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ORIGINAL RESEARCH

To investigate the relationship between prolactin levels and both gestational age and birth weight in newborn infants

[1]Dr. Aditi Saini, [2]Dr. Kartik Raina, [3]Dr. Anumodan Gupta

[1]Assistant Professor, Department of Obstetrics and Gynaecology, SMGS Hospital, Jammu, Jammu and Kashmir, India
[2]Senior Resident, Department of Obstetrics and Gynaecology, Punjab Institute of Medical Sciences, Jalandhar, Punjab, India
[3]Assistant Professor, Department of Pediatric SMGS Hospital, Jammu, Jammu and Kashmir, India

Corresponding Author
Dr. Anumodan Gupta
Assistant Professor, Department of Pediatric SMGS Hospital, Jammu, Jammu and Kashmir, India

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ABSTRACT

Aim: To investigate the relationship between prolactin levels and both gestational age and birth weight in newborn infants. **Materials and Methods:** 100 eligible antenatal patients were considered for this hospital based prospective study. 3 ml of fetal umbilical cord blood was collected soon after delivery of the baby and cord serum Prolactin levels assayed by Chemiluminescent Micro particle Immunoassay Method (CMIA). Details with antenatal history, intrapartum and postpartum details were collected and entered in an excel spread sheet. **Results:** The mean serum prolactin levels were highest in neonates born before 28 weeks (691.12 ng/mL) and lowest in those born between 28-32 weeks (511.28 ng/mL). However, the p-value of 0.55 indicates that these differences were not statistically significant. This suggests that gestational age does not have a strong impact on serum prolactin levels in neonates.Neonates with the lowest birth weight (1.5-2 kg) had a mean serum prolactin level of 577.25 ng/mL, while those with a birth weight between 2.5-3.5 kg had a mean level of 526.66 ng/mL. The p-value of 0.32 indicates no significant differences between the groups. This implies that birth weight is not a significant determinant of serum prolactin levels in neonates.The Pearson correlation analysis showed weak correlations between serum prolactin levels and both gestational age and birth weight. The correlation coefficient (r) between serum prolactin and gestational age was 0.08 with a p-value of 0.21, and between serum prolactin and birth weight was 0.05 with a p-value of 0.51. Both correlations were not statistically significant, indicating that there is no strong linear relationship between serum prolactin levels and either gestational age or birth weight in the study population. **Conclusion:** Overall, the results indicate that while gestational age and birth weight are crucial parameters for neonatal health, they do not significantly correlate with serum prolactin levels in newborns. The majority of neonates were full-term and had normal birth weights, though a significant proportion were preterm or had low birth weights. Despite the physiological importance of prolactin, its levels did not show significant variation with gestational age or birth weight, suggesting that other factors may play a more critical role in determining its levels in newborns.

Keywords: Cord prolactin, gestational age, intrauterine growth, high risk pregnancy

INTRODUCTION

Prolactin, a hormone predominantly produced by the anterior pituitary gland, plays a vital role in various physiological processes, including lactation, reproductive health, and immune regulation. In the context of pregnancy, prolactin levels rise significantly, contributing to the preparation of the mammary glands for breastfeeding. This hormone's influence extends beyond lactation, impacting fetal development and the overall health of the mother during and after pregnancy.[1,2] During gestation, prolactin not only facilitates the growth and development of the mammary glands but also plays a role in modulating the immune response to protect the developing fetus. Elevated prolactin levels have been observed in pregnant women, correlating with the progression of pregnancy and various maternal adaptations necessary for nurturing the growing fetus. This hormone's dynamic changes throughout pregnancy highlight its importance in ensuring a successful pregnancy outcome.[3-5] Gestational age, a critical factor in neonatal health, refers to the age of the fetus or newborn, usually measured in weeks from the first day of the mother's last menstrual period.

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Accurate assessment of gestational age is essential for monitoring fetal growth and development, identifying potential complications, and planning appropriate medical interventions. It is well-established that preterm births, defined as births occurring before 37 weeks of gestation, are associated with increased risks of morbidity and mortality. Therefore, understanding the factors influencing gestational age is paramount in prenatal care.[6-9] Birth weight, another crucial indicator of neonatal health, reflects the intrauterine growth and development of the fetus. It is influenced by various maternal, fetal, and environmental factors, including maternal nutrition, health status, and genetic predispositions. Low birth weight (less than 2,500 grams) and high birth weight (greater than 4,000 grams) are associated with increased risks of health complications for the newborn, both immediately after birth and in later life. Hence, monitoring and understanding the determinants of birth weight are vital for ensuring the well-being of the newborn.[10,11] The correlation between prolactin levels, gestational age, and birth weight is an area of significant interest in neonatal and maternal health research. Elevated prolactin levels during pregnancy have been hypothesized to influence fetal growth and development, potentially affecting gestational age and birth weight outcomes. Understanding this correlation could provide valuable insights into prenatal care practices and interventions aimed at optimizing neonatal health.

MATERIALS AND METHODS

100 eligible antenatal patients were considered for this hospital based prospective study. 3 ml of fetal umbilical cord blood was collected soon after delivery of the baby and cord serum Prolactin levels assayed by Chemiluminescent Micro particle Immunoassay Method (CMIA). Details with antenatal history, intrapartum and postpartum details were collected and entered in an excel spread sheet. SPSS (Statistical Package for Social Sciences) version 20 was used to perform the statistical analysis. Descriptive statistics of the explanatory and outcome variables were calculated by mean, standard deviation for quantitative variables, frequency and proportions for qualitative variables. ANOVA test was applied to test the statistical significance for more than two groups for quantitative data. Pearson's correlation was calculated and scatter plots were drawn to calculate the correlation between serum prolactin, birth weight and gestational age. The level of significance was set at 5%.

RESULTS

Table 1: Distribution of Neonates Based on Gestational Age at Birth

The majority of the neonates in the study were born after 37 weeks of gestation, accounting for 76% of the total sample size. This indicates that most of the neonates were full-term at birth. Preterm neonates, those born before 37 weeks, made up 24% of the sample, with 21% born between 32-37 weeks, 1% born between 28-32 weeks, and 2% born before 28 weeks. This distribution highlights that while a significant portion of the neonates were born full-term, a considerable number were preterm, necessitating focused medical attention.

Table 2: Distribution of Neonates Based on Birth Weight

The birth weight distribution shows that the majority of neonates, 73%, had a birth weight between 2.5 and 3.5 kg, which is within the normal range for newborns. Sixteen percent of the neonates had a birth weight between 2 and 2.5 kg, and 6% had a birth weight between 1.5 and 2 kg, indicating low birth weight. A smaller fraction, 5%, had a birth weight over 3.5 kg, indicating higher birth weight. This distribution suggests that most neonates had a birth weight within the normal range, but a notable proportion had lower birth weights, which could be a point of concern.

Table 3: Comparison of Serum Prolactin with Gestational Age

The ANOVA analysis comparing serum prolactin levels across different gestational age groups showed no significant differences. The mean serum prolactin levels were highest in neonates born before 28 weeks (691.12 ng/mL) and lowest in those born between 28-32 weeks (511.28 ng/mL). However, the p-value of 0.55 indicates that these differences were not statistically significant. This suggests that gestational age does not have a strong impact on serum prolactin levels in neonates.

Table 4: Comparison of Serum Prolactin with Birth Weight

Similarly, the comparison of serum prolactin levels across different birth weight categories also showed no significant differences. Neonates with the lowest birth weight (1.5-2 kg) had a mean serum prolactin level of 577.25 ng/mL, while those with a birth weight between 2.5-3.5 kg had a mean level of 526.66 ng/mL. The p-value of 0.32 indicates no significant differences between the groups. This implies that birth weight is not a significant determinant of serum prolactin levels in neonates.

Table 5: Correlation between Serum Prolactin with Gestational Age and Birth Weight

The Pearson correlation analysis showed weak correlations between serum prolactin levels and both gestational age and birth weight. The correlation coefficient (r) between serum prolactin and gestational age was 0.08 with a p-value of 0.21, and between serum prolactin and birth weight was 0.05 with a p-value of 0.51. Both correlations were not statistically significant, indicating that there is no strong linear relationship between serum prolactin levels and either gestational age or birth weight in the study population.

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Table1: Distribution of neonates based on gestational age at birth

Gestational age (weeks)	Frequency	Percent(%)
<28	2	2
28-32	1	1
32-37	21	21
>37	76	76
Total	100	100

Table2: Distribution of neonates based on birth weight

Birth weight(kg)	Frequency	Percent(%)
1.5-2	6	6
2-2.5	16	16
2.5-3.5	73	73
>3.5	5	5
Total	100	100

Table3: Comparison of Serum Prolactin with Gestational age

Gestational age (weeks)	N	Serum Prolactin(ng/mL)		F value	p value*
		Mean	Std.Dev		
<28	2	691.12	189.65	0.65	0.55
28-32	1	511.28	107.54		
32-37	21	521.65	111.42		
>37	76	514.87	178.57		
Total	100	517.85	156.77		

Table 4: Comparison of Serum Prolactin with birth weight

Birth weight(kg)	N	Serum Prolactin(ng/mL)		F value	p value*
		Mean	Std.Dev		
1.5-2	6	577.25	97.65	1.43	0.32
2-2.5	16	463.26	92.23		
2.51-3.5	73	526.66	89.24		
>3.5	5	521.22	91.29		
Total	100	509.78	88.56		

Table5: Correlation between Serum Prolactin with Gestational age and Birth weight

Pearson Correlation	Gestational age	Birth weight
r value	0.08	0.05
pvalue	0.21	0.51

DISCUSSION

The distribution of neonates based on gestational age at birth revealed that the majority (76%) were full-term, while 24% were preterm. This finding aligns with the study by Goldenberg et al. (2008), which reported that approximately 11% of all live births worldwide are preterm, highlighting the significance of preterm births as a global health concern.[12] The breakdown within the preterm category showed that most were born between 32-37 weeks, which corresponds with findings by Blencowe et al. (2012) indicating that late preterm births (34-36 weeks) are more common than earlier preterm births. The relatively small proportion of extremely preterm neonates (born before 28 weeks) underscores the critical need for specialized neonatal care for these high-risk infants.[13]The birth weight distribution indicated that the majority of neonates (73%) fell within the normal range of 2.5-3.5 kg, consistent with global birth weight standards (Kramer, 1987).[14] However, 16% of the neonates were classified as low birth weight (2-2.5 kg), and 6% had very low birth weight (1.5-2 kg), which is slightly higher than the worldwide prevalence of low birth weight reported by UNICEF (2019).[15] The 5% of neonates with birth weights over 3.5 kg aligns with the prevalence of macrosomia observed in studies by the WHO (2016), which reported a 3-5% incidence in developed countries.[16]

The ANOVA analysis showed no significant differences in serum prolactin levels across different gestational age groups (p-value = 0.55). This finding is in contrast to the study by Zuppa et al. (2015), which found higher prolactin levels in preterm infants compared to full-term infants, suggesting that the relationship between gestational age and serum prolactin may be more complex and influenced by other factors not accounted for in this study.[17]Similarly, no significant differences were found in serum prolactin levels across different birth

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weight categories (p-value = 0.32). This is consistent with the findings of Ziegler et al. (2014), who reported that birth weight alone does not significantly influence prolactin levels in neonates. This could imply that factors such as maternal health, nutritional status, and the presence of gestational diabetes might play more crucial roles in determining serum prolactin levels.[18]The Pearson correlation analysis demonstrated weak and non-significant correlations between serum prolactin levels and both gestational age (r = 0.08, p-value = 0.21) and birth weight (r = 0.05, p-value = 0.51). These findings suggest that serum prolactin levels in neonates are not strongly influenced by either gestational age or birth weight, aligning with previous studies by Akinbi et al. (2000) and Seller et al. (1998) which reported minimal correlation between these variables.[19,20]

CONCLUSION

Overall, the results indicate that while gestational age and birth weight are crucial parameters for neonatal health, they do not significantly correlate with serum prolactin levels in newborns. The majority of neonates were full-term and had normal birth weights, though a significant proportion were preterm or had low birth weights. Despite the physiological importance of prolactin, its levels did not show significant variation with gestational age or birth weight, suggesting that other factors may play a more critical role in determining its levels in newborns.

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