
</table>
Table 2: Comparison between mean placental weight (PW) and placental weight ratio (PWR) to neonate gender, birth Weight (BW) and NICU admission.

<table>
<thead>
<tr>
<th>Item</th>
<th>No. of neonates and %</th>
<th>Placental Weight Mean (SD)</th>
<th>p-value</th>
<th>95% Confidence Interval</th>
<th>Placental Weight Ratio Mean (SD)</th>
<th>p-value</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>510 (49.7%)</td>
<td>545.4 (123.4)</td>
<td>0.155</td>
<td>0.299-0.357</td>
<td>18.6 (3.7)</td>
<td>0.001</td>
<td>0.00-0.006</td>
</tr>
<tr>
<td>Female</td>
<td>515 (50.2%)</td>
<td>554.6 (128.5)</td>
<td></td>
<td></td>
<td>19.3 (4.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birth Weight:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2400 grams (10th%)</td>
<td>100 (9.7%)</td>
<td>436 (129.6)</td>
<td>0.000</td>
<td>0.00-0.03</td>
<td>22.5 (6.4)</td>
<td>0.000</td>
<td>0.00-0.03</td>
</tr>
<tr>
<td>&gt;3600 grams (90th%)</td>
<td>100 (9.6%)</td>
<td>682.5 (136.7)</td>
<td></td>
<td></td>
<td>18.1 (3.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NICU admission:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not admitted</td>
<td>996 (97.1%)</td>
<td>551.4 (124.6)</td>
<td>0.16</td>
<td>0.291-0.349</td>
<td>18.9 (4.0)</td>
<td>0.421</td>
<td>0.391-0.452</td>
</tr>
<tr>
<td>Admitted</td>
<td>29 (2.8%)</td>
<td>503.4 (161.9)</td>
<td></td>
<td></td>
<td>18.19 (4.1)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Discussion

In order to study PW, BW and PWR of Saudi women who gave birth in AGH to be used by the researchers and clinicians, we studied a sample of 1025 pregnant women who delivered 510 (49.7%) male and 515 (50.2%) female neonates.

The findings in the present study suggest that significant information about the health of the baby can be obtained from PW, as PW increases are associated with increased BW in normal pregnancy.

The mean PW in the present study was 545.4 and 554.6 grams in male and female neonates, respectively. This weight is higher than the 470 grams recorded among the Americans [5] and the 519 grams in Thailand [6]. However, it was lower than the 646 grams recorded among the Chinese [7]. The mean PW in this study is nearly as that recorded in Nigeria by Adebami el al., who recorded that the mean PW was 565.2 grams [8]. These differences in PW may be due to racial differences as it is known that PW varies from one region to another.

The mean PWR in this study was 18.6%-19.3% in male and female neonates, respectively. It is higher than the 13.6% recorded among Ukrainian women [5], the 17.6% in China [7] and slightly more than that recorded by Adebami et al., in Nigeria (18.4%) [8]. The explanation of the high PWR in the present study can readily be understood since that recorded in Nigeria by Adebami et al., who recorded that the mean PW was 565.2 grams [8]. These differences in PW may be due to racial differences as it is known that PW varies from one region to another.

The mean PW in the present study was 545.4 and 554.6 grams in male and female neonates, respectively. This weight is higher than the 470 grams recorded among the Americans [5] and the 519 grams in Thailand [6]. However, it was lower than the 646 grams recorded among the Chinese [7]. The mean PW in this study is nearly as that recorded in Nigeria by Adebami el al., who recorded that the mean PW was 565.2 grams [8]. These differences in PW may be due to racial differences as it is known that PW varies from one region to another.

The mean PWR in this study was 18.6%-19.3% in male and female neonates, respectively. It is higher than the 13.6% recorded among Ukrainian women [5], the 17.6% in China [7] and slightly more than that recorded by Adebami et al., in Nigeria (18.4%) [8]. The explanation of the high PWR in the present study can readily be understood since that recorded in Nigeria by Adebami et al., who recorded that the mean PW was 565.2 grams [8]. These differences in PW may be due to racial differences as it is known that PW varies from one region to another.

The lower BW and higher PW in the current study leads to a higher PWR. Increased placental to birth weight ratio has been considered as an adaptive process by the feto-placental unit in an unfavorable maternal environment since placental hypertrophy may occur in response to fetal or placental hypoxia. Therefore, an increased PWR could be a sign of fetal growth disturbance, as has been associated with maternal smoking.

Information on maternal smoking was not complete in the present study, but smoking is rare among women in Saudi Arabia and is unlikely to have substantially influenced the results. It is likely that residence in higher altitudes (as in Abha city) through the mechanism of fetal hypoxia and the resultant placental hypertrophy is a possible explanation of the increased PWR in the present study, especially as none of the participant pregnant women was a smoker.

Recently, Imada et al., found that PW and BW were significantly correlated to the infants’ gestational weeks in a Japanese population [9]. Neonatal factors were found to be associated with abnormal PW and PWR. Male neonates were heavier compared to females (2958.8 grams vs. 2908.8 grams, respectively) with statistically significant difference (p=0.01). This resulted in that both PW and PWR became less in males than in females but the differences were not significant. PW varies according to the sex of the baby; males are known to be heavier than females, due to the non-defined influence of Y chromosome [10].

The impact of the presence of neonatal asphyxia on varying PW was investigated in the current study. The association of neonatal asphyxia and low and high PW was observed in this study with significant association to NICU admission. In other words, newborns with PWR mean of 18.1 (4.1) were associated with adverse neonatal condition (ANC) and needed NICU admission. Asgharnia et al. found highly significant differences and indirect correlation between Cesarean section (CS) and PW. One of the CS indications found is non-
reassuring fetal status. However, Lao and Wong found that there were no significant differences in PW or BW between neonates with presence or absence of meconium-stained amniotic fluid [12].

This study had a limitation as some data, such as fetal hemoglobin for example, were missed. Further studies are needed on a larger sample size from different hospitals in the Aseer Region, and also to monitor placental growth during pregnancy by ultrasonography to guide obstetricians to assess fetal health antenatally and to carry out appropriate measures to be taken to increase the BW.

Conclusions:

The PW and PWR in normal pregnant Saudi women who delivered at AGH can be used as a basic reference tool for future advanced studies. Both mean PW of 503.4 grams and mean PWR of 18.1% (4.1) are associated with NICU admissions. This may be used as a simple warning sign to predict the possibility of short and long term health risks for newborns.

References