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ORIGINAL RESEARCH

Placental weight and placental weight to birth weight ratio in relation to APGAR score at birth

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ABSTRACT

Background: The Apgar score serves as a composite indicator of a newborn's vitality, incorporating assessments of heart rate, respiratory effort, skin color, muscle tone, and reflex irritability.Hence; the present study was conducted for assessing the role of Placental weight and placental weight to birth weight ratio in relation to APGAR score at birth. **Materials & methods:**Two hundred pregnant women who were sure of dates from the antenatal clinic at 32 weeks were recruited. All patients were followed up to 36 weeks and after delivery. Obstetric ultrasound was performed on all patients using a 3.5-MHz curvilinear transducer. The foetus was observed for viability and gross anatomical defects, and gestational age was estimated using various growth parameters. Placental weight was measured and ratio of placental weight with birth weight was correlated with APGAR score at birth. All the results were recorded in Microsoft excel sheet and was subjected to statistical analysis using SPSS software. **Results:**The age of the study group varied from below 20 years to 35 years. Out of 200 (100%) study subjects, study subjects were predominantly falls in the age group of 21 to 25 years, i.e., 130 (65%) followed by 37 (18.5%) study subjects were in the age group 26 to 35 years and 33 (16.5%) of the study subjects in the age below ≤ 20 yrs.An increase in mean placental weight was seen in correlation with increasing APGAR score. No association of birth weight with APGAR score was seen. A significant correlation of mean placental weight to birth weight ratio was seen with APGAR score.**Conclusion:**In pregnancies where the infant Apgar score was ≤7, both placental weight and the ratio of placental weight to birth weight were found to be greater than in those with lower Apgar scores.

Key words: APGAR, Placental, Weight

INTRODUCTION

The Apgar score serves as a composite indicator of a newborn's vitality, incorporating assessments of heart rate, respiratory effort, skin color, muscle tone, and reflex irritability.[1] A low Apgar score, regardless of the gestational age at which the infant is born, correlates with adverse outcomes, including intrauterine growth restriction, heightened risk of chronic central nervous system dysfunction, and increased likelihood of infant mortality. In many cases of intrauterine growth restriction or chronic central nervous system issues, such as cerebral palsy, the underlying causes remain unidentified, though they may be linked to intrauterine conditions. Factors such as preterm birth and acute hypoxia during delivery are known to contribute to low Apgar scores.[2, 3]It is also plausible that chronic hypoxia experienced during intrauterine development could lead to a diminished

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Apgar score. Assessing the relationship between chronic intrauterine hypoxia and perinatal outcomes poses challenges, as measuring fetal oxygen levels over time in a population study is complex. Nevertheless, identifying potential intrauterine factors contributing to low Apgar scores could be crucial for preventing conditions associated with such scores at birth.[4]

During gestation, oxygen is transferred from the maternal bloodstream to the fetus via the placenta, meaning that compromised placental function may result in inadequate oxygen levels for the fetus, potentially leading to a low Apgar score. Research has indicated that a high placental weight relative to birth weight is linked to lower Apgar scores; however, these studies often fail to account for gestational age at birth. This factor may serve as a significant confounder, as both low Apgar scores and elevated placental weight relative to birth weight are frequently observed in preterm births.[5, 6]Hence; the present study was conducted for assessing the role of Placental weight and placental weight to birth weight ratio in relation to APGAR score at birth.

MATERIALS & METHODS

The present study was conducted for assessing the role of Placental weight and placental weight to birth weight ratio in relation to APGAR score at birth. This was a prospective observational longitudinal study conducted for a period of September 2019 to August 2021 The primary source of data for the study are patients were from the teaching hospital attached to Bapuji Education Association J.J.M. Medical College, Davangere namely. Two hundred pregnant women who were sure of dates from the antenatal clinic at 32 weeks were recruited. All patients were followed up to 36 weeks and after delivery.Obstetric ultrasound was performed on all patients using a 3.5-MHz curvilinear transducer. The foetus was observed for viability and gross anatomical defects, and gestational age was estimated using various growth parameters. Placental weight was measured and ratio of placental weight with birth weight was correlated with APGAR score at birth. All the results were recorded in Microsoft excel sheet and was subjected to statistical analysis using SPSS software.

RESULTS

The age of the study group varied from below 20 years to 35 years. Out of 200 (100%) study subjects, study subjects were predominantly falls in the age group of 21 to 25 years, i.e., 130 (65%) followed by 37 (18.5%) study subjects were in the age group 26 to 35 years and 33 (16.5%) of the study subjects in the age below ≤ 20 yrs.An increase in mean placental weight was seen in correlation with increasing APGAR score. No association of birth weight with APGAR score was seen. A significant correlation of mean placental weight to birth weight ratio was seen with APGAR score.

Table 1: Age-wise distribution

Age-Classified	Frequency	Per cent
≤ 20 yrs	33	16.5
21 to 25 yrs	130	65.0
26 to 35 yrs	37	18.5
Total	200	100.0

Table 2:Correlation of Mean Placental weight, birth weight and placental weight to birth weight ratio with APGAR score

APGAR score	N	Mean placental weight	Mean birth weight	Mean placental weight to birth weight ratio
1	2	576.5	2812.3	0.205
2	3	659.5	3125.4	0.211
3	6	648.9	3153.9	0.206
4	11	673.6	3215.8	0.209
5	17	674.2	3254.4	0.207
6	23	662.3	3233.3	0.205
7	27	681.3	3456.7	0.197
8	34	681.5	3512.8	0.194
9	36	666.7	3565.2	0.187
10	41	671.3	3671.1	0.183
p-value Vs APGAR SCORE		0.001*	0.882	0.000*

DISCUSSION

The capacity of a fetus to develop and thrive in utero is believed to be influenced by the available placental surface area, which facilitates the exchange of respiratory gases and nutrients. Research has established a linear correlation between fetal weight and placental weight across various mammalian species, including humans, indicating that smaller fetuses are typically associated with smaller placentas, while larger fetuses correspond to larger placentas.

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Although a general linear trend exists at a given gestational age, there are instances of variation; some fetuses connected to larger placentas may exhibit a lower fetal weight-to-placental weight ratio, whereas those linked to smaller placentas may demonstrate a higher ratio.[7] Studies have shown that the weights of trimmed and drained human placentas are linearly correlated with their surface area, making them a reliable indicator of the surface area available for diffusion. A reduction in placental surface area has been linked to adverse perinatal outcomes in pregnancies with complications.[8- 10]Hence; the present study was conducted for assessing the role of Placental weight and placental weight to birth weight ratio in relation to APGAR score at birth.

The age of the study group varied from below 20 years to 35 years. Out of 200 (100%) study subjects, study subjects were predominantly falls in the age group of 21 to 25 years, i.e., 130 (65%) followed by 37 (18.5%) study subjects were in the age group 26 to 35 years and 33 (16.5%) of the study subjects in the age below ≤ 20 yrs.An increase in mean placental weight was seen in correlation with increasing APGAR score. No association of birth weight with APGAR score was seen. A significant correlation of mean placental weight to birth weight ratio was seen with APGAR score. Bonds DR et al assessed the relationship of placental size to perinatal outcome in a population of low-risk infants. A trimmed and drained placenta was weighed for each of 417 low-risk infants, and for 108 infants whose intrapartum course was complicated only by compression of the umbilical cord. Tracings from intrapartum electronic fetal heart rate monitoring were analyzed by an investigator who was unaware of the fetal weight/placental weight ratio. The incidence of perinatal problems was increased in those infants whose fetal weight/placental weight ratio was greater than 11: intrapartumfetal distress, 20%; meconium-stained amniotic fluid, 28.9%; Apgar score less than 7, 11.1%; and hyperbilirubinemia, 24.4%. On the basis of these data, the conclusion drawn was that there is a population of presumably low-risk infants who are at increased risk because they have outgrown their placentas.[10]Eskild A et al studied whether placental weight or placental weight to birthweight ratio are associated with Apgar score in the newborn 5 min after birth. The placental weight to birthweight ratios were divided into quartiles within 2-week intervals of gestational age at birth, hence 25% of the pregnancies were within each group. Theystudied the proportion of pregnancies in the highest quartile of placental weight and placental weight to birthweight ratio according to Apgar score 5 min after birth, and estimated the odds ratio for Apgar score ≤7 if the placental weight to birthweight ratio was in the highest quartile, and used the lowest quartile as reference. In births after pregnancy week 29, and at every 2-week gestational age interval, the mean placental weight and placental weight to birthweight ratio were higher in newborn with Apgar score ≤7 than in infants with Apgar >7. The crude odds ratio of Apgar score ≤7 was 1.65 (95% CI 1.57-1.74), comparing the highest to the lowest quartile of placental weight to birthweight ratio. Adjustments for gestational age, birthweight, infant sex, maternal age, preeclampsia, diabetes and congenital malformations did not alter the odds ratio significantly. Placental weight and placental weight to birthweight ratio were higher in pregnancies with infant Apgar score ≤7 compared with Apgar score >7.[12]A study was conducted by Nagpal K et al. in 2018 to correlate ultrasonographic placental thickness at 32 and 36 weeks pregnancy with the neonatal outcome and to propose placental thickness as a simple test for prediction of neonatal outcome. Placental thickness at 32 and 36 weeks was measured by ultrasound in 130 pregnant mothers with confirmed dates and uncomplicated singleton pregnancy. Placental thickness was categorized as normal (10th–95th percentile), thin (10th percentile), and thick (95th percentile) at each stage and was correlated with birth weight and neonatal outcome. The results depicted that the neonatal outcome was good in women with normal placental thickness at 32 and 36 weeks and was compromised in women with thin placentae. The study concludes that the placental thickness at 32 and 36 weeks corresponds well with gestational age and is a good prognostic factor in assessing neonatal outcome. Furthermore, therefore, the placental thickness should be measured in addition to biometric parameters in antenatal women undergoing an ultrasound.[13]

CONCLUSION

In pregnancies where the infant Apgar score was ≤7, both placental weight and the ratio of placental weight to birth weight were found to be greater than in those with lower Apgar scores.

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