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# Evaluation of Serum Prolactin as a Marker of Lung Maturation

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**Abstract:** ***Background: Respiratory distress syndrome (RDS) is an important cause of early neonatal morbidity and mortality, especially among preterm and low-birth-weight neonates. Prolactin has been suggested to support fetal lung maturation by promoting surfactant phospholipid synthesis. This study assessed maternal and cord blood prolactin levels and their relation with RDS in newborns. Methods: This prospective observational study was conducted in the Department of Obstetrics and Gynaecology, Sardar Patel Medical College and Associated Group of Hospitals, Bikaner, over six months from December 2025 to May 2026. A total of 100 pregnant women were included, with 50 high-risk pregnancies and 50 normal pregnancies. Maternal venous blood and mixed umbilical cord blood were collected around delivery and analyzed for serum prolactin by fluorescence immunoassay. Neonates were assessed for birth weight, APGAR scores, RDS by Downes score, NICU admission and outcome. Results: Maternal serum prolactin was significantly lower in high-risk pregnancies than normal pregnancies (184.6 +/- 52.8 vs 236.8 +/- 61.3 ng/mL, p=0.001). Cord blood prolactin was also lower in high-risk neonates (212.4 +/- 68.5 vs 298.7 +/- 74.2 ng/mL, p=0.001). RDS was more common in high-risk pregnancies (38.0%) than normal pregnancies (10.0%, p=0.001). Neonates with low cord prolactin <250 ng/mL had higher RDS (37.5%), low 5-minute APGAR (25.0%) and NICU admission (45.8%). Conclusion: Low maternal and cord blood prolactin levels were significantly associated with increased neonatal RDS and morbidity. Cord blood prolactin may be useful as an early biochemical marker for identifying newborns at risk of respiratory distress.***

**Keywords:** Maternal prolactin, cord blood prolactin, respiratory distress syndrome, newborn, high-risk pregnancy, NICU

## 1. Introduction

Respiratory distress syndrome (RDS), also known as hyaline membrane disease, is a common cause of neonatal illness and death, particularly among preterm babies. It occurs mainly due to immature lungs and deficiency of pulmonary surfactant. Surfactant is produced by type II alveolar cells and reduces surface tension in the alveoli, thereby preventing collapse during expiration and helping the newborn to breathe effectively after birth. Clinically, RDS presents soon after delivery with tachypnea, grunting, chest retractions, nasal flaring and cyanosis. Its occurrence is strongly related to gestational age; however, neonates with similar gestational age and birth weight may show different respiratory outcomes. This suggests that other biological and hormonal factors may also influence fetal lung maturity.

Prolactin is a polypeptide hormone mainly secreted by the anterior pituitary gland, but it is also produced by extra-pituitary tissues during pregnancy. Maternal prolactin increases progressively during gestation, while fetal prolactin levels rise rapidly in the third trimester. Experimental and clinical studies have suggested that prolactin may help in fetal lung maturation by increasing surfactant phospholipid production, especially phosphatidylcholine and phosphatidylglycerol. Several studies have reported lower cord blood prolactin levels among neonates who develop RDS, although some studies have shown variable results.

Maternal complications such as hypertensive disorders, diabetes, preterm labour and low birth weight can affect neonatal respiratory adaptation. Cord blood reflects the fetal hormonal environment and can be collected easily at birth without additional risk to the neonate. Therefore, evaluating maternal and cord blood prolactin may help in early identification of babies at risk of RDS. The present study was planned to measure maternal and cord blood serum prolactin levels in normal and high-risk pregnancies and to assess their relation with RDS, APGAR score, NICU admission and neonatal outcome.

## 2. Aim and Objectives

Aim: To measure maternal blood serum prolactin and cord blood serum prolactin levels and assess their relation with respiratory distress syndrome in newborns.

- To estimate maternal and fetal cord blood serum prolactin levels in normal pregnancy.
- To estimate maternal and fetal cord blood serum prolactin levels in high-risk pregnancy.
- To assess the relation of maternal and cord blood serum prolactin levels with RDS in neonates in terms of APGAR score, NICU admission and outcome of treatment.

## 3. Materials and Methods

This prospective observational study was conducted in the labour room and Department of Obstetrics and Gynaecology, Sardar Patel Medical College and Associated Group of Hospitals, Bikaner, Rajasthan. The study period was six months from December 2025 to May 2026. Pregnant women admitted for delivery were screened and enrolled after informed consent. A total of 100 women were included and divided into two equal groups: Group A included 50 high-risk pregnancies with conditions such as hypertensive disorders of pregnancy, preterm labour, diabetes or more than one risk factor; Group B included 50 normal pregnancies without antenatal complications.

Singleton pregnancies with gestational age >=28 weeks and live-born neonates without major congenital anomalies were included. Multiple pregnancies, major fetal malformations, intrauterine fetal demise and mothers with chronic renal failure, heart disease or thyroid disorder were excluded. Detailed maternal history, parity, obstetric risk factors, gestational age, mode of delivery and relevant antenatal records were noted. Gestational age was calculated from the last menstrual period or first-trimester ultrasound.

Five millilitres of maternal venous blood was collected during labour or the antenatal period before delivery. Immediately after delivery and before placental separation, a segment of umbilical cord was clamped and 5 ml mixed arterial and venous cord blood was collected in plain vials. Samples were stored at 2-8°C and analyzed on the same day for serum prolactin using a validated fluorescence immunoassay method with TOSHO 360 machine. All newborns were examined by a paediatrician. Birth weight, APGAR score at 1 and 5 minutes, RDS by Downes score, NICU admission, duration of NICU stay and final outcome were recorded. Data were entered in Microsoft Excel and analyzed using SPSS version 26. Descriptive statistics, chi-square test and comparison of means were used, and $p<0.05$ was considered statistically significant.

## 4. Results

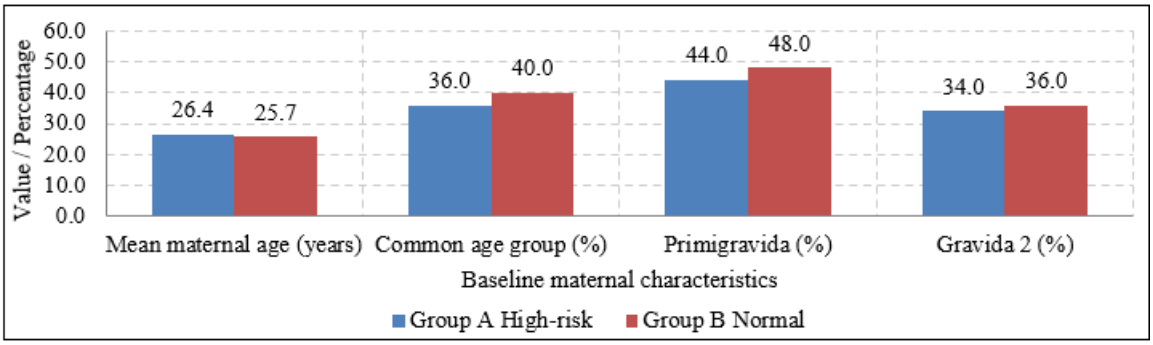
In the present study, 100 pregnant women were included, with 50 high-risk and 50 normal pregnancies. Most women belonged to the 25-29 years age group, and the mean age was comparable between high-risk and normal groups (26.4 +/- 4.8 vs 25.7 +/- 4.2 years, p=0.440). Primigravida women were most common in both groups. Among high-risk pregnancies, hypertensive disorders were the commonest risk factor (44.0%), followed by preterm labour (32.0%), gestational diabetes mellitus (16.0%) and multiple risk factors (8.0%). The mean gestational age was lower in the high-risk group than the normal group (36.2 +/- 2.8 vs 38.4 +/- 1.1 weeks, p=0.0001), and caesarean section was more frequent among high-risk pregnancies (60.0%).

Maternal serum prolactin was significantly lower in high-risk pregnancies than normal pregnancies (184.6 +/- 52.8 vs 236.8 +/- 61.3 ng/mL, p=0.001). Similarly, cord blood prolactin was significantly lower in neonates of high-risk pregnancies (212.4 +/- 68.5 vs 298.7 +/- 74.2 ng/mL, p=0.001). Low birth weight was also more common in high-risk pregnancies, with mean birth weight of 2.34 +/- 0.54 kg compared to 2.82 +/- 0.46 kg in normal pregnancies (p=0.005).

RDS was present in 24% of neonates overall. It was significantly higher in the high-risk group (38.0%) than the normal group (10.0%, p=0.001). Neonates born to mothers with low maternal prolactin <200 ng/mL had higher RDS (40.5%) than those with prolactin >=200 ng/mL (12.1%, p=0.004). Low cord prolactin <250 ng/mL was also associated with higher RDS (37.5% vs 11.5%, p=0.002), low 5-minute APGAR score (25.0% vs 5.8%, p=0.018) and NICU admission (45.8% vs 19.2%, p=0.004). RDS was strongly associated with NICU admission (91.7%, p<0.001) and neonatal death (16.7% vs 1.3%, p=0.003).

**Table 1:** Summary of baseline maternal characteristics in both groups

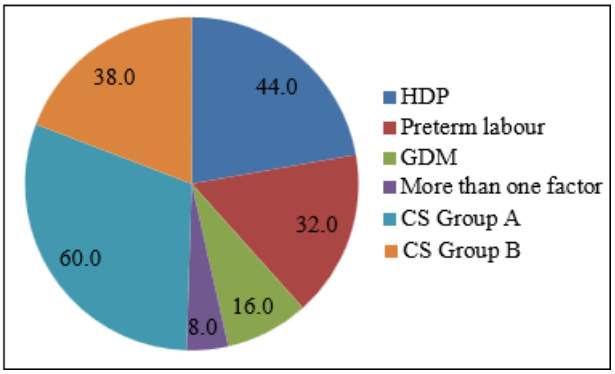
| Variable | Group A High-risk | Group B Normal |
|---|---|---|
| Number of cases | 50 | 50 |
| Mean maternal age (years) | 26.4 +/- 4.8 | 25.7 +/- 4.2 |
| Most Common age group in both group(25-29 years) | 25-29 years: (36.0%) | 25-29 years: (40.0%) |
| Primigravida | 22 (44.0%) | 24 (48.0%) |
| Gravida 2 | 17 (34.0%) | 18 (36.0%) |




**Graph 1:** Summary of baseline maternal characteristics

**Table 2:** Summary of high-risk factors and obstetric profile

| Variable | Findings | Percentage / p-value |
|---|---|---|
| Hypertensive disorders of pregnancy | 22 cases | 44.0% |
| Preterm labour | 16 cases | 32.0% |
| Gestational diabetes mellitus | 8 cases | 16.0% |
| More than one high-risk factor | 4 cases | 8.0% |

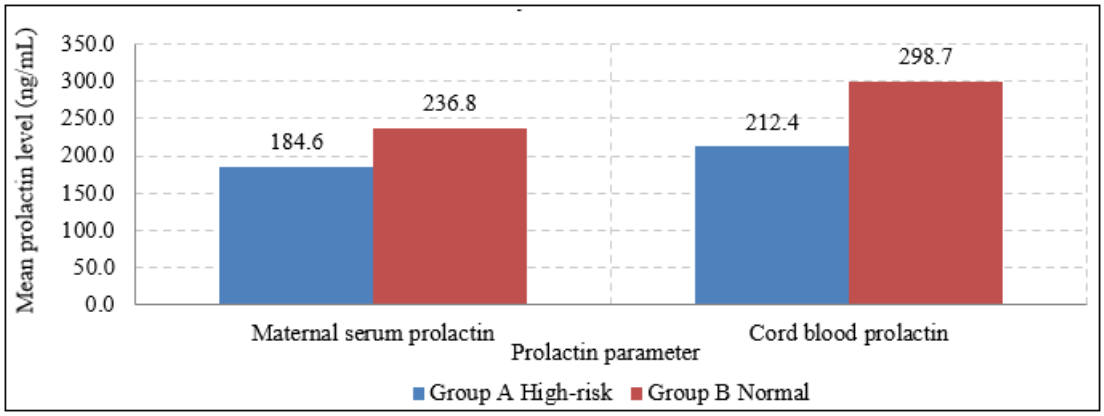



**Graph 2:** Summary of high-risk factors and obstetric profile

**Table 3:** Comparison of maternal and cord blood prolactin levels

| Prolactin parameter | Group A High-risk | Group B Normal | p-value |
|---|---|---|---|
| Maternal serum prolactin (ng/mL) | 184.6 +/- 52.8 | 236.8 +/- 61.3 | 0.001*** |
| Cord blood prolactin (ng/mL) | 212.4 +/- 68.5 | 298.7 +/- 74.2 | 0.001*** |

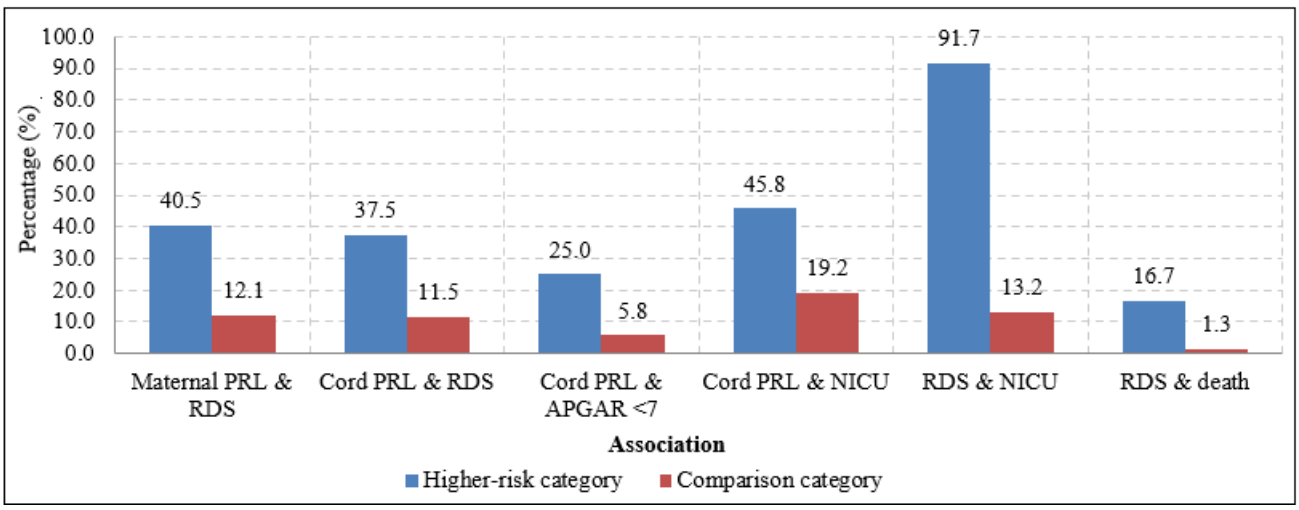
*Not significant **Significant with p value < 0.05
***highly significant with p value <0.01




**Graph 3:** Comparison of maternal and cord blood prolactin levels

**Table 4:** Relation of prolactin and RDS with neonatal morbidity

| Association | Group A High-risk | Group B Normal | p-value |
|---|---|---|---|
| Maternal prolactin and RDS | <200 ng/mL: 17/42 (40.5%) | >=200 ng/mL: 7/58 (12.1%) | 0.004 |
| Cord prolactin and RDS | <250 ng/mL: 18/48 (37.5%) | >=250 ng/mL: 6/52 (11.5%) | 0.002 |
| Cord prolactin and APGAR <7 at 5 min | <250 ng/mL: 12/48 (25.0%) | >=250 ng/mL: 3/52 (5.8%) | 0.018 |
| Cord prolactin and NICU admission | <250 ng/mL: 22/48 (45.8%) | >=250 ng/mL: 10/52 (19.2%) | 0.004 |
| RDS and NICU admission | RDS present: 22/24 (91.7%) | RDS absent: 10/76 (13.2%) | <0.001 |
| RDS and neonatal death | RDS present: 4/24 (16.7%) | RDS absent: 1/76 (1.3%) | 0.003 |




**Graph 4:** Relation of prolactin and RDS with neonatal morbidity

## 5. Discussion

The present study showed that high-risk pregnancy was associated with significantly lower maternal and cord blood prolactin levels and higher neonatal respiratory morbidity. Both study groups were comparable in terms of maternal age and parity, which strengthens comparison between the groups. However, the high-risk group had lower gestational age, higher caesarean section rate and lower birth weight, which are known contributors to neonatal RDS.

The mean cord blood prolactin level was significantly lower in high-risk pregnancies than normal pregnancies. This finding supports the concept that cord prolactin reflects fetal maturity and intrauterine hormonal environment. Gluckman et al. reported that cord prolactin increased with gestational age and was significantly lower among preterm infants who developed RDS. Grosso et al. also observed lower prolactin levels in RDS infants between 30 and 33 weeks of gestation. Dhanireddy et al. found that preterm infants with RDS had lower cord prolactin and thyroxine levels, suggesting that endocrine factors may contribute to lung maturation.

The present study also found that low cord prolactin <250 ng/mL was significantly associated with RDS, low APGAR score at 5 minutes and NICU admission. These findings are comparable with Saharan et al., Padvi et al., Gaikwad et al. and Sehra et al., who reported that low fetal cord prolactin levels were associated with respiratory distress and adverse neonatal outcomes. In contrast, some studies have suggested that prolactin may be related more to gestational age than direct lung mechanics, showing that the association may be influenced by prematurity, birth weight and maternal disease. Overall, our findings indicate that cord blood prolactin may be a useful supportive marker, especially when interpreted along with gestational age, birth weight, maternal risk status and neonatal clinical assessment.

## 6. Conclusion

The present study concluded that maternal and cord blood prolactin levels were significantly lower in high-risk pregnancies compared to normal pregnancies. Neonates born to high-risk mothers had lower gestational age, lower birth weight, more low APGAR scores and higher frequency of RDS. Low maternal prolactin <200 ng/mL and low cord blood prolactin <250 ng/mL were significantly associated with increased occurrence of neonatal RDS. Low cord blood prolactin was also related to higher NICU admission and poorer early neonatal adaptation.

These findings suggest that cord blood prolactin may be used as an early biochemical marker for identifying newborns at risk of respiratory distress syndrome, particularly in high-risk pregnancies and preterm deliveries. However, prolactin should not be used alone; it should be interpreted with gestational age, birth weight, APGAR score, maternal risk factors and clinical assessment. Larger multicentric studies with long-term follow-up are recommended to confirm its predictive value and clinical utility. This study may be helpful in present scenario in cases where repeated use of corticosteroid may have adverse effect on newborn.

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