



## A STUDY ON PLACENTAL WEIGHT AND ITS ASSOCIATION WITH MATERNAL AND NEONATAL CHARACTERISTICS

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**ABSTRACT** Placenta plays a vital role in normal fetal development and failure of placenta to gain weight and insufficiency of its function can result in fetal disorders. We performed this study to determine placental weight with birth weight, maternal diabetes, pre-eclampsia/eclampsia, Anemia, Apgar score, SNCU admission, in a longitudinal cross-sectional study, women with single pregnancy, and gestational age between 29-42 weeks were studied. The placental weight, birth weight, maternal age, gestational age, hypertensive disorders in pregnancy, maternal diabetes, Apgar score in 5th minutes after delivery were examined. Two fifty pregnant women were included in the study. The mean and standard deviation for maternal ages and gestational ages at deliveries were  $25.6 \pm 4.4$  and  $38.3 \pm 4.4$  days, respectively. The mean and standard deviation of neonates' weights at birth and placental weights were  $2709 \pm 614.0$ g and  $466.6 \pm 112.2$  g, respectively. The prevalences of low and high placental weights were 2% and 2.8%, respectively. There were statistically significant relationships between placental weight, placental weight ratio (PWR) and birth weight, maternal diabetes, hypertensive disorders in pregnancy, anemia, Apgar score, SNCU admission. Our findings indicate that placental weight Ratio (PWR) can be associated with important variables influencing some maternal and neonatal outcomes. Careful attention to placenta growth during pregnancy, for example by ultrasonography, can guide physicians to assess neonatal health.

**KEYWORDS :** Birth weight, placental weight, Placental weight ratio, SNCU, Diabetes, Preeclampsia

### INTRODUCTION

Placenta is the most important organ for maintaining and continuing healthy pregnancy. It transfers and exchanges oxygen and nutrition needed for fetus. The examination of placenta would demonstrate important information about whatever has happened in the fetus. As the fetus grows, many changes take place in the placental shape and function that reflects changes in needs of fetus in different growth stages. To achieve this, metabolic, immunologic and endocrine changes should happen in placental trophoblast.

The placenta at term is an average, 185 mm in diameter and 23 mm in thickness, with an average volume of 497 ml, and a weight of 508g. Molteni et al<sup>1</sup> reported that the ratio between placenta weight and newborn weight is 1:6. However, measurement varies widely and differs in different countries with different placental preparations.

Placental weight and placental weight ratio, reflects placental development and functions and is correlated with maternal diabetes, hypertensive disorders in pregnancy, Anemia in pregnancy, birth weight, APGAR score at 5 minutes after delivery and neonatal outcome.

Various studies have shown that maternal or fetal diseases (gestational diabetes, severe anemia, hypertensive disorder in pregnancy) influence fetal and placental weight<sup>2-5</sup>. Barker et al<sup>6</sup> showed the higher blood pressures have occurred in later life for men and women who had been small babies with large placentas. Lo et al<sup>7</sup> found that placental weight has a significant role in fetal growth in terms of weight, body length, and cord length but it has no significant role in the presence of meconium-stained fluid. Little et al<sup>8</sup> showed that absolute measures of infant size and placental weight had mutual positive correlation. The results of this study would have an important implication for infants care and decision-making for obstetrics.

Lao et al<sup>9</sup> found that there are numerous adverse short term outcomes associated with abnormal PWR's. Infants with a high PWR had increased incidence of meconium stained liquor, hypocalcaemia and hypomagnesaemia. After adjusting for the effects of preterm birth and vaginal delivery, a high placenta weight ratio was associated with low APGAR score.

### MATERIALS AND METHODS

This Cross-sectional study entitled "Placental weight and its association with maternal and neonatal characteristics at SCB MCH, Cuttack" was conducted in labour room, Dept. of Obstetrics & Gynaecology for period of 2 years (July 2011-July 2013).

After taking written consent the cases were subjected to detailed

history taking and a complete clinical examination with due emphasis on age, socioeconomic status (modified Kupuswami classification), parity, gestational age, maternal diabetes, hypertensive disorders in pregnancy, anaemia in pregnancy, birth weight, APGAR score at 5 minutes after delivery and fetal outcome in women with singleton pregnancy between 28-42 weeks gestational age.

The patients who fulfilled the following criteria were included in the study and rest were excluded.

**Inclusion criteria:** Women with singleton pregnancy, Hypertensive disorders in pregnancy, Maternal diabetes, Known gestational age  $\geq 28$ -42 weeks either from LMP or from early scan, Anaemia in pregnancy.

**Exclusion criteria:** Women with unknown gestational age, Multiple pregnancies, Intrauterine death, Abruptio placenta and Adherent placenta.

**Placenta preparation:** Placentae were prepared according to the method of placental preparation as described by Molteni et al<sup>10</sup>, in the following manner.

**Step-I:** An accurate weighing of the placentas was done by trimming off all membranes and severing the umbilical cord at the insertion site on the placenta surface.

**Step-II:** Superficial fetal vessels was drained of all blood. Adherent blood clots were removed from the maternal surface.

**Step-III:** The placenta was weighed three times on a calibrated digital device to the nearest gram. The weights will be recorded and means calculated. The weighing will be accomplished within one hour after delivery.

**Newborn protocol:** The newborns weight was recorded to the nearest gram immediately after delivery, APGAR scores were recorded at 5 minutes after delivery

### RERULT

In this cross-sectional study, we noticed that the percentage of primipara 45.2%, multipara 55.8%, normotensive mother 86% and pregnancy induced hypertension 15%, percentage of SNCU admission 6.8%, anemia in pregnancy 78.8%, gestational diabetes 2% respectively. (Table 1). This study shows that decrease in APGAR score with increased PWR associated with more fetal distresses and more SNCU admission in placentas with abnormal weight.

**Table 1: Demographic distribution of cases with fetal and maternal characteristic.**

Demographic	Obstetric features	Number	Percentage
Parity	Primipara	113	45.2
	Multipara	137	55.8
Hypertension in Pregnancy	Normotensive	215	86
	Gestational hypertension	10	4
	Preeclampsia	17	6.8
	Eclampsia	8	3.2
Gestational Diabetes		5	2
Anemia in Pregnancy	<7gm%	9	3.6
	8-9gm%	75	30
	10-11gm%	113	45.2
	>12gm%	44	17.6
Apgar score	< 5	17	6.8
	> 6	233	93.2
SNCU admission		17	6.8

**Table 2. Mean and Standard deviation for some important variables**

Variables	Mean	Max.	Min.	SD
Birth weight(g)	2709	4600	1000	614.0
Mother age (years)	25.6	42	20	4.4
Gestational age(days)	38.3	42	29	2.5
Placenta weight(g)	466.6	800	200	112.2
Apgar score(in 5TH min)	8.5	10	3	1.5
Parity(No.)	1.6	5	1	0.8
Placental weight ratio	0.17	0.3	0.12	0.02

Abbreviation: SD, standard deviation.

Out of 250 cases, mean birth weight of babies 2709gm, mean placental weight 466.6 and placental weight ratio 0.17. There were lower Apgar scores in neonates with increase placental weight ratio and more fetal distresses and more Cesarean section in placentas with abnormal weight.

In this study, the mean placental weight ratio of babies delivered from mothers who had preeclampsia/eclampsia was higher than mothers who had normal blood pressure. Also the mean placental weight ratio of babies delivered from mothers who had gestational hypertension was higher than mothers who had normal blood pressure. [Table-3].

**Table-3: Correlation of placental weight ratio and hypertensive disorders in pregnancy**

	Mean PWR	n	Std. Deviation	Std. Error of Mean
Normal blood pressure	0.164	213(85.2%)	0.017	0.005
Gestational hypertension	0.171	12(4.8%)	0.019	0.001
Preeclampsia/ eclampsia	0.185	25(10%)	0.034	0.006
Total	0.172	250	0.022	0.001

ANOVA TEST; F=5.937, P<0.05

The above table shows, the mean PWR of babies delivered from mothers who had normal blood pressure (n=213) was 0.164, the mean PWR of babies delivered from mothers who had gestational hypertension (n=12) was 0.171, the mean PWR of babies delivered from mothers who had preeclampsia/eclampsia (n=25) was 0.185. Hence this difference between groups indicate statistically significant (P<0.05).

**Table-4: Group Statistics between gestational diabetes mellitus and placenta weight ratio (PWR)**

GDM	N	Mean PWR	Std. Deviation	Std. Error Mean
Yes	5(2%)	0.215	0.049	0.022
No	245(98%)	0.171	0.020	0.001

t-test; t=4.62, P<0.05

Table-4 shows, the mean PWR of babies delivered from diabetic mother (n=5) was 0.215, the mean PWR of babies delivered from non-diabetic mother (n=245) was 0.171 which indicates diabetic mother's babies PWR higher than non-diabetic, this difference was statistically significant (P<0.05).

**Table-5: Distribution of placenta weight and placenta weight ratio with different degrees of anemia**

Hb%		Placenta weight	Placental weight ratio
< 7gm% Severe anemia	Mean	494.44grms	0.171
	N	9	9
	Std. Deviation	101.379	0.006
8-9gm% Moderate anemia	Mean	463.11grms	0.183
	Std. Deviation	113.974	0.022
10-11gm% Mild anemia	Mean	457.11grms	0.173
	N	122	122
	Std. Deviation	107.974	0.024
> 12gm%	Mean	488.64grms	0.166
	N	44	44
	Std. Deviation	130.234	0.015
ANOVA TEST		F=1.771 P>0.05	F=1.716 P>0.05

The above table shows, Hb% had no effect on the mean placental weight and mean placental weight ratio; because this relationship were statistically not significant (P>0.05)

**Table-6: Correlations between APGAR score and placental weight ratio (PWR)**

APGAR score at 5minuts	Mean PWR	n	Std. Deviation	Std. Error of Mean
< 5	0.182	16 (6.4%)	0.028	0.007
> 6	0.172	234 (93.6%)	0.023	0.001
Total	0.172	250 (100%)	0.022	0.001

ANOVA test: F=5.63, P<0.05

Table-6 shows, babies APGAR score < 5, the mean PWR was 0.182; babies APGAR score > 6, the mean PWR (n=234) was 0.172 which indicates that difference of PWR between two groups were statistically significant (P<0.05).

**Table-7: Group Statistics of SNCU admission with PWR**

SNCU admission	N	Mean PWR	Std. Deviation	Std. Error Mean
Yes	17 (6.8%)	0.185	0.022	0.005
No	233 (93.2%)	0.171	0.022	0.001

t-test; t=2.63, P<0.05, PWR-Placenta weight ratio

Out of 250 cases, SNCU admission 17 cases, mean PWR was 0.185 and 233 cases were not admitted to SNCU, mean PWR was 0.171, this difference was statistically significant (P<0.05).

## DISCUSSION

The present study entitled "Placental weight and its association with maternal and neonatal characteristics at SCB MCH, Cuttack" was conducted with 250 subjects in labour room, department of Obstetrics & Gynaecology for period of 2years (July 2011 -July 2013). This study found that abnormal placental weight and placenta weight ratio (PWR=Weight of placenta/Weight of newborn) were associated with adverse perinatal outcomes.

In this study, the mean placental weight ratio of babies delivered from mothers who had gestational hypertension and preeclampsia/eclampsia was higher than mothers who had normal blood pressure. This difference between groups indicates statistically significant. (P<0.05) [Table-3]. This present study is concordance with study conducted by Coan et al<sup>12</sup>. They reported that the PWR is often increased in pregnancies that are complicated with preeclampsia which suggests that there is compensatory growth of placental villi in an attempt to overcome an unfavorable maternal environment.

In this study, the mean placental weight ratio of babies delivered from

diabetic mothers was higher than the placenta weight ratio of babies delivered from non-diabetic mother, this difference was statistically significant ( $P < 0.05$ ) [Table-4]. In a study conducted by Kucuk et al<sup>11</sup> reported that a high placenta weight ratio (PWR=weight of placenta/weight of baby) has also been found in women with gestational diabetes, which the authors indicated that an increased placental weight rather than a decreased birth weight.

In this study severity of anaemia had no effect on the mean placental weight and mean placental weight ratio; so this relationship was not statistically significant ( $P > 0.05$ ) [Table-5]. This present study is contradicted with Baptiste-Roberts et al<sup>13</sup>. They noted that placenta weight tend to be heavy in pregnancies complicated by both severe and mild maternal anaemia, with the fetus often being small, and therefore the PWR increased.

In this study babies APGAR score  $\leq 5$  having the mean placental weight ratio babies higher than APGAR score  $\geq 6$  which was statistically significant ( $P < 0.05$ ) [Table-6]. Also correlation of PWR and APGAR score is statistically significant ( $P < 0.05$ ). This indicates when APGAR score decreases placental weight ratio increases [Table-5]. So this present study is concordance with Lao et al<sup>14</sup> study. The neonates with a high PWR had increased incidence of low 1-minute Apgar score, treatment for neonatal jaundice and infection, and respiratory complications. After adjusting for the effects of preterm birth and vaginal delivery, Lao et al<sup>15</sup> studied that a high ratio was still associated with low APGAR score, respiratory complications, and treatment for infection.

In this study shows that mean placental ratio SNCU admitted babies more than who were not admitted to SNCU, this difference was statistically significant ( $P < 0.05$ ) [Table-7]. This present study is concordance with study by Bonds et al<sup>16</sup>. They found that both an abnormally low and abnormally high PWR are associated with adverse outcomes. A PWR below the 10th percentile has been found to be significantly associated with fetal distress. Alternatively, Janthanaphan et al<sup>17</sup> studied that placental weight above the 90th percentile was found to be significantly associated with newborns requiring neonatal intensive care admission.

## CONCLUSION:

A strong association between manifestations of immediate postpartum low APGAR score and overweight placentae were found in this study. Also high mean placenta weight ratio associated with increased SNCU admission. On the whole, it seems that abnormal placental weight or the abnormal placental weight ratios are found to be positively correlated with adverse outcomes in a high risk population. Further research need to confirm such association. Measurement of the placental weight as a part of routine practice would be judicious. Identification of modifiable high risk factors and placental weight measurement may warrant closure surveillance of the newborn.

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