Original Article

# Relationship between high Placental Weight to Birth Weight (PW/BW) Ratio and Poor Neonatal

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**Objective:** To determine the frequency of high placental weight to birth weight ratio and compare the frequency of poor neonatal outcome in terms of NICU admissions in new borns with normal vs. high placental weight to birth weigth ratio.

**Methods:** In our study 120 placenta and newborns of mothers with singleton pregnancy at term delivered via spontaneous vaginal delivery or C-section were included. Outcome variables were frequency of placental weight to birth weight ratio and NICU admission.

**Results:** High PW/BW ratio was recorded in 12 new borns(10.0%),11 new borns required admission in NICU. When compared the frequency of NICU admissions, admission rate significantly higher among new born with high PW/BW ratio as compared to those with normal PW/BW ratio.

**Conclusions:** High PW/BW ratio was found to be associated with significantly increased frequency of NICU admission as compared to those with normal PW/BW ratio.

**Keywords:** placental weight, birth weight, PW/BW ratio, NICU admission, APGAR score

## Introduction

Neonatal period consists of first 28days of life and is the most vulnerable period. According to an estimate, 130 million neonates are born each year and out of these 4 million die in first 28 days of their life. Neonatal mortality rate in Pakistan is 49/1000 live births which is alarmingly high and necessitates measures to timely identify and manage high risk neonates in future practice.[1]

The placenta is an organ for maintaining pregnancy. The weight of the placenta is "functionally significant" because it is related to villous surface area and fetal metabolism.[2].Appropriate development of placenta is essential for fetal growth and wellbeing.[3] Term placenta is about 23cm in diameter and 2-2.6cm thick.[4] It weighs approximately 350-600g with a mean weight of 590g (15% of neonatal weight)[5,6]The ratio between placental weight and newborn has been reported as 1:6 which vary in different regions[7,8] Certain maternal and fetal conditions influence the fetal and placental weight i.e severe anaemia ,diabetes ,hypertension[9] Abnormally large or small placenta has been found in association with poor perinatal outcome.[10] Studies have been done on different aspects of placenta and fetus but few on P/W /BW ratio which if high and is an indicator of non-reassuring fetal status i-e increased NICU admission, apgar score <7, RDS.[11,12] The purpose of the current study is to determine the association between high PW/BW ratio and increase need of NICU admission which will help in identification of high risk neonates so timely intervention can be done to reduce morbidity and mortality.

## Methods

It was a cross sectional study conducted in Department of Obstetrics & Gynaecology Unit- 1V ,Sir Ganga Ram Hospital Lahore, for a duration of six months i-e 7-5-2016 to 6-11-2016. Mothers of 18- 40 yrs of reproductive age, either primigravidas or multig- ravidas , having singleton pregnancy at term(≥37 weeks of gestation as per dating scan) delivered through vaginal delivery/c-section were enrolled in the study. Detailed history and written informed consent was taken from each parent. Sampling was done by non probability consecutive technique.120 newborns calculated with 95% confidence level and &7% margin of error while taking expected frequency of high placental weight to birth weight ratio to be 19%.Women who were multiparas>5, known diabetic (Fasting Blood Sugar>110mg/dl), hypertensive (Blood pressure>140/90mm of Hg on at least two occasions 4 hours apart) and obese (BMI>30kg/m2), having babies with congenital defects or with low placental weight to birth weight (<10th Percentile )were excluded from study.

120 new-borns who delivered and met the inclusion criteria were enrolled in this study. Need for NICU

Proforma along with demographic details of the mother. All the weight measurements were done by a staff nurse on a same machine and all the new-borns were examined by a consultant pediatrician. Confounding variables were controlled by exclusion. Data collected from Sir Ganga Ram Hospital through SPSS version 21 after extracting required variables. Numerical variables; age and gestational age presented by mean±SD Categorical variables; mode of delivery, normal and high PW/BW ratio and neonatal admission in normal and high PW/BW groups have been presented by frequency and percentage.

Post stratification chi-square test has been applied taking $p \leq 0.05$ as significant to see the difference between the groups age, parity and mode of delivery to address effect modifiers. Placenta is vital for maintaining pregnancy and promoting normal development of the fetus. High placental weight to birth weight (PW/BW) ratio is an indicator of placental nutrient transport efficiency and has been studied in relation to poor neonatal outcome.[13,14] However, this association was not well established and there were studies which claimed no such association.[15,16] A possible explanation for this controversy among researchers could be the population difference in placental weight for gestational age and placental weight to birth weight ratios.[17] Owing to this controversy in the existing literature.[13-16] population differences and lack of local such published material, need for the present study was felt.

## Results

The age of the patients ranged from 18 years to 34 years with a mean of 24.73±4.66 years. Majority (n=90, 75%) mothers were aged above 20 years with only 30 (25.0%) mothers under 20 years of age. There were 42 (42.5%) primiparas with 68 (57.5%)

**Table-1:** Comparison of frequency of NICU admission across PW/BW Ratio n=120.

| Hight PW/BW Ration | NICU Admission | | Total | P-Value |
|---|---|---|---|---|
| | Yes (n=11) | No (n=109) | | |
| **Yes (n=12)** | 4 (33.3%) | 8 (66.7%) | 12 (100.0%) | 0.002* |
| **No (N=108)** | 7 (6.5%) | 101 (93.5%) | 108 (100.0%) | |
| **Total** | 11 | 109 | 120 | |

**Table-2:** Comparison of Frequency of NICU Admission across PW/BW Ratio and Age Groups n=120.

| Age Groups | High PW/BW ratio | NICU Admission | | Total | P-Value |
|---|---|---|---|---|---|
| | | Yes (n=11) | No (n=109) | | |
| **<20 Years (m=30)** | Yes (n=3) | 1 (33.3%) | 2 (66.7%) | 3 (100.0%) | 0.00* |
| | No (n=27) | 1 (3.7%) | 26 (96.3%) | 27 (100.0%) | |
| | **Total** | 2 (6/7%) | 28 (93.3%) | 30 (100.0%) | |
| **21-34 years (n=90)** | Yes (n=9) | 3 (33.3%) | 6 (66.7%) | 9 (100.0%) | 0.014* |
| | No (n=81) | 6 (7.4%) | 75 (92.6%) | 81 (100.0%) | |
| | Total | 9 (10.0%) | 81 (90.0%) | 90 (100.0%) | |

**Table-3:** Comparison of Frequency of NICU Admission across PW/BW Ratio and Parity Groups n=120.

| Parity | High PW/BW ratio | NICU Admission | | Total | P-Value |
|---|---|---|---|---|---|
| | | Yes (n=11) | No (n=109) | | |
| **Primiparas (n=51)** | Yes (n=6) | 2 (33.3%) | 4 (66.7%) | 6 (100.0%) | 0.13* |
| | No (n=45) | 2 (4.4%) | 43 (95.6%) | 45 (100.0%) | |
| | **Total** | 4 (7.8%) | 47 (92.2%) | 51 (100.0%) | |
| **Multiparas (n=69)** | Yes (n=6) | 2 (33.3%) | 4(66.7%) | 6 (100.0%) | 0.049* |
| | No (n=63) | 5 (7.9%) | 58 (92.1%) | 63 (100.0%) | |
| | Total | 7 (10.1%) | 62 (89.9%) | 69 (100.0%) | |

**Table-4:** Comparison of Frequency of NICU Admission across PW/BW Ratio and Gestational Age Groups (n=120.

| Gestational Age | High PW/BW ratio | NICU Admission | | Total | P-Value |
|---|---|---|---|---|---|
| | | Yes (n=11) | No (n=109) | | |
| **37-39 Weeks (n=57)** | Yes (n=9) | 3 (33.3%) | 6 (66.7%) | 9 (100.0%) | 0.036* |
| | No (n=45) | 8 (8.3%) | 44 (6.7%) | 48 (100.0%) | |
| | **Total** | 7 (12.3%) | 50 (87.7%) | 57 (100.0%) | |
| **40-42 (n=63)** | Yes (n=3) | 1 (33.3%) | 2 (66.7%) | 3 (100.0%) | 0.050* |
| | No (n=60) | 3 (5.0%) | 57 (95.0%) | 60 (100.0%) | |
| | Total | 4 (6.3%) | 59 (93.7%) | 63 (100.0%) | |

**Table-5:** Comparison of Frequency of NICU Admission across PW/BW Ratio and Mode of Delivery (n=120.

| Mode of Delivery | High PW/BW ratio | NICU Admission | | Total | P-Value |
|---|---|---|---|---|---|
| | | Yes (n=11) | No (n=109) | | |
| **Simple Vaginal Delivery(n=87)** | Yes (n=7) | 2 (28.6%) | 5 (71.4%) | 9 (100.0%) | 0.037* |
| | No (n=80) | 5 (6.3%) | 75 (93.8%) | 48 (100.0%) | |
| | **Total** | 7 (8.0%) | 80 (92.0%) | 57 (100.0%) | |
| **Elective Caesarean Section (n=33** | Yes (n=5) | 2 (40.0%) | 3 (60.0%) | 5 (100.0%) | 0.038* |
| | No (n=28) | 2 (7.1%) | 26 (92.9%) | 28 (100.0%) | |
| | Total | 4 (12.1%) | 29 (87.9%) | 33 (100.0%) | |

multiparas. Gestational age of the newborns ranged from 37 weeks to 42 weeks with a mean of 39.40±1.45 weeks. It was vaginal delivery in 87 (72.5%) patients with elective caesarean section in 33 (27.5%) patients. High PW/BW ratio was recorded in 12 (10.0%) newborns. 11 (9.2%) newborns required admission to neonatal intensive care unit . When compared the frequency of NICU admission was significantly higher among newborns with high PW/BW ratio (33.3% vs. 6.5%; p=0.02) as compared to those with normal PW/BW ratio as shown in Table 1. Similar significant difference was observed across all age, parity, gestational age and mode of delivery groups as shown in **Tables 1- 5.**

## Discussion

In the present study, the age of the patients ranged from 18 years to 34 years with a mean of 24.73±4.66 years. Majority (n=90, 75%) mothers were aged above 20 years with only 30 (25.0%) mothers under 20 years of age. A similar age group distribution has been reported previously by Nayak et al. who observed 82.1% of such mothers in the age group 21-34 years in India.[9] Janthanaphan et al. in a similar study reported much higher frequency of this age group (89.9%) in Thai population.[16]

There were 42 (42.5%) primiparas with 69 (57.5%) multiparas. Our observation matches with that of Nayak et al. who also observed that 55.4% of the mothers were multiparas.[15] It was simple vaginal delivery in 87 (72.5%) patients with elective caesarean section in 33 (27.5%) patients. Previously, Janthanaphan et al. also observed SVD among 74.8% of cases with caesarean delivery in only 25.2% cases.

High PW/BW ratio was recorded in 12 (10.0%) newborns. A similar frequency of high PW/BW ratio has been reported previously by Janthanaphan et al. (10.0%), Nayak et al. (9.84%) and Shehata et al. (9.93%).[14,15,16] 11 (9.2%) newborns required admission to neonatal intensive care unit. A similar frequency of NICU admission has been reported previously by Madkar et al. (8.5%).[13] However, much lower frequency of NICU admission was observed by Janthanaphan et al. (5.0%).[16] While Nayak et al. reported much higher frequency of 16.1%. When compared the frequency of NICU admission was significantly higher among newborns with high PW/BW ratio (33.3% vs. 6.5%; p=0.02) as compared to those with normal PW/BW ratio. Similar

Gestational age and mode of delivery groups. Our results are in line with those of Madkar et al. who also observed significantly increased frequency of NICU admission among neonates with high PW/BW ratio (30.0% vs. 7.5%; p=0.01).

The present study is first of its kind in local population and has found high placental weight/ birth weight ratio among 10.0% deliveries. This high PW/BW ratio was found to be associated with significantly increased frequency of neonatal ICU admission (33.3% vs. 6.5%; p=0.02). Thus a high PW/BW ratio can be used to identify a high risk neonate and anticipated measures should be taken to decrease the morbidity and mortality in future practice.

## Conclusion

Poor neonatal outcome measured as significantly increased frequency of neonatal ICU admission (33.3% vs. 6.5%;p=0.02), had a significant relationship with High placental weight/birth weight ratio , found in 12(10.0%) deliveries as compared to those with normal PW/BW ratio regardless of mother's age ,gestational age, parity and mode of delivery.

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