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Short Communication

Analysis of birth weight, placental weight and maternal BMI: A correlational study

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Abstract

Placental morphology and pathology greatly influences fetal growth and is an influential factor in perinatal and neonatal mortality rates, thus understanding these correlations becomes of great importance. Placental morphology can be indirectly assessed by anthropometric placental measurements. This cross-sectional study was conducted to investigate the association between placental weight, neonatal weight and maternal BMI.

Keywords: Placental, Fetal, Maternal BMI, Neonatal Birthweight, Nutrient exchange.

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1. Introduction

Neonatal birth weight is a critical determinant of infant health, influencing immediate survival and long-term developmental outcomes. A primary factor contributing to neonatal weight is placental weight, which reflects the placenta's capacity to supply oxygen and nutrients to the foetus. Understanding the relationship between placental weight, maternal body mass index (BMI), and neonatal birth weight is essential for identifying at-risk pregnancies and implementing timely interventions.[1-2]

2. Objective

1. To determine the correlation between Neonatal birth weight and placental weight
2. To analyse the association between maternal BMI and placental weight
3. To analyse the association between maternal BMI and neonatal birthweight

3. Methodology

Ethical clearance for the study was obtained from the Father Muller Research Committee, following which data collection was initiated. This cross-sectional study was conducted among pregnant women admitted for safe confinement at Father Muller Medical College, Mangalore, India. A total of 50 participants were included, all of whom had singleton pregnancies carried to full term with a known pre-pregnancy maternal BMI. Women with multiple gestations and pre-term deliveries were excluded from the study. Data collection involved recording placental weight immediately postpartum (including the umbilical cord), measuring neonatal weight at birth, and calculating maternal BMI either pre-pregnancy or during early gestation. Statistical analysis was performed using Pearson's correlation coefficient and regression analysis to assess associations between maternal BMI, placental weight, and neonatal birth weight.(**Figure 1**, **Figure 2**)

3.1. Statistical analysis

There is a moderate, statistically significant positive correlation between birth weight and placental weight r = 0.476, p = 0.001. This suggests that as placental weight increases, birth weight also tends to increase. The relationship is statistically significant at the p < .01 level (2-tailed), based on a sample size of N = 50.(**Table 1**)

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Figure 1: Placenta with umbilical cord

Figure 2: Weighing of the placenta

There is a very weak, non-significant positive correlation between maternal BMI and neonatal weight, r = 0.048, p = 0.742. This indicates that no meaningful linear relationship exists between maternal BMI and neonatal weight in this sample of N = 50. The result is not statistically significant (p > 0.05), suggesting that any observed association is likely due to chance.(**Table 3**)

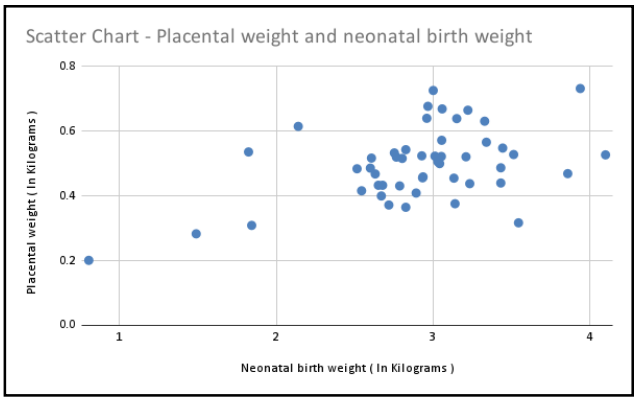

Figure 3: Scatter chart – Placental weight and neonatal birth weight

There is a very weak, non-significant positive correlation between maternal BMI and placental weight, r = 0.034, p = 0.818. This indicates no meaningful linear relationship between maternal BMI and placental weight in this sample of N = 50. The correlation is not statistically significant (p > 0.05), suggesting that the observed association may be due to random variation.(**Table 2**)

Table 1: Correlation between Neonatal birth weight and placental weight

		Neonatal weight	**Placental weight**
Neonatal weight	Pearson Correlation	1	0.476
	Sig. (2-tailed)		0.001
	N	50	50
Placental weight	Pearson Correlation	0.476	1

Table 2: Correlation between between maternal BMI and placental weight.

		Maternal BMI	**Placental weight**
Maternal BMI	Pearson Correlation	1	0.034
	Sig. (2-tailed)		0.818
	N	50	50
Placental weight	Pearson Correlation	0.034	1
	Sig. (2-tailed)	0.818	
	N	50	50

Table 3: Correlation between between maternal BMI and neonatal birth weight

		Maternal BMI	**Neonatal weight**
Maternal BMI	Pearson Correlation	1	0.048
	Sig. (2-tailed)		0.742
	N	50	50
Neonatal weight	Pearson Correlation	0.048	1
	Sig. (2-tailed)	0.742	
	N	50	50

4. Results

A moderate, statistically significant positive correlation was found between placental weight and neonatal birth weight ($r = 0.476$, $p = 0.001$), indicating that an increase in placental weight was associated with a corresponding increase in birth weight. However, a very weak and statistically non-significant positive correlation was observed between maternal BMI and placental weight ($r = 0.034$, $p = 0.818$). Similarly, the correlation between maternal BMI and neonatal birth weight was also very weak and not statistically significant ($r = 0.048$, $p = 0.742$).

5. Discussion

After recording the BMI of 50 women, their neonates and the placentas, we can arrive at the conclusion that there is a significant relation between birth weight and placental weight. This supports the critical role of the Placenta in fetal growth and development. Heavier Placentas often reflect the enhanced nature of maternal-fetal nutrient exchange capacity.[3]

Physiologically, placentas serve as the primary interface for exchange of nutrients, oxygen and all requirements of the baby. A well-developed, healthy placenta with adequate mass is more likely to have an intensive vascular network and increased surface area for nutrient exchange, ensuring optimal growth.

Our findings highlight the importance of routine placental examination and recording of placental weight as it is a simple yet effective predictor of fetal well-being.[4,5]

6. Conclusion

Placental weight was revealed to positively correlate with neonatal birth weight.

7. Source of Funding

None.

8. Conflict of Interest

None.

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