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## A study of early neonatal morbidity in late preterm

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### Abstract

**Background:** There has been a lot of interest in the late preterm infants in the recent years. Due to the built in assumption of the late preterm infants as the term infants, these babies are roomed in with the mother immediately after delivery and are being discharged as the full term infants. Studies revealed that late preterm infants are at risk of morbidity. The most common morbidities observed in the late preterm infants were respiratory distress, hypoglycaemia, sepsis and hyperbilirubinemia.

**Objectives:** This study is being done to assess variables such as respiratory distress, hypoglycaemia, probable and proven sepsis and hyperbilirubinemia, in the first week of life, and the risk of these morbidities as the gestational age regresses compared to the full term newborns. It also focuses on the associated maternal complications.

**Methods:** All term and late preterm born in Bhaskar General Hospital and Bhaskar medical college, satisfying the inclusion criteria were included in the study. All these infants were observed for the morbidities explained above during the hospital stay.

**Results:** Probable sepsis was found in 14.7% of late preterm compared to the 1.7% of term infants. On seeing the odds of probable sepsis for individual gestational age the risk was 19, 13.7, 5.98 times in late preterm infants at 34 0/7-34 6/7, 35 0/7-35 6/7, 36 0/7- 36 6/7 weeks compared to the term infants respectively. Proven sepsis was seen in 5.42% of late preterm infants when compared to 0.82% of term newborns in our population. On seeing the odds of proven sepsis for individual gestational age the risk was 10.9, 8.3, 5.1 times in late preterm infants at 34 0/7-34 6/7, 35 0/7-35 6/7, 36 0/7- 36 6/7 weeks compared to the term infants respectively.

**Conclusion:** Considering significant morbidity like respiratory distress, hypoglycaemia, sepsis and hyperbilirubinemia in late preterm compared to the term infants they must be considered as a special entity of preterm infants and need to be monitored carefully.

**Keywords:** study, early neonatal morbidity, late preterm

### Introduction

There has been a lot of interest in the late pre- term infants in the recent years. They have been called as the near term infants as they were closer to the term gestation. They have been seen as almost mature infants requiring no attention as the term infants <sup>[1]</sup>. The Workshop panel intended to coin the infants born from 34 0/7 to 36 6/7 weeks of gestation as late preterm instead near term, owing to the immaturity of these infants <sup>[2]</sup>. Advances in neonatology have improved the focus on extreme preterm newborns diverting away from the late preterm who are prone to have 2 to 3 times <sup>[3]</sup> more morbidity compared to the term infants. Studies in the near past has found an increasing number of this subset of neonates due to raise in the pregnancy related complications such as increasing maternal age, and other maternal morbid conditions such as hypertension, abruptio placenta, diabetes, oligohydramnios, infertility <sup>[4]</sup>.

Due to the built in assumption of the late pre- term infants as the full term infants, these babies are roomed in with the mother immediately after delivery and are being discharged as the full term infants <sup>[5]</sup>. Studies revealed that late preterm infants are at risk of morbidities. Hence these infants require more attention in order to anticipate the morbidity. It has been observed that these late pre- term infants needed prolonged hospitalization and those who were being discharged as the term infants, 72 hours post-delivery needed re admission due to some morbidity <sup>[5]</sup>. The most common morbidities observed in the late preterm infants were respiratory distress, hyperbilirubinemia, and hypoglycaemia, probable and proven sepsis.

This study is being done to assess variables such as respiratory distress, hyperbilirubinemia, hypoglycaemia, probable and proven sepsis in the first week of life, and the risk of these morbidities as the gestational age regresses compared to the full term newborns. It also focuses on the associated maternal complications.

**Materials and Methods**

**Study design:** Prospective Cohort Study.

**Study place:** Bhaskar General Hospital and Bhaskar medical college, Moinabad, Ranga Reddy district.

**Study duration:** July 2021 to December 2021

**Sample size:** All term and late preterm infants born

**Inclusion criteria:** All late preterm (34 0/7-36 6/7 weeks) and Term infants born in the hospital

**Exclusion criteria**

- Newborns with major congenital anomalies.
- Newborns with clinically identified chromosomal syndromes.
- All out born newborns admitted in our hospital.
- All term and late preterm born satisfying the inclusion criteria were included in the study.

Informed consent was obtained from the parents. Data was collected from the parents and case sheets. Maternal details included last menstrual period, risk factors like hypertension, antepartum haemorrhage, and premature rupture of membranes. Newborn details included birth weight, gestational age, morbidity variables discussed below.

All these details collected were entered into the proforma sheet followed by entry into the excel sheet. All these infants were observed for the morbidities explained below during the hospital stay. New born is considered as late preterm if it is born at 34 0/7 through 36 6/7 weeks according to the AAP guidelines. Gestational age for the late preterm is assessed by

- LMP
- First trimester ultrasound abdomen or
- New Ballard’s scoring

Both the term and late preterm are classified as AGA/SGA/LGA by Fenton’s chart.

**Statistical Analysis:** Data was entered into Microsoft excel data sheet and was analysed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions.

**Observation and Results**

**Table 1:** Distribution based on Term and late preterm

Variables	Frequency	Percentage
Term	1341	91.22%
Late preterm	129	8.77%

Out of 1470 newborns included, there were 1341 term infants (91.22%) and 129 late preterm (8.77%).

**Table 2:** Distribution based on Gestational age

Gestational age	Frequency	%
34 0/7-34 6/7 weeks	24	1.6
35 0/7-35 6/7 weeks	31	2.1
36 0/7-36 6/7 weeks	74	5.03
37 0/7-37 6/7 weeks	394	26.8
38 0/7-38 6/7 weeks	372	25.3
39 0/7-39 6/7 weeks	339	23.06
40 0/7-41 6/7 weeks	235	15.9

**Table 3:** Distribution of A/L/S across gestational status

A/L/S	LPT	%	Term	%
AGA	86	66.67	1190	88.75
LGA	3	2.33	10	0.74
SGA	40	31	141	10.51
Total	129		1341	

Most of the term infants are adequate for gestational age, most of the late preterm are small for gestational age.

**Table 4:** Maternal risk factors associated with preterm

Maternal risk factors	Frequency	Percentage
PROM	30	24.1
Preterm labour	39	31.4
Hypertensive disorders	31	24.1
Bad obstetric History	12	9.6
Abruption	3	2.4
APH	3	2.4
Oligohydramnios	3	2.4
Polyhydramnios	3	2.4

**Table 5:** Distribution of morbidity across LPT and Term

RDS	Yes	No	Frequency	P Value	OR
LPT	21	121	16.2%	0.0001	15.1
Term	17	1324	1.26%		
<b>Hypoglycaemia</b>					
LPT	12	117	9.3%	0.0001	7.98
Term	17	1324	1.26%		
<b>Probable sepsis</b>					
LPT	19	110	14.7%	0.0001	9.89
Term	23	1318	1.7%		
<b>Proven Sepsis</b>					
LPT	7	122	5.4%	0.0001	6.93
Term	11	1330	0.82%		
<b>Hyperbilirubinemia</b>					
LPT	51	78	39.5%	0.0001	4.6
Term	166	1175	12.3%		

16.2% of late preterms have respiratory distress compared to 1.26% of term infants which is statistically significant and they are 15 times more likely to develop respiratory distress compared to the term infants.

9.3% of late preterms have hypoglycemia compared to 1.26% in term infants which is statistically significant and they are 8 times more likely to develop hypoglycaemia compared to the term infants 14.7% of late preterms have probable sepsis compared to 1.71% in term infants which is statistically significant they are 10 times more likely to develop probable sepsis compared to the term infants 5.4% of late preterm had proven sepsis compared to 0.82% of term infants which is statistically significant, and they are 7 times more likely to develop sepsis compared to the term infants. 39.5% of late preterms have hyperbilirubinemia compared to the 12.3% in term infants which is statistically significant, and late preterm have 4 times more risk of developing hyperbilirubinemia than term infants.

**Table 6:** Comparison of neonatal morbidity among late preterm and term infants

Morbidity	LPT	Term	P Value	OR
Respiratory distress	16.2%	1.26%	0.0001	15.1
Hypoglycemia	9.3%	1.26%	0.0001	7.98
Probable sepsis	14.7%	1.7%	0.0001	9.89
Proven sepsis	5.42%	0.82%	0.0001	6.93
Hyperbilirubinemia	39.5%	12.3%	0.0001	4.6

The common morbidities seen in late preterm compared to the term newborns are respiratory distress, hypoglycaemia, sepsis and hyperbilirubinemia.

### Discussion

Out of 1504 live term and late preterm deliveries in our hospital, there were 136 late preterm births (9%) and the remaining were 1368 (90.9%) term infants. Out of 1504, 27 term babies and 7 late preterm were excluded from the study, 11 of them had congenital malformations noted clinically.

Late preterm births account for about 9% of term and late preterm infants at our hospital. In a prospective cohort study by jaiswal *et al.*, 2010 had 11.2% of late preterm births. Similarly study by Donald D. *et al.*, 2008 had 9% late preterm births. In study at United States by Cande V. Ananth *et al.*, which is a population based study in 2008 found late preterm births to be around 7.5% [6, 7, 8]. So it is essential to look upon this group as this population was found to be prone to neonatal morbidity like a preterm infant than a term infant.

In our study, 76.6% had at least one morbidity compared to the term infants who had 20.4% morbidity which is in concordance with the study done by jaiswal *et al.* showed at least one morbidity in 70.8% of late preterm. Study by Wang *et al.* concluded that 77.8% of late preterm had at least one clinical problem. Hence we require close monitoring for these babies for morbidities which are more common in preterm infants.

In our study respiratory morbidity accounts for 16.2% in late preterm infants. A Study by jaiswal *et al.*, 2010 found a similar morbidity pattern (10.5%) with a significant P value and OR of 7.5 suggesting that the near terms are at 7 times more higher risk than the term infants. In our study when these late preterm were split into sub groups, preterm that fall under 34 0/7-34 6/7 weeks of gestation had respiratory morbidity in 29.1% of them, and they are at 32 times more higher risk of having a respiratory morbidity compared to the term infants. On seeing the odds respiratory distress for individual gestational age the risk was 14.9, 10.7 times in late preterm infants at 35 0/7-35 6/7, 36 0/7- 36 6/7 weeks compared to the term infants respectively. Study by Femintha *et al.*, which is a case control study of 250 late preterm and term infants analysed the various respiratory morbidities in both groups and found that 13.8% of late preterm had RDS and half of them needed surfactant therapy [8]. This signifies that late preterm infant are at high risk of developing respiratory distress and need to be monitored closely like the preterm infants.

In our study hypoglycemia affects 9.3% of late preterm compared to the 1.26% in the term infants. In a Study by Maria Altman *et al.*, a population based study found 16% of late preterm had hypoglycemia when compared to the term infants. Jamie. A *et al.* in a retrospective study has a higher incidence of hypoglycemia [9]. In our study 34.8% of late preterm had hypoglycemia when compared to 6% of the term infants. Most studies have not described the etiology for hypoglycemia in the late preterm infants. It's understood from literature that the etiology of hypoglycemia is probably due to the poor oro-motor tone of late preterm infants, and poor feeding by the mother. Other morbidities may also contribute to the hypoglycemia. On seeing the odds of hypoglycemia for individual gestational age the risk was 15.5, 11.53, 4.45 times in late preterm infants at 34 0/7-34

6/7, 35 0/7-35 6/7, 36 0/7- 36 6/7 weeks respectively. A study by Femintha *et al.* which was a case control study found a higher incidence than our study. Rocha *et al.* found a higher incidence of hospitalization for hypoglycemia in IUGR late preterm when compared to the late preterm that are adequate for gestational age, Further studies may be necessary to study these details. In this study asymptomatic hypoglycemia was seen in 71% of the late preterm compared to 42.8% of the term infants suggesting the physiological immaturity of the late preterms compared to the term infants.

In our study probable sepsis was found in 14.7% of late preterm compared to the 1.7% of term infants. In the study by Minesh khashu *et al.* infectious morbidity was 5.2 times more in late preterm than term infants. In the study by jaiswal *et al.* had similar results as our study. Study by Wang *et al.* had similar odds of developing infectious morbidity. All of these studies support the fact that late preterm need careful monitoring. While looking at age wise sepsis morbidity infants at 34 0/7-34 6/7 weeks are at 19 times more risk of developing probable sepsis. This becomes 13.7times at 35 0/7-35 6/7weeks and 5.98 times at 36 0/7- 6/7 weeks. Hence compared to the term infants, and at each decreasing gestational age infectious morbidity was noted to be 6 to 7 times more. A Study by Melamed *et al.* [10] found a 30 fold increase in infectious morbidity which was more than our study. Higher incidence of infection reported may be due to the difference in the population and the definition of morbidities. In a previous study it was found that maternal complications such as chorioamnionitis and premature rupture of membranes contribute to the infectious morbidity in late preterms. This study did not specifically look at maternal risk factors [11].

Proven sepsis or confirmed sepsis was seen in 5.42% of late preterm infants when compared to 0.82% of term newborns in our study. Study by jaiswal *et al.* found that proven sepsis was present in 1.1% of late preterm compared to 0.67% in the term infants. In our study infants at 34 0/7-34 6/7 weeks are 10.9 times more prone to develop sepsis than the term infants and infants at 35 0/7- 35 6/7,36 0/7- 36 6/7 weeks are 8.3, 5.1 times more likely to develop sepsis than term newborns respectively. In a previous study, it recommends complete work up for infants born less than 36 weeks whose maternal status is not known and have not received intrapartum antibiotic prophylaxis [12].

Hyperbilirubinemia was found in 39.5% of late preterm compared to the 12.3% in term new-borns in our study. In a Study by Jamie *et al.* [13] 40.6% of late preterm had hyperbilirubinemia compared to 9.7% term new-born. In a retrospective study by found 25.35% of late preterm infants had hyperbilirubinemia compared to 2.5% of the term infants. In a retrospective study done in a well infant population of 35-36 weeks, 36-37 weeks who needed readmission for hyperbilirubinemia was found to be 13.2, 7.7 times more respectively [14]. In this study, infants at 34 0/7-34 6/7 weeks were 14.1 times more likely to have hyperbilirubinemia when compared to the term infants. Infants at 35 0/7- 35 6/7,36 0/7-36 6/7 weeks were 5.8, 2.8 times respectively more likely to develop hyperbilirubinemia than the term infants. This morbidity pattern was obtained after excluding the confounding factors such as instrumental deliveries and blood group incompatibility. The study by marochella *et al.* did not exclude these risk factors and that probably explains the

higher morbidity. Incidence of hyperbilirubinemia in the late preterm infants is due to the reduced hepatic enzyme inactivity and reduced efficacy to handle the bilirubin load and uptake. In a previous study found that late preterm infants experienced hyperbilirubinemia more at 24 to 48 hours, necessitating the importance of pre discharge assessment of bilirubin levels <sup>[15]</sup>. This study does not include the infants between 32 to 34 weeks, but there are studies comparing moderate preterm, late preterms and term infants. Boyce and colleagues <sup>[16]</sup> studied infants born from 33 to 36 weeks and had admission rates similar to the term infants for respiratory morbidity. Study by Ananth *et al.* found that infants born at 32-36 weeks are at risk for mortality and morbidity compared to the term infants. Cohort study done by Jamie *et al.*, in infants born between 22 0/7 and 33 6/7 weeks of gestational age had increased risk ratio of morbidity, when compared to term infants. The adverse outcome range in late preterm in this study was comparable to the infants born at 32 to 33 weeks. These studies show that late preterm have morbidity similar to preterm hence late preterm also need to be considered as preterm and need to be carefully monitored.

### Conclusion

Late preterm infants are more likely to develop proven sepsis compared to the term infants. The risk increases with decreasing gestational age, with those born at 34 weeks having an eleven times greater risk than a term newborn. Considering significant morbidity in late preterm compared to the term infants they must be considered as preterm infants and need to be monitored carefully. Appropriate discharge criteria and discharge advice, follow up plan are required for late preterm infants. There is a need to educate health care providers and parents about the vulnerability of the late preterm infants to various morbidities during the first week of life and seeking appropriate medical attention for these morbidities.

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