

# Morbidity and Mortality Patterns of Late Pre-terms and Their Short-term Neonatal Outcome from a Tertiary Care Hospital Puducherry

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## Abstract

**Background:** Late pre-term is defined as those babies born between 34 and 36 weeks and 6 days. This group of pre-terms is commonly associated with various complications soon after birth.

**Objectives:** To analyze the short-term neonatal morbidities associated with these late pre-terms and to look into the maternal risk factors involved.

**Materials and Methods:** This hospital-based prospective study was conducted at Sri Manakula Vinayagar Medical College and Hospital, Puducherry. All live late pre-term infants (34 0/7-36 6/7) born between June 2012 and July 2015 were enrolled in the study. Detailed history of the maternal complications during pregnancy, parity, mode of delivery, sex, gestational age, birth weight, and neonatal complications were all entered in the pre-designed proforma. The outcome of the babies was accessed by their morbidities, mortality, duration of hospital stay, and readmission following discharge. Descriptive statistics was used in the study.

**Results:** A total of 112 late pre-term were included in the study group. The male to female ratio was 1.54:1. The major proportion (71.4%) of these neonates was small for gestational age. Premature rupture of membranes, pregnancy-induced hypertension, anemia, and oligohydramnios are significant maternal risk factors identified. Respiratory distress was the major morbidity noted followed by sepsis, hyperbilirubinemia, and feeding difficulties. The duration of stay in the hospital was more than 7 days in the majority of them, but the rate of readmission was relatively less in our study. Three late pre-terms died during the study period.

**Conclusion:** The majority of the late pre-terms requires medical interventions in the neonatal intensive care setup and, therefore, has to be closely monitored and preferably planned for a safe discharge.

**Key words:** Hypoglycemia, Jaundice, Length of stay, Premature birth, Sepsis

## INTRODUCTION

Late pre-term babies (LPTB) are those delivered between 34 (0/7) and 36 (6/7) weeks of gestation.<sup>1</sup> 70% of all pre-term deliveries constitute these late pre-terms.<sup>2</sup> They are physiologically immature and metabolically

unstable and hence are at great risk of various medical complications after birth.<sup>3</sup> The common problems encountered by these infants include a higher rate of respiratory morbidities,<sup>4,6</sup> metabolic complications such as hypoglycemia, hypothermia, hyperbilirubinemia<sup>7,8</sup> feeding difficulties, increased risk of sepsis, and intraventricular hemorrhage.<sup>9,10</sup> Hence, there is an absolute increase in the number of these pre-terms admitted to the NICUs World Wide.

Understanding the morbidities of these infants helps the treating newborn healthcare providers to anticipate them, to treat accordingly to reduce their mortality.<sup>11</sup> Very few

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studies<sup>4,12-14</sup> have been conducted in the past to assess the morbidity and mortality in this group. Hence, the present study was undertaken to address to the short-term morbidities of these LPTB and their neonatal outcome.

## MATERIALS AND METHODS

This hospital-based prospective study was conducted at Sri Manakula Vinayagar Medical College and Hospital, Puducherry. All live late pre-term infants (34 0/7-36 6/7 weeks) admitted to our hospital between June 2012 and July 2015 were enrolled in the study. Those pre-term infants who had major congenital anomalies or suspected chromosomal disorder were excluded. Parental consent was taken, and the study was approved by Institutional Ethical Committee.

The following maternal details like age of mother, parity, complications during pregnancy, mode of delivery, if lower segment cesarean section (LSCS) the indications were noted. The infant details include gestational age, sex and birth weight, and the morbidities observed were noted. The gestational age of the child were assessed from last menstrual period date, 1<sup>st</sup> trimester ultrasonography (USG) if available and by modified Ballard score. The interventions done for the needed pre-terms such as continuous positive airway pressure (CPAP)/ventilation, surfactant therapy, and inotropic support, were also entered in the predesigned proforma. The following criteria were used for assessing the various morbidities observed.

### Birth Asphyxia

Complete cessation of breathing, inadequate, or gasping for breath with Apgar<4 at 1 min. The requirement of post resuscitation is assessed as per NRP 2010 guidelines.

### Hypoglycemia

Blood sugars of <40 mg/dl in capillary or venous blood sample. The blood sugars were monitored 8-12 h in sick late pre-term, intra uterine growth restriction (IUGR), infant of diabetic mother and large for gestation, birth weight >2SD) infants. Random blood sugar estimation done if clinically indicated.

### Hypothermia

New born core body temperature <36°C.

### Jaundice

Clinically, visible jaundice requiring phototherapy/exchange transfusion as per hour specific total serum bilirubin normogram by American Academy of Pediatrics chart. Bilirubin estimation done as per clinical requirement.

### Hyaline Membrane Disease (HMD)

Presence of tachypnea respiratory rate >60/min, Nasal flaring, grunting, or retraction of chest wall with need of O<sub>2</sub> for more than 2 h after birth and or CPAP/ventilation. Supportive radiological findings were also considered.

### Transient Tachypnea of Newborn (TTN)

The clinical and radiographic features noted during the 1<sup>st</sup> h of life, which shows complete resolution by 24-48 h.

### Apnea of Prematurity

Respiratory pause for more than 20 s or accompanied by bradycardia (heart rate <100 beats/min) or cyanosis.

### Pneumonia

As diagnosed by clinical examination and supported by X-ray chest findings.

### Hypocalcemia

Blood total serum calcium concentration of <7mg/dl.

### Sepsis

#### Probable sepsis

Positive septic screen (two of the five parameters namely, total leukocyte count <5000/mm<sup>3</sup> or 15,000/mm<sup>3</sup>, band to total neutrophil ratio of >0.2 absolute neutrophil count <1800/mm<sup>3</sup> or >7200/mm<sup>3</sup>, C reactive protein >0.5 mg/dl, platelets <1 lakh/mm<sup>3</sup>).

#### Proven sepsis

Isolation of pathogens from blood or cerebrospinal fluid (CSF) or urine.

### Intraventricular Hemorrhage

Hemorrhage identified by serial cranial USG.

### Feeding Difficulties

Delay in initiation and maintenance of adequate oral milk intake was considered as feeding difficulties in the absence of sepsis and respiratory distress.

The hospital outcome was assessed in the form of various morbidities, mortality, duration of hospital stay, and readmission following discharge. All the data were entered into a predesigned proforma and analyzed using Epi info version 3.5.4. Descriptive statistics was used in the study.

## RESULTS

Out of 120 cases, admitted during the study period, 112 met the inclusion criteria, among which 68 (60.7%) were male, and 44 (39.3%) were female. Male to female ratio was 1.54:1.95 cases (84.8%) were inborn babies, and 17 (15%) were outborn. Among 112 late pre-terms, 52 (46.4%) had

gestational age between 34 (0/7) and 34 (6/7) weeks, while 32 babies (28.5%) had gestational age between 35 (0/7) and 35 (6/7) weeks and 28 (25%) babies had gestational age between 36 (0/7) and 36 (6/7) weeks. Table 1 depicts the distribution of babies in different gestational age groups. In 28 (25.1%) neonates, the weight was appropriate for gestational age while the majority of them 80 (71.4%) were small for gestational age (SGA). On analyzing the birth weight 92 babies (82%) were born with the birth weight between 1.5 and 2.49 kg, 14 (12.5%) late pre-terms had birth weight above 2.5 kg while 6 (5.3%) neonates had birth weight below 1.5 kg.

46 (41%) babies were born to a primigravida, 38 (34%) babies were born to the second gravida mother and the remaining 28 (25%) babies were born to gravida 3 and above. The number of babies born vaginally was 48 (42.8%) while 63 (56.2) babies were delivered by LSCS and one baby was delivered via forceps extraction.

Maternal risk factors were present in 86 late pre-terms which constitute about 76% of cases. No maternal risk factors were identifiable in 13 (11.6%) of cases. Fetal factors like previous pre-term delivery and IUGR were noted in 11.5% of the cases. Among maternal risk factors pre-term premature rupture of membrane (PPROM) and pregnancy induced hypertension (PIH) has major contributed to 19.7% and 18.6% of cases, respectively. Oligohydramnios and anemia in the mother are the other significant risk factors identified. Maternal conditions such as antepartum hemorrhage, gestational diabetes, and eclampsia were noted in 4.6%, 5.8%, and 3.4% of cases, respectively. Table 2 elaborates the various maternal risk factors identified in our study group.

Among the 112 late pre-term 93 (83%) required NICU admission for some interventions, while 19 (17%) did not require NICU stay. Respiratory distress (51.7%) and sepsis (50%) constitute the major neonatal morbidities. Among the respiratory morbidities, 24 (41.3%) neonates had respiratory distress secondary to TTN. HMD and pneumonia were identified as important case of respiratory distress in 20.6% of cases each. Apnea of prematurity was noted in 10 (17.2%) of cases. Congenital heart disease was identified in 5 (4.5%) neonates 4 had acyanotic and one had cyanotic heart disease. 52 (46.4%) neonates had probable sepsis while 4 neonates had culture proven sepsis of which 2 had *Klebsiella* isolated from blood, 1 had Group B streptococcus sepsis, and the other one had *Escherichia coli* isolated from CSF culture. Among the metabolic problems, neonatal hyperbilirubinemia, hypoglycemia, hypocalcemia was noted in 40.1%, 17.8%, and 4.5% of the cases, respectively. Table 3 illustrates the various morbidities observed in our late pre-terms of the

**Table 1: Distribution of late pre-terms in different gestational age groups**

Gestational age weeks (days)	Number of late pre-terms (n=112)	Percentage
34-34 (6/7)	52	46.4
35-35 (6/7)	32	28.5
36-36 (6/7)	28	25

**Table 2: The various maternal risk factors associated with late pre-term births**

Maternal risk factors	Number of late pre-terms (n=86)	Percentage
PPROM	17	19.7
Pre-term LSCS	9	10.4
Anemia	12	13.9
PIH	16	18.6
Multiple births	3	3.4
APH	4	4.6
Gestational diabetes	5	5.8
BOH	4	4.6
Oligohydramnios	11	12.7
MSAF	2	2.3
Eclampsia	3	3.4

PPROM: Pre-term premature rupture of membranes, LSCS: Lower segment cesarean section, PIH: Pregnancy induced hypertension, BOH: Bad obstetric history, APH: Antepartum hemorrhage, MSAF: Meconium stained amniotic fluid

**Table 3: Distribution of various morbidities observed in late pre-terms**

Morbidities	Number of late pre-terms (n=112)	Percentage
Respiratory distress	58	51.7
Cardiovascular problems	5	4.5
Sepsis	56	50
Jaundice	45	40
Hypothermia	18	16
Hypoglycemia	20	17.8
Hypocalcemia	5	4.5
Feeding difficulties	34	30.3
IVH	1	0.9
Birth asphyxia	10	8.9
Anemia of prematurity	4	3.5
NNEC	5	4.4

IVH: Intraventricular hemorrhage, NNEC: Neonatal necrotizing enterocolitis

112 neonates 60 late pre-terms required oxygen which contributes to 53.5%. Mechanical ventilation was required in 4 babies, 3 for HMD, and the remaining one neonate was ventilated for severe sepsis. Non-invasive positive pressure ventilation was required in 16 (14.2%) late pre-terms. 45 (40.1%) neonates required phototherapy while 12 (10.7%) of them required inotropic support. Table 4 highlights the various interventions done for late pre-term.

Regarding the stay in the hospital 13 (11.6%) neonates required <3 days, 56 (50%) neonates required 4-7 days,

**Table 4: Various interventions required for late pre-term babies**

Interventions	Number of late pre-terms (n=112)	Percentage
Oxygen	60	53.5
NIPPV	16	14.2
Mechanical ventilation	4	3.5
Inotropic support	12	10.7
Surfactant	3	2.6
Phototherapy	45	40

NIPPV: Non-invasive positive pressure ventilation

and 39 (34.8%) neonates required 7-14 days of hospital stay, 4 required more than 14 days of stay in the hospital. Among 112 neonates, 109 were discharged after successful treatment while 3 late pre-term expired. Among the discharged neonates 4 had readmission to the hospital 2 for feeding difficulties, one for probable sepsis and one for jaundice which accounts for 3.5%.

## DISCUSSION

A total of 112 LPTB enrolled during the study period 60.7% were males and females constituted 39.3% which was similar to the observation made by other studies.<sup>11,15,16</sup> The majority of our late pre-terms were (71.4%) SGA which is in contrast to the other studies<sup>16,17</sup> where the population of SGA were much lower, the increase is probably due to higher incidence of maternal complications like PIH and Anemia detected in our study.

Maternal risk factors for pre-term delivery was noted in 86 (76%) of the babies in whom the major risk factors identified were PPRM, PIH, anemia, and oligohydramnios in the decreasing order. PPRM was also identified as an important maternal risk factor in other studies.<sup>16,17</sup> The percentage of babies born by LSCS was 56.2% which was high compared to other studies.<sup>15,16</sup>

On analyzing the various morbidities, respiratory distress was seen in 51.7% of late pre-term which was relatively high compared to other studies<sup>11,16,18</sup> probably due to increased incidence of TTN (41.3%) in our study secondary to the high rate of LSCS. The other respiratory morbidities include hyaline membrane disease and pneumonia in 20% of the babies each.

Late pre-term infants were more susceptible to develop sepsis compared to term infants.<sup>19</sup> In the present study, sepsis was identified as the second commonest morbidity (50%) which was significantly high compared to other studies.<sup>5,16</sup> In our study, the incidence of neonatal hyperbilirubinemia is 40% which is similar to the

observations made by the other studies;<sup>13,18</sup> however, Jaiswal *et al.*<sup>11</sup> reported much higher occurrence of jaundice in his study. The other metabolic problems noticed include hypoglycemia in 17% of late pre-terms similar observations was made by Leone *et al.*,<sup>18</sup> but in other studies<sup>5,11,16</sup> the incidence of hypoglycemia was much lower. The incidence of various other morbidities, such as hypothermia, feeding difficulties, and birth asphyxia, was comparable to the study done by Ezhilvannan *et al.*<sup>16</sup> but the incidence of intraventricular hemorrhage and neonatal necrotizing enterocolitis was much lower in our study.

Overall 83% of late pre-terms had at least one neonatal morbidity requiring medical interventions and NICU care which was slightly high compared to other studies.<sup>11,17,18</sup> In our present study, more than 43 (39%) neonates required hospital stay for more than 7 days which was similar to the study done by Ezhilvannan *et al.*<sup>16</sup> 4 neonates were readmitted in our study which is less when compared to other studies<sup>11,16</sup> probably because of our strict policy to maintain a safe discharge of these late pre-terms. Three deaths were noticed in our study period which accounts for 2.6% comparable to other studies.<sup>14,16</sup> Two died due to severe sepsis and one due to intraventricular hemorrhage.

The limitation of the study was first the small sample size and it secondly it highlights only on the short-term neonatal morbidities, so further studies are required to know the impact of these morbidities and the long-term neurodevelopmental outcome.

## CONCLUSION

PPROM and PIH are the most common maternal risk factors identified. Respiratory distress, sepsis, and neonatal hyperbilirubinemia are the significant morbidity noted in our study. The majority of the late pre-term required some medical intervention and NICU stay hence all these venerable group should be closely monitored and preferably planned for a safe discharge. Therefore every effort should be made to extend the pregnancy if there is no undue risk to the mother and the fetus, and urgent steps are required to prevent iatrogenic late pre-term births.

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