



**ORIGINAL RESEARCH PAPER**

**Physiology**

**IMMUNOGLOBULIN G LEVELS IN NORMAL, PRETERM AND LOW BIRTH WEIGHT(LBW) NEWBORNS- A COMPARATIVE STUDY**

**KEY WORDS:**

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**ABSTRACT**

Immunoglobulin G (IgG) is the principal antibody transferred from mother to fetus through the placenta and provides essential passive immunity during early neonatal life. The efficiency of this transfer is largely dependent on gestational age and fetal growth, making preterm and low birth weight (LBW) newborns more vulnerable to infections. This prospective observational study was conducted in the Department of Physiology, Hi-Tech Medical College & Hospital, Bhubaneswar, from February 2024 to August 2025, to estimate and compare serum IgG levels among normal full-term, preterm, and LBW newborns and to assess their correlation with gestational age and birth weight. A total of 99 newborns were enrolled and divided equally into three groups: full-term normal, preterm, and LBW. Cord blood samples were collected at birth, and serum IgG levels were measured using the ELISA method. The mean serum IgG concentration was significantly higher in full-term newborns ( $820 \pm 45$  mg/dL) compared to preterm ( $620 \pm 52$  mg/dL) and LBW neonates ( $610 \pm 49$  mg/dL) ( $p < 0.05$ ). A strong positive correlation was observed between gestational age and IgG levels ( $r = +0.78$ ), while birth weight showed a moderate positive correlation ( $r = +0.64$ ). The findings indicate that gestational maturity and adequate intrauterine growth play a critical role in effective transplacental IgG transfer, and reduced IgG levels in preterm and LBW newborns may contribute to their increased susceptibility to infections during early life.

**INTRODUCTION**

Immunoglobulin G (IgG) is the predominant antibody transferred from the mother to the fetus through the placenta and plays a crucial role in providing passive immunity to the newborn during the early neonatal period, when the infant's immune system is immature<sup>1</sup>. This transplacental transfer of IgG protects the neonate against a wide spectrum of bacterial and viral infections until the infant is capable of producing endogenous immunoglobulins. The transport of IgG across the placenta is an active, receptor-mediated process that increases progressively with advancing gestational age, reaching its maximum efficiency during the third trimester of pregnancy<sup>2</sup>. Consequently, full-term newborns generally attain higher serum IgG concentrations at birth compared to those born prematurely. Preterm newborns receive a reduced amount of maternal IgG due to curtailed gestational duration, which predisposes them to increased susceptibility to infections, morbidity, and mortality in the early postnatal period<sup>3</sup>. Similarly, low birth weight (LBW) newborns, particularly those affected by impaired intrauterine growth, may exhibit decreased serum IgG levels owing to suboptimal placental function and fetal growth restriction<sup>4</sup>. Although the gestational age-dependent nature of IgG transfer is well recognized, comparative quantitative data evaluating serum IgG levels among full-term, preterm, and LBW newborns within the same cohort remain limited, especially in developing country settings<sup>5</sup>. Understanding the relative influence of gestational maturity and birth weight on neonatal IgG levels is essential for identifying infants at risk of immune compromise and for improving early neonatal care strategies.

**AIMS AND OBJECTIVES**

The present study was undertaken to estimate and compare serum immunoglobulin G (IgG) levels among normal full-term, preterm, and low birth weight (LBW) newborns, and to evaluate the relationship between IgG concentration and key determinants of neonatal maturity, namely gestational age and birth weight, in order to better understand the factors influencing transplacental antibody transfer and early neonatal immunity.

**METHODS AND METHODOLOGY**

A prospective observational study was conducted in the Department of Physiology, Hi-Tech Medical College & Hospital, Bhubaneswar, over a period from February 2024 to August 2025. A total of 99 newborns delivered at the institution during the study period were included and categorized into three equal groups: full-term normal newborns (control group,  $n = 33$ ), preterm newborns ( $n = 33$ ), and low birth weight (LBW) newborns ( $n = 33$ ). Cord blood samples were collected immediately after delivery under strict aseptic precautions, and serum was separated by centrifugation and stored appropriately until analysis. Serum immunoglobulin G (IgG) levels were quantitatively estimated using a standardized enzyme-linked immunosorbent assay (ELISA) kit, following the manufacturer's protocol. Absorbance was measured at 450 nm using an ELISA reader. Data were expressed as mean  $\pm$  standard deviation. Comparison of mean IgG levels among the three groups was performed using one-way analysis of variance, and the correlation between serum IgG levels, gestational age, and birth weight was assessed using Pearson's correlation coefficient. A  $p$ -value of less than 0.05 was considered statistically significant.

**RESULTS**

Table 1 shows a total of 99 newborns were included in the study, with equal distribution across groups. Full-term, preterm, and low birth weight (LBW) newborns each comprised 33 (33.3%) of the study population, ensuring uniform representation for comparative analysis.

**Table 1**

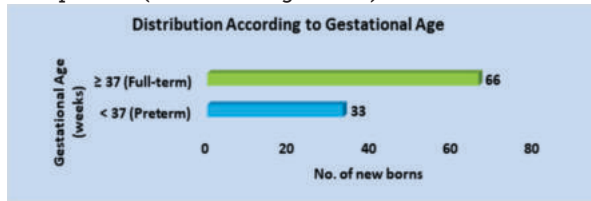
Category	No. of Newborns	Percentage (%)
Full-term	33	33.3
Preterm	33	33.3
Low Birth Weight (LBW)	33	33.3
<b>Total</b>	<b>99</b>	<b>100</b>

In Table 2 Out of 99 newborns included in the study, 33 (31.3%) had a birth weight less than 2.5 kg and were classified as low birth weight (LBW), while 66 (68.7%) had a birth weight of 2.5 kg or more.

**Table 2**

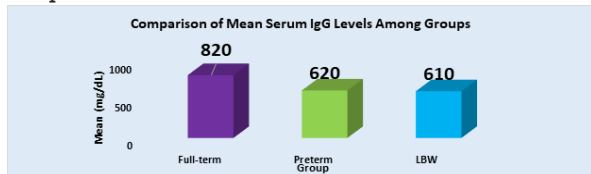
Birth Weight (kg)	No. of Newborns	Percentage (%)
< 2.5 (LBW)	33	31.3
≥ 2.5	66	68.7
<b>Total</b>	<b>99</b>	<b>100</b>

In Figure 1 among the 99 newborns studied, 66 (66.7%) were delivered at term (≥ 37 weeks of gestation), while 33 (33.3%) were preterm (< 37 weeks of gestation).



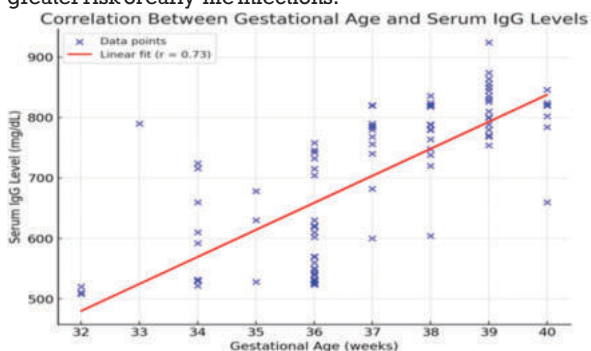
**Figure 1**

In Figure 2 it shows the mean serum Immunoglobulin G (IgG) level was highest among full-term newborns (820 mg/dL) and was markedly lower in preterm (620 mg/dL) and low birth weight (LBW) newborns (610 mg/dL), demonstrating a significant reduction in IgG levels in preterm and LBW groups compared to full-term infants.



**Figure 2**

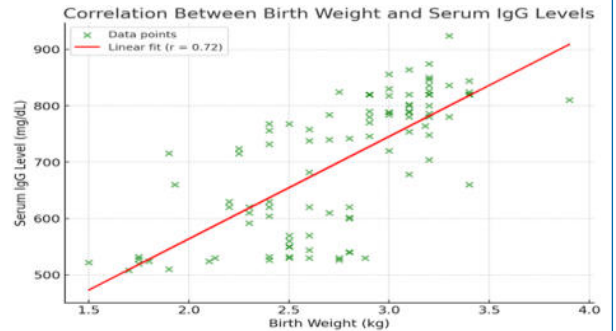
In Figure 3 Correlation analysis demonstrated a clear positive relationship between gestational age and serum Immunoglobulin G (IgG) levels. The scatter plot revealed a progressive increase in IgG concentration with advancing gestational age. Statistical analysis showed a strong positive correlation between gestational age and serum IgG levels ( $r = 0.73$ ), indicating that newborns delivered at higher gestational ages had significantly higher IgG concentrations. This finding confirms that transplacental transfer of IgG increases with fetal maturity, and preterm newborns receive comparatively lower levels of maternal IgG, placing them at greater risk of early-life infections.



**Figure 3**

Figure 4 the analysis of the relationship between birth weight and serum Immunoglobulin G (IgG) levels demonstrated a clear positive association. The scatter plot revealed that IgG concentrations increased progressively with increasing birth weight. Statistical evaluation showed a moderate to strong positive correlation between birth weight and serum IgG levels ( $r = 0.72$ ), indicating that newborns with higher birth weights had significantly higher IgG concentrations. Conversely, low birth weight infants exhibited comparatively lower IgG levels, reflecting reduced transplacental antibody transfer. This finding suggests that adequate intrauterine growth plays an important role in optimizing maternal IgG

transfer to the fetus and contributes to improved neonatal immune status at birth.



**Figure 4**

In a whole the study included 99 newborns equally distributed among full-term, preterm, and low birth weight (LBW) groups. Mean serum Immunoglobulin G (IgG) levels were significantly higher in full-term newborns ( $820 \pm 45$  mg/dL) compared to preterm ( $620 \pm 52$  mg/dL) and LBW newborns ( $610 \pm 49$  mg/dL) ( $p < 0.05$ ). Gestational age showed a strong positive correlation with serum IgG levels ( $r = 0.73$ ), while birth weight demonstrated a moderate to strong positive correlation ( $r = 0.72$ ). These findings indicate that both advancing gestational age and higher birth weight are associated with increased transplacental IgG transfer, whereas preterm and LBW newborns receive reduced maternal IgG and are therefore at greater risk of early-life infections.

**LIMITATIONS**

The study had a relatively small sample size and was conducted at a single tertiary care center, which may limit the generalizability of the findings. Only cord blood IgG levels were assessed, without follow-up measurements to evaluate postnatal changes or their direct association with clinical outcomes such as infections. Maternal factors influencing IgG transfer, including maternal IgG levels, nutritional status, infections, and placental pathology, were not evaluated. Additionally, the study did not assess IgG subclasses, which may have provided a more detailed understanding of transplacental antibody transfer.

**CONCLUSIONS**

The findings of this study clearly indicate that serum Immunoglobulin G (IgG) levels at birth are significantly influenced by both gestational age and birth weight. Full-term newborns exhibit substantially higher IgG concentrations compared to preterm and low birth weight (LBW) infants, reflecting more efficient transplacental antibody transfer during late gestation. The strong positive correlation observed between gestational age and IgG levels underscores the importance of fetal maturity in establishing adequate passive immunity, while the moderate to strong association with birth weight highlights the role of optimal intrauterine growth in enhancing maternal antibody transfer. Preterm and LBW newborns, due to reduced IgG acquisition, are at a greater risk of infections during the early neonatal period. These findings emphasize the need for heightened clinical surveillance, early preventive interventions, and strengthened neonatal care strategies for vulnerable newborn populations to reduce infection-related morbidity and improve neonatal outcomes.

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