

## Original Research Article

# Morbidity profile and immediate outcome of late preterm neonates compared to term neonates in a rural tertiary care hospital of Gujarat

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## ABSTRACT

**Background:** Late premature infants are born near term, but are immature. As a consequence, late preterm infants are at higher risk than term infants to develop morbidities. Although late preterm infants are the largest subgroup of preterm infants, there is a very limited data available on problems regarding late preterm infants in rural India.

**Methods:** This is a retrospective cohort study using previously collected data from neonates born at Dhiraj Hospital and neonates who were born outside but admitted at SNCU of Dhiraj Hospital, Piparia, Vadodara district, Gujarat, India between January 2015 to December 2015.

**Results:** 168 late preterm infants and 1025 term infants were included in this study. The need for SNCU admission is significantly higher in late preterm compared to full term (41.07% vs 2.04%). Morbidities were higher in late preterm neonates compared to full term neonates. Sepsis (4.76% vs 1.07%), TTN (10.11% vs 2.04%), hyperbilirubinemia (19.04% vs 9.36%), RDS (1.78% vs 0.09%), hypoglycemia (1.78% vs 0.29%), PDA (1.78% vs 0.58%), risk of major congenital malformation (2.38% vs 0.58%). Need for respiratory support was 5.95% in late preterm vs 2.04% in full term neonates. Immediate neonatal outcome in terms of death and DAMA (non-salvageable) cases was poor in late preterm neonates compared to full term neonates (1.19% vs 0.78%).

**Conclusions:** Late preterm neonates are at higher risk of morbidities and mortalities. They require special care. Judicious obstetric decisions are required to prevent late preterm births.

**Keywords:** Immediate outcome, Late preterm, Morbidities, Term infants

## INTRODUCTION

Prematurity is a major cause of neonatal mortality and morbidity. Most of the studies are focused on outcomes among preterm neonates less than 34 weeks gestation which has highest mortality and morbidity.

Not much is known about premature infants at higher gestations. Late preterm infants are defined as born at 34-0/7 to 36-6/7 weeks of gestational age.<sup>1</sup> Late premature infants are born near term, but are immature. Late

preterm infants are physiologically and metabolically immature. As a consequence, late preterm infants are at higher risk than term infants to develop medical complications that result in higher rates of mortality and morbidity during birth hospitalization.<sup>2,3</sup>

Although late preterm infants are the largest subgroup of preterm infants, there is a very limited data available on problems regarding late preterm infants in India, and in particularly from rural and tribal areas of Gujarat.

## METHODS

This is a retrospective cohort study using previously collected data from neonates born at Dhiraj Hospital and neonates who were born outside but admitted at SNCU of Dhiraj Hospital, Piparia, Vadodara district, Gujarat, India between January 2015 to December 2015.

These neonates were examined, monitored and managed by standard protocols. Gestational age is calculated using last menstrual period and new Ballard score. Neonates with gestational age <37 weeks and >34 weeks are classified as late preterm neonates. Neonates with gestational age of ≥37 weeks and <42 weeks are classified as full term. Neonates with gestational age of ≥32 and <34 are classified as moderate preterm newborn. They were analyzed for morbidities and immediate neonatal outcome. There morbidities and outcome were compared.

This study is a retrospective analysis of previously collected information. Neonates were managed by standard protocols. This study was approved by the hospital ethics committee.

## RESULTS

### General characteristics of inborn live births

During study period, total numbers of live births in our hospital were 1236. 1025 (82.9%) were full term, 208 (16.8%) were preterm and 3 (0.24) were post term. Out of 208 preterm neonates, 168 (80.7%) were late preterm, 23 (11.05%) moderate preterm, 16 (7.69%) very preterm and 1 (0.48%) extreme preterm. 722 (58.4%) neonates had normal birth weight, 484 (39.15%) had low birth weight, and 30 (0.24%) had large weight. Out of 1236 live births, 217 (17.55%) required SNCU admission. During study period, there were total 411 admissions in SNCU. 217 were inborn admissions, 189 were out born admissions and 5 were inborn readmissions. (Table 1).

**Table 1: General characteristics of inborn live births.**

Live births	1236
Full term	1025 (82.9%)
Preterm	208 (16.8%)
Late preterm	168
Mod preterm	23
Very preterm	16
Extreme preterm	01
Post term	03 (0.24%)
Normal birth weight (2500-3500 gm)	722 (58.4%)
Lbw (<2500 gm)	484 (39.15%)
Large weight (>3500 gm)	30 (0.24%)
AGA	1080 (87.3%)
SGA	88 (7.12%)
LGA	68 (5.5%)

### General characteristics of late preterm neonates (inborn and outborn)

Out of 168 late preterm inborn neonates, 69 (41.07%) required SNCU admissions. Out of 217 inborn admissions, 69 (37.79%) were late preterm. Out of 189 out born SNCU admissions, 53 (28.04%) were late preterm. Out of total 411 SNCU admissions, late preterm neonates were 122 (29.68%).

Out of 168 inborn late preterm neonates, 152 (90.47%) were low birth weight, 84 (50%) were between 2000-2499 grams, 66 (39.28%) were between 1500-1999 grams, while only 2 (1.19%) of late preterm were very low birth weight. 153 (91%) of late preterm were AGA, 13 (7.73%) were SGA, while only 2 (1.19%) were LGA. Need for SNCU admission was less in AGA late preterm compared to SGA late preterm (57 of 153 (37.2%) versus 12 of 13 (92.30%) (Table 2).

**Table 2: General characteristics of late preterm neonates (inborn and outborn).**

	Inborn Late Pt Total (168)	Inborn Late Pt SNCU (69)	Outborn Late Pt SNCU (53)
<b>Birth weight</b>			
>2500 gm	16	00	03
2000-2499	84(50%)	17	19
1500-1999	66 (39.28%)	50	24
1250-1499	02(1.19%)	02	05
1000-1249	00	00	02
<1000	00	00	00
AGA	153(91.07%)	57	39
SGA	13(7.73%)	12	14
LGA	02(1.19%)	00	00
Male	92	36	25
Female	76	33	28
Vaginal delivery	116	52	40
LSCS delivery	52	17	13

### Morbidities of late preterm neonates admitted in SNCU

Of 122 late preterm admitted in SNCU, 16.39% had birth asphyxia, 28.6% had sepsis, 7.37% had RDS, and 32.78% had hyperbilirubinemia. Other common morbidities were TTN (16.39%), apnea (4.92%), hypoglycemia (8.19%), ARF (9.01%). Major malformations were there in 11.47% cases and PDA in 7.37%.

Morbidities were relatively higher in out born late preterm neonates. 27 (22.13%) of SNCU admitted late preterm neonates required respiratory support. Need for respiratory support was higher for out born late preterm neonates (Table 3).

**Table 3: Morbidities of late preterm neonates admitted in SNCU.**

	Inborn late Pt SNCU (69)	Outborn late Pt SNCU (53)	Late Pt SNCU (122)
Birth Asphyxia	10 (14.49%)	10 (18.86%)	20 (16.39%)
Mod- Sev HIE	02	05 (9.43%)	07 (5.73%)
Sepsis	08 (11.59%)	27 (50.94%)	35 (28.6%)
RDS	03 ((4.34%)	06 (11.32%)	09 (7.37%)
MAS	00	03 (5.66%)	03 (2.45%)
PPHN	00	01 (1.88%)	01 (0.82%)
TTN	17 (24.63%)	03 (5.66%)	20 (16.39%)
Apnea	02 (2.89%)	04 (7.54%)	06 (4.92%)
NEC	01 (1.44%)	00	01 (0.82%)
Hyperbilirubinemia	23 (33.3%)	17 (32.07%)	40 (32.78%)
Polycythemia	00	02 (3.77%)	02 (1.64%)
Hypoglycemia	03 (4.34%)	07 (13.2%)	10 (8.19%)
Thrombocytopenia	01 (1.44%)	00	01 (0.82%)
DIC	01 (1.44%)	01 (1.88%)	02 (1.64%)
Coagulopathy	01 (1.44%)	03 (5.66%)	04 (3.27%)
Hyponatremia	00	02 (3.77%)	02 (1.64%)
Hypernatremia	01 (1.44%)	02 (3.77%)	03 (2.45%)
Hypocalcemia	00	01 (1.88%)	01 (0.82%)
ARF	01 (1.44%)	10 (18.86%)	11 (9.01%)
Prerenal failure	01 (1.44%)	01 (1.88%)	02 (1.64%)
Major malformations	04 (5.79%)	10 (18.86%)	14 (11.47%)
PDA	03 (4.34%)	06 (11.32%)	09 (7.37%)
Need for CPAP/Venti	10 (14.4%)	17 (32.07)	27 (22.13%)

### Outcome of late preterm neonates

Of 122 admitted late preterm neonates, 9.01% had poor outcome. Outcome was poorer in out born late preterm neonates compared to inborn late preterm (16.98% vs 2.89%) (Table 4).

**Table 4: Outcome of late preterm neonates.**

	Inborn late preterm SNCU (69)	Outborn late preterm SNCU (53)	Total late preterm SNCU (122)
Discharged	65	42	107
Death	01	03	04
DAMA	03	08	11
DAMA-NS	01	06	07
Death + DAMA – NS	02 (2.89%)	09 (16.98%)	11 (9.01%)
Transferred	00	00	00

### Comparison of morbidities of late preterm neonates with full term and moderate preterm neonates

Need for SNCU admission is significantly higher in late preterm compared to full term (41.07% vs 2.04%). Many of the morbidities were higher in late preterm neonates

compared to full term neonates. Difference was more significant in risk of sepsis (4.76% vs 1.07%), TTN (10.11% vs 2.04%), hyperbilirubinemia (19.04% vs 9.36%), RDS (1.78% vs 0.09%), and risk of major congenital malformation (2.38% vs 0.58%). Need for respiratory support was 5.95% in late preterm vs 2.04% in full term neonates.

Morbidities were significantly higher in moderate preterm neonates compared to late preterm neonates; RDS (34.7% vs 1.78%), sepsis (30.4% vs 4.76%), apnea (17.39% vs 1.19%), hyperbilirubinemia (26.08% vs 19.04%), NEC (8.69% vs 0.59%), hypoglycemia (8.69% vs 1.78%) and PDA (17.39% vs 1.78%). Need for respiratory support was significantly higher in moderate preterm compared to late preterm (47.8% versus 5.95%) (Table 5).

### Comparison of outcome of late preterm neonates with full term and moderate preterm neonates

Death cases and DAMA cases which are non-salvageable are together counted to consider poor outcome. Overall outcome was slightly poor in late preterm neonates compared to full term neonates (1.19% vs 0.78%).

Immediate outcome was significantly poor in moderate preterm neonates compared to late preterm neonates (13.04% vs 1.19%) (Table 6).

## DISCUSSION

This study group included 1236 live born neonates delivered at Dhiraj hospital during the year 2015. 1025 (82.9%) were full term, 208 (16.8%) were preterm and 3

(0.24) were post term. Out of 208 preterm neonates, 168 (80.7%) were late preterm, 23 (11.05%) moderate preterm, 16 (7.69%) very preterm and 1 (0.48%) extreme preterm. The incidence of late preterm neonates in our study was 136 per 1000 live births.

**Table 5: Comparison of morbidities of late preterm neonates with full term and moderate preterm neonates.**

	Inborn late preterm (168)	Inborn full term (1025)	Inborn moderate preterm (23)
Total	168	1025	23
SNCU admission	69 (41.07%)	106 (2.04%)	23 (100%)
Birth Asphyxia	10 (5.95%)	42 (4.09%)	00
Mod – Sev HIE	02 (1.19%)	13 (1.26%)	00
Sepsis	08 (4.76%)	11 (1.07%)	07 (30.4%)
RDS	03 (1.78%)	01 (0.09%)	08 (34.7%)
MSAF	17 (10.12%)	146 (14.24%)	01 (4.34%)
MAS	00	12 (1.17%)	00
PPHN	00	04 (0.39%)	00
TTN	17 (10.11%)	21 (2.04%)	01 (4.34%)
Apnea	02 (1.19%)	00	04 (17.39%)
NEC	01 (0.59%)	00	02 (8.69%)
Hyperbilirubinemia	32 (23+9) (19.04%)	96 (41+55) (9.36%)	06 (26.08%)
Polycythemia	00	01 (0.09%)	01 (4.34%)
Hypoglycemia	03 (1.78%)	03 (0.29%)	02 (8.69%)
Thrombocytopenia	01 (0.59%)	01 (0.09%)	00
DIC	01 (0.59%)	01 (0.09%)	01 (4.34%)
Coagulopathy	01 (0.59%)	00	00
Hyponatremia	00	01 (0.09%)	00
Hypernatremia	01 (0.59%)	00	00
Hypocalcemia	00	00	00
ARF	01 (0.59%)	03 (0.29%)	00
Prerenal failure	01 (0.59%)	00	00
Major malformations	04 (2.38%)	06 (0.58%)	00
PDA	03 (1.78%)	06 (0.58%)	04 (17.39%)
Need for respiratory support (CPAP/Ventilator)	10 (5.95%)	21 (2.04%)	11 (47.8%)

Common morbidities identified in SNCU admitted inborn late preterm neonates in decreasing frequency were hyperbilirubinemia (33.3%), transient tachypnea of newborn (24.63%), birth asphyxia (14.49%), sepsis (11.59%), RDS (4.34%), hypoglycemia (4.34%) and apnea (2.89%). Major malformations were found in 5.79% and PDA in 4.34%. Morbidities were relatively higher in out born late preterm neonates.

Comparing morbidities of inborn late preterm neonates with full term neonates, it was found that the need for SNCU admission is significantly higher in late preterm compared to full term (41.07% vs 2.04%). Morbidities were manifold higher in late preterm neonates compared to full term neonates.

**Table 6: Comparison of outcome of late preterm neonates with full term and moderate preterm neonates.**

	Inborn Late Preterm (168)	Inborn Full Term (1025)	Inborn Moderate Preterm (23)
Discharged	65	95	20
Death	01	01	02
DAMA	03	08	01
DAMA – NS	01	07	01
Death + DAMA – NS	02 (1.19%)	08 (0.78%)	03 (13.04%)
Transferred	00	02	00

Difference was more significant in risk of sepsis (4.76% versus 1.07%), TTN (10.11% versus 2.04%), hyperbilirubinemia (19.04% versus 9.36%), RDS (1.78% versus 0.09%), hypoglycemia (1.78% versus 0.29%), PDA (1.78% versus 0.58%) and risk of major congenital malformation (2.38% versus 0.58%). Need for respiratory support was 5.95% in late preterm vs 2.04% in full term neonates. Similar to our findings, in a retrospective study by Wang et al., 77.8% near term infants compared to 45.3% of term infants had at least one clinical problem and nearly all clinical outcomes differed significantly between near term and full term neonates.<sup>4</sup> Melamed et al., also found that compared with full term infants, spontaneous late preterm delivery was independently associated with an increased risk of neonatal mortality, including RDS, sepsis, intraventricular hemorrhage, hypoglycemia, and jaundice requiring phototherapy.<sup>5</sup> Srinivasmurki et al., found overall morbidities significantly higher in late preterm neonates (70.8%) as compared to term neonates (29.1%) ( $p < 0.001$ , adjusted OR: 5.5, 95% CI 4.2-5.1).<sup>6</sup> Araujo BF, Zatti H et al., found that the late preterm were statistically more likely to subject to hypoglycemia as compared to term neonates.<sup>7</sup> Hendricks-Munoz KD et al., found a RDS in 9%, 4%, 3% in 34 week, 35 week, 36 week as compared to 0.7%, 0.2% and 0% in 37 week, 38 to 39 week, and 40 week gestational age neonates ( $p < 0.001$ ).<sup>8</sup> Gilbert et al., found that 3.4% late preterm neonates as compared to 0.9% term neonates needed mechanical ventilation.<sup>9</sup> We have counted both death cases and DAMA (non-salvageable) cases together to consider poor outcome. Overall immediate outcome was poor in late preterm neonates compared to full term neonates (1.19% versus 0.78%). In a study Luis et al., a higher mortality in late preterm versus term was observed, with an adjusted odds ratio (OR) of 5.29 ( $p < 0.0001$ ).<sup>10</sup> In a study by Ghulam Nabi Rather et al., risk of late preterm death was 25 per 1000 live births compared to 11 per 1000 live births in full term neonates.<sup>11</sup> We also analyzed moderate preterm group. In our analysis, it was found that morbidities were significantly too manifold higher in moderate preterm neonates compared to late preterm neonates; RDS (34.7% versus 1.78%), sepsis (30.4% versus 4.76%), apnea (17.39% vs 1.19%), hyperbilirubinemia (26.08% versus 19.04%), NEC (8.69% versus 0.59%), hypoglycemia (8.69% versus 1.78%) and PDA (17.39% versus 1.78%). Need for respiratory support was significantly higher in moderate preterm compared to late preterm (47.8% versus 5.95%). Immediate outcome was significantly poor in moderate preterm neonates compared to late preterm neonates (13.04% versus 1.19%). Significantly high morbidities and mortalities of moderate preterm neonates are well known. The problems of late preterm deliveries are ignored a lot.

## CONCLUSION

Late preterm neonates have quite higher risk of morbidity and mortality compared with full term neonates. Greater

attention and care is required for care of this ignored at risk neonates. It is important to make judicious decision while considering late preterm delivery.

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