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Placental Weight for Gestational Age and Adverse Neonatal Outcome at Bhumibol Adulyadej Hospital

Kesinee Lonimitdee, MD*,
Sinart Prommas, MD*.

** Department of Obstetrics and Gynecology, Bhumibol Adulyadej Hospital, Bangkok 10220, Thailand*

ABSTRACT

Objective: To exam association between placental weight and perinatal outcome.

Materials and Methods: The retrospective cohort study was performed. Data recorded from birth records were reviewed. Placental weight was divided in to three groups, abnormal and normal weight (high and low, normal) according to placenta weight percentile at 10 and 90 percentile respectively. The association to birth weight was analyzed.

Result: The abnormal placental weight group was associated with increased Apgar score at 1 and 5 minute less than 7 (RR 4.0, 95% CI = 1.79-8.91 and RR 4.22, 95% CI = 1.31-13.55), NICU admission rates (RR 4.29, 95% CI = 2.42-7.59), and respiratory complication (RR 3.0, 95% CI = 1.34-6.04) when compared with the normal placental weight group.

Conclusions: Abnormal placental weight was significantly associated with adverse pregnancy outcomes such as Apgar score at 1 and 5 minute less than 7, NICU admission rates and respiratory complication.

Keywords: placental weight for gestational age, adverse neonatal outcome

Correspondence to: *Kesinee Lonimitdee, MD, Department of Obstetrics and Gynecology, Bhumibol Adulyadej Hospital, Bangkok, 10220, Thailand Tel. 02-5347314, Fax. 02-5347319*

Introduction

The placenta is an important organ for transporting nutrition and oxygen from the mother to the fetus and placental weight is directly correlated with fetal birth weight[1]. High placenta weight was associated with a poor perinatal outcome, a low Apgar score, respiratory distress syndrome and perinatal death; whereas a low placental weight was associated with medical complications in the mother[2]. Many studies have observed ratio between placental weight and fetal weight are highly correlation[3-5]. Disproportionately large placentas and low fetoplacental weight ratio (F/P ratio) could reflect acute placental injury resulting in villous edema or a chronic process requiring placental overgrowth, such as maternal anemia or malnutrition[3-5]. Disproportionately small placentas (high F/P ratio) may be seen in maternal hypertension, and may result in fetal distress or low Apgar scores[3-5]. The normal ratio

can reflect birth weight and placental weight when both are concordance whether in normal, high or low placenta weight groups. The fetoplacental ratio may be unable to predict of adverse perinatal outcome. The goal of this study was to examine the relationship between placental weight for gestational age and early perinatal mortality from 34 gestational weeks to 42 gestational weeks.

Material and Method

The study was a cross-sectional study between 1st January 2013 and 31st of August 2013 at Bhumibol Adulyadej Hospital. Three hundred and twenty women who met the inclusion criteria were recruited for the study. The inclusion criteria were singleton delivery at 34–42 weeks. The exclusion criteria included no antenatal care (ANC), fetal anomalies and incomplete medical data.

The information obtained from this study population included gestational age at delivery (in weeks), maternal age, parity, pre–pregnancy weight, pre-delivery weight, absolute total weight gain, birth weight, freshly delivered untrimmed placental weight, fetal gender, fetal weight, maternal medical diseases (e.g., hypertensive disorders , thalassemia and diabetes mellitus). The gestational age was estimated using last menstrual period (LMP). However when the LMP was unknown, the gestational age was estimated via ultrasound in first or second trimester.

All placentas were weighed shortly after delivery weighing scale together with the membranes and the cord after removing obvious blood clots. The weights of the newborn were recorded to the nearest gram. Weight measurements were made by the nursing staff on duty using the same weighting scale. To divide the population into high, normal and low weight groups, the placental weight was calculated and percentile charts 6 for the 3rd, 10th, 25th, 50th, 75th, 90th and 97th percentiles of placental weight by gestational weeks were constructed for males and females separately. Deliveries with a placental weight below the tenth percentile were considered to comprise the low placental weight group (n = 103), those with a placental weight above the 90th percentile were considered to comprise the high placental weight group (n = 104), leaving the rest as the normal placental group (n = 113). This study used power at 80% and alpha error at 0.05 and relative risk of NICU admission at 2.9 to determine sample size at least 92 record per group. The data was processed using the SPSS version 20.0 and statistical analysis performed using one-way analysis of variance (ANOVA) and Chi–square test as appropriate.

Results

Our three study groups (low, normal and high placental weight; n = 320) were comparable in terms of the main demographic and obstetric variables: maternal age, gestational age (Table 1). However, there was a significant increase in pre–pregnancy weight, pregnancy induced hypertension and DM. When obstetric outcomes between high placental weight and normal placental weight groups were compared (Table 2), the high placental weight group showed an increased risk of NICU admission (P < 0.000, OR 0.087, 95% CI 0.033 - 0.234), 1 minutes Apgar score < 7 (P < 0.000, OR 2.215, 95% CI 1.906 - 2.575), 5 minutes Apgar score < 7 (P = 0.005, OR 2.65, 95% CI 1.87 - 2.505), respiratory complications (P < 0.000, OR 0.049, 95% CI 0.006 - 0.377). When compared of obstetric outcomes between low placental weight and normal placental weight groups (Table 3). The risks of perinatal outcomes for the same variables were increase as well: NICU admission (P < 0.000, OR 3.580, 95% CI 2.731 - 4.692), 1 minutes Apgar score < 7 (P < 0.000, OR 2.314, 95% CI 1.973 - 2.713) 5 minutes Apgar score <7 (P = 0.0018, OR 2.153, 95% CI 1.863 - 2.489), respiratory complications (P < 0.000, OR 2.321, 95% CI 1.925 - 2.798).

Table 1. Demographics and baseline obstetric characteristics of the three study groups (low, normal and high placental weight)

	Low placental	Equal as expected (N = 59)	Smaller than expected (N = 43)	P
Maternal age				**0.114**
< 20 year	3	13	5	
20-34 year	62	53	52	
> 34 year	38	47	47	
Gestational age				**0.053**
< 37 week	34	20	22	
37-41 week	69	92	80	
>41 week	0	1	2	
Pre-pregnancy weight (kg.)	52.03	55.99	61.18	0.002
Pre-delivery weight (kg)	64.35	69.65	76.09	0.061
Absolute weight gain	12.31	13.72	14.91	0.168
Thalassemia	3	13	4	0.203
PIH	8	22	2	0.014
DM	3	21	10	0.000

Table 2. Adverse obstetric outcome rate of the high placental weight group versus normal placental weight group

	High (%)	Normal (%)	Odds ratio	95% CI	P
Apgar at 1 minute	11 (10.6)	0 (0)	2.215	1.906 - 2.575	0.000
Apgar at 5 minute	7 (6.7)	0 (0)	2.165	1.871 - 2.505	0.005
NICU admission	36 (34.6)	5 (4.4)	0.087	0.033 - 0.234	0.000
Respiratory complication	16 (15.4)	1 (0.9)	0.049	0.006 - 0.377	0.000
Stillbirth	5 (4.8)	0 (0)	2.141	1.855 - 2.473	0.018

Table 3. Adverse obstetric outcome rate of the low placental weight group versus normal placental weight group

	Low (%)	Normal (%)	Odds ratio	95% CI	P
Apgar at 1 minute	17	0	2.314	1.973 - 2.713	0.000
Apgar at 5 minute	5	0	2.153	1.863 - 2.489	0.018
NICU admission	63	5	3.580	2.731 - 4.692	0.000
Respiratory complication	24	1	2.321	1.925 - 2.798	0.000
Stillbirth	3	0	2.130	1.847 - 2.457	0.068

Discussion

Neonatal outcomes in the mother, who had low and high placental weight, both had significantly higher low Apgar scores at 1 and 5 minute, had more NICU admission and more respiratory complications. All three groups were difference in pre-pregnancy which much more in high placenta weight group. This show correlation between maternal sizes that may be some part effected neonatal outcomes. PIH and DM are also different between groups. Most of them were still in normal percentile placenta weight group. These show no effect on neonatal outcome.

The retrospective nature of this study has some limitation. The placental weight in this study collected from the medical records which were weighed at the time of delivery. The true placenta weight was depended on umbilical cord length and weight. All placenta weight was measured and recorded in the same way by trained nurse stuff with the same weighting scale. The placenta weight can be comparable.

These results were similar to that of the studies of Bonds[4], Ashwini[7], Junthanaphan[8] and Molteni[9]. Another retrospective cohort study also found other correlation between fetoplacental ratio and perinatal outcome[10]. There was significant association between stillbirth and low placental weight which not increase in this study. The adverse outcomes studied in various reports were different. These came from the difference in recruited cases criteria, such as the gestational age which might affect the difference in results of the studies. However, what was found in this study along with others were the low placental weight below tenth and high weight above ninetieth percentile could yield the increase of adverse perinatal outcomes.

To effective predict the adverse perinatal outcomes using the placental weight for gestational age, the placental weight has to be measured prenatally at that specific gestation ages. Prenatal ultrasonic measurement of the placental weight may be helpful for the clinician to be aware of the adverse perinatal outcomes. However the ultrasound measurement of placental weight need experienced operator. Placental weight in this retrospective study came from labor record. There might be some variation in the placental weight measurement because varied length of umbilical cord attached to placenta which was weighed together. To predict the possibility of adverse neonatal outcome further study of placental weight during third trimester by ultrasound is suggested.

Conclusion

Apgar scores less than seven at 1 and 5 minute, NICU admission and respiratory complications were significantly associated with both low and high placental weight.

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น้ำหนักรกในแต่ละอายุครรภ์และผลลัพธ์ที่ผิดปกติของทารกแรกเกิดในโรงพยาบาลภูมิพลอดุลยเดช

เกศิณี หล่อนิมิตดี, สินาท พรหมมาศ

บทนำ: *เพื่อศึกษาความสัมพันธ์ระหว่างน้ำหนักรกในแต่ละอายุครรภ์และผลลัพธ์ของทารกแรกเกิด*

วัสดุและวิธีการ: *การศึกษาแบบย้อนหลังโดยการวิเคราะห์บันทึกเวชระเบียน โดยแบ่งกลุ่มน้ำหนักรกเป็น 3 กลุ่ม คือ กลุ่มน้ำหนักรกผิดปกติแบบน้อยกว่า10 เปอร์เซ็นไทล์ กลุ่มน้ำหนักรกผิดปกติมากกว่า 90 เปอร์เซ็นไทล์ และกลุ่มน้ำหนักรกปกติระหว่าง 10-90 เปอร์เซ็นต์ไทล์ ทำกาวิเคราะห์ความสัมพันธ์ระหว่างน้ำหนักรกในแต่ละอายุครรภ์และผลลัพธ์ของทารกแรกเกิด*

ผลการศึกษา: *น้ำหนักรกที่ผิดปกติมีความสัมพันธ์กับการเพิ่มขึ้นของอัตราทารกที่มีคะแนนแอบการ์ที่ 1 นาที และ 5 นาที น้อยกว่า 7 (RR 4.0, 95% CI = 1.79 - 8.91 and RR 4.22, 95% CI = 1.31 - 13.55), อัตราการใช้หออภิบาลทารกวิกฤต (RR 4.29, 95% CI = 2.42 - 7.59), อัตราเกิดผลแทรกซ้อนของระบบทางเดินหายใจ (RR 3.0, 95% CI = 1.34 - 6.04) เมื่อเปรียบเทียบกับกลุ่มที่มีน้ำหนักรกปกติ*

สรุป: *น้ำหนักรกที่ผิดปกติมีความสัมพันธ์อย่างมีนัยสำคัญกับผลลัพธ์ที่ผิดปกติของทารกแรกเกิด เช่น คะแนนแอบการ์ที่ 1 นาที และ 5 นาที น้อยกว่า 7 อัตราการใช้หออภิบาลทารกวิกฤต และอัตราเกิดผลแทรกซ้อนของระบบทางเดินหายใจ*