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# The short-term outcome of late preterm new-borns, an observational study

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**Abstract**
**Background:** Preterm birth complications are the predominant causes of the Under 5- mortality rate, causing nearly 1 million deaths in 2015. Late preterm neonates contribute to 71% of all preterm births.
**Aim:** To study the short-term outcome of late preterm newborns in the early neonatal period.
**Methods and Material**: A single-centre prospective observational study of 50 late preterm babies born in the gestational period of 34-(0/7) to 36-(6/7) weeks at the Aditya Birla Memorial Hospital, whose gestational age, confirmed by New Ballard Score were enrolled during the study period of November 2015- June 2017 (20 months) after meeting inclusion criteria.
**Results**: The average gestational age and weight of the late preterm babies in the study group were 35 weeks 2 days (SD=0.78) and 2535.4 gm (SD = 335.67) respectively. 48% of all late preterm new-borns in this study had a gestational age of 36 weeks 0/6 to 36 weeks 6/7 indicating pregnancies in these number of mothers continuing closer to the term gestation and 34% of the late preterm were small for gestational age, thus making them susceptible for early morbidities. Late preterm babies are vulnerable to the complications of prematurity. They are at risk for early complications such as respiratory difficulty, neonatal jaundice, hypothermia, feeding difficulties, hypoglycaemia, and sepsis, etc.
**Conclusions:** Late preterm babies are at risk for increased early neonatal morbidities such as respiratory distress, neonatal jaundice, hypothermia, feeding difficulties, hypoglycemia, and neonatal sepsis. Many maternal and neonatal risk factors like pregnancy-induced hypertension and IUGR are associated with late preterm births. Mortality was more in late preterm babies.

**Keywords:** late preterm baby, early neonatal morbidity and mortality, outcome

## Introduction
Late preterm births refer to all deliveries of 34-0/7 to 36-6/7 weeks. Every year, approximately 15 million neonates are born preterm (before completed 37 weeks of gestation), and the same number in increasing trend now.
Preterm birth complications are the predominant causes of the Under 5- mortality rate, causing nearly 1 million deaths in 2015 [1]. 75% of these deaths could be prevented with cost-effective measures. The preterm birth rate varies from 5% to 18% of all the new-borns delivery in 184 countries. Late preterm infants account for 71% of all the preterm births. Currently, there are fewer data available measuring the incidence of late preterm in India [2, 3]. There is an increasing neonate born of gestations of 34 0/7 to 36 6/7 weeks due to numerous maternal and neonatal reasons. Late preterm neonates born between 34 0/7 to 36 6/7 weeks of gestation are physiologically not matured and have less counter-regulatory mechanisms to the outside environment as compared with term babies.

## 2. Subjects and Methods
The prospective observational study was undertaken in the tertiary care Neonatal intensive care unit, Special care nursery unit of Aditya Birla Memorial Hospital to know the immediate outcome of late preterm newborns. All late preterm newborns (34-0/7 to 36-6/7 weeks) delivered at Aditya Birla Memorial Hospital, whose gestational age is confirmed by New Ballard Score. Such late preterm new-borns were enrolled throughout the study period of November 2015- June 2017 (20 months). The evaluation of the morbidity, mortality and the short-term outcome of late preterm newborns in the early neonatal period concerning their clinical profile with various antenatal, intranatal and postnatal factors influencing the immediate outcome was carried out.

### Aim
To study the short-term outcome of late preterm newborns in the early neonatal period.

### Objective
To study the morbidity and mortality in late preterm new-borns in the neonatal period.
To study the clinical profile of late preterm newborns
To study various antenatal, intranatal and postnatal factors influencing the immediate outcome in late preterm new borns.

### Inclusion criteria
All the new-borns delivered at Aditya Birla Memorial Hospital during the study period at a gestational age of 34-0/7 to 36-6/7weeks according to the New Ballard Score will be included in the study.

### Exclusion criteria
1. Gestational age less than 34 weeks and more than 37 weeks
2. New-borns delivered outside the hospital.
3. New-borns whose parents will Leave Against Medical Advice (LAMA) before the outcome is known.

4. Any baby who satisfied the inclusion criteria but whose parents did not give consent for enrolment in the study

**Flow Chart**

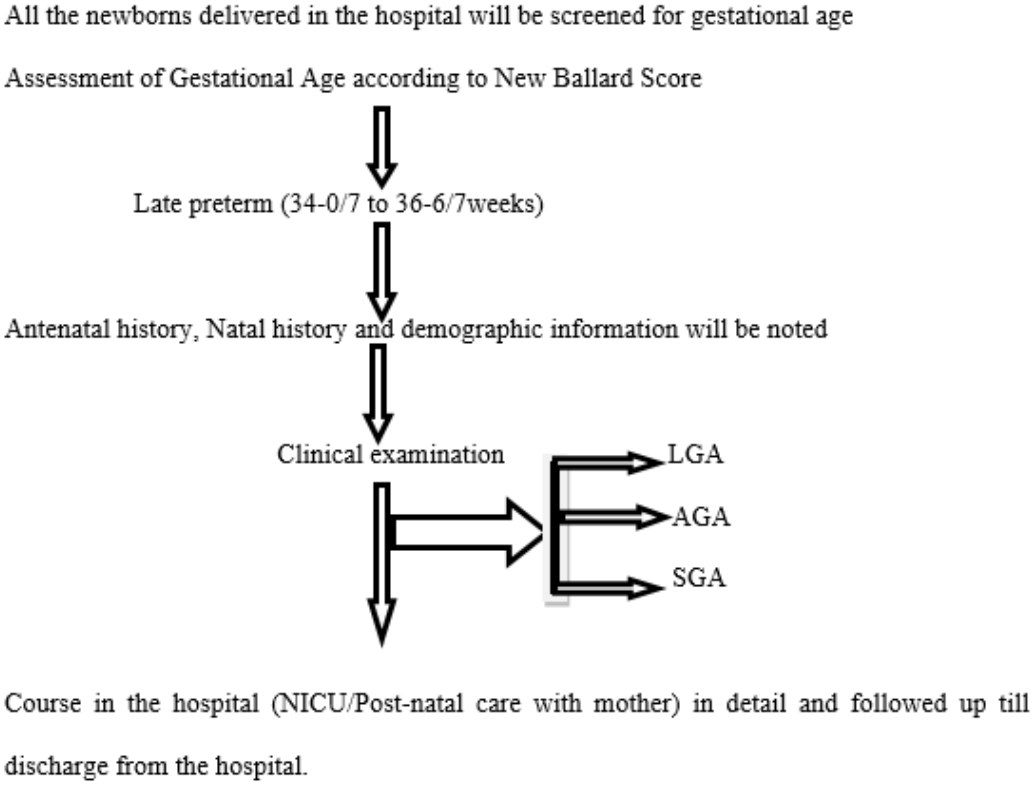


**Fig 1**

## 3. Results and Discussion

It was an observational (prospective) study in which a total of 50 late preterms were studied. In a study by Jain *et al* [4], 114 late preterm babies were included to study early morbidities in late preterms. The male to female ratio was almost equal in this study. Lubow *et al* [5] did a retrospective analysis of 149 late preterms to study their short-term outcomes. The sample size studied by them was the largest. Jaiswal *et al* [6] studied 363 late preterm babies for early morbidities. In their study 54.5 % were males and 45.5 % were females. Thus, the male to female ratio was 1.2: 1 in their study.

In our study, out of 50 late preterm babies, 68% (34 cases) were males and 32% (16 cases) were females. So, Male to female ratio of 2.1: 1. Our findings comparable to Melamed *et al* [7] study in which 55.9 % of the study group were males and 44.1 % were females.

Out of 50 late preterm babies, 48% (24) born at 36 weeks of gestation, 32% (16) were born at 35 weeks and 20% (10) babies were born at 34 weeks. This is comparable to the study done by Jain *et al* [4] where the incidence of late preterm births was 46.9% at 36 weeks, 29.8% at 34 weeks, and 23.6% at 35 weeks. In another similar study done by Lubow *et al* [5] found that gestational age-wise distribution of late preterms was 33.55% for both 36 and 35 weeks of gestation respectively and 32.88% for 34 weeks.

Classification of late preterms on the basis of weight for gestation Lubchencho showed that 34% of the babies were SGA, 56% of the babies were AGA and only10 % of the babies were LGA in our study. In the study by Jain *et al* [4], 11 % of babies were SGA. 81 % were AGA and 8 % were LGA. In the study by Jaiswal *et al* [6], 83.7 late preterm babies were in the AGA group. 10.2% of the babies were SGA and 6.1 % were LGA respectively.

In our study, out of 50 late preterm deliveries, 40 % were not associated with any maternal complications. 60% of the deliveries were associated with some maternal complications. Incidence of pregnancy-induced hypertension was 12% whereas, the Incidence of premature rupture of membranes (PROM) was 10% in this study. Medical complication like GDM, UTI, heart disease was found in very less of patients. The study by Lubow *et al* [5] showed spontaneous labor and premature rupture of membranes were the most frequent indications for the late preterm delivery. In the study by Mansoura *et al* [8], pre-eclampsia was responsible for 8% of the late preterm deliveries. Shapiro – Mendoza *et al* [9] found that pregnancy-induced hypertension and gestational diabetes mellitus were the most frequent maternal complications in late preterm followed by antepartum haemorrhage. In the study by Jain *et al* [4], preterm labor and PROM accounted for 46.9% cases while, maternal fetal factors such as – PIH, GDM, antepartum hemorrhage, multiple gestations, fetal distress, IUGR, abnormal doppler, and meconium-stained amniotic fluid accounted for 53.5% cases.

In our study, out of 50 totals, 80% (40 cases) of late preterms, cried immediately after birth and they just required routine care. Rest 20% (10 late preterm babies) who did not cry immediately after birth requiring resuscitation, 7 babies (14%) responded to bag and mask ventilation and 3 preterms (6%) required intermittent positive pressure ventilation with chest compression. In the study by Jain *et al* [4], 14% late preterm babies required some form of neonatal resuscitation. They found that the

initial steps of resuscitation were required in 4.3 % late preterm, Positive pressure ventilation at birth in 9.7 % and Intubation in 0.8% of the study group.

Incidence of early morbidities in the late preterms was 68%, whereas 32% (16 babies) had no medical problems in our study which is comparable to study by Jaiswal *et al* [6], 70.8% of late preterms presented one of the neonatal morbidities requiring inpatient hospital hospitalization. Another study by Tamashek, *et al* [10] reported that the late preterm babies required more in-hospital care and readmission rate by1.5 times and 1.8 times respectively as compared to term babies. Shapiro - Mendoza, *et al* [9] found that the newborn morbidity rate increased by 2 times every week prior to delivery before 37 weeks of gestation.

**Respiratory morbidities**

Out of all the morbidities associated with late preterm, the incidence of respiratory problems or distress was highest with 42%. Respiratory distress due to transient tachypnoea of the newborn (TTN) in 22 % of cases, respiratory distress syndrome (RDS) in 8% of cases, meconium aspiration syndrome (MAS) (6%), and birth asphyxia (6%), respectively. The respiratory issue was not significantly affected by the mode of delivery in our study. Respiratory support was needed in 20% of the new-borns in this study group. Jaiswal *et al* [6] study showed the incidence of respiratory morbidities in10.5% of the late preterm study group. In the study by Leone *et al* [11], the incidence of respiratory distress was 34.7% whereas another study by Celik *et al* [12] found the incidence of respiratory distress was 46.5% which yet is comparable to our study. In one more study by Lubow *et al* [5], 20% late preterm had respiratory complications. In the study by Jain *et al* [4], respiratory support in the form of oxygen by hood, ventilation, and surfactant administration was required in 29.8% of late preterm delivery. The most common etiology of neonatal respiratory distress was TTN (Transient tachypnea of newborn) followed by sepsis, meconium aspiration syndrome and others.

**Hypoglycemia**

4% of the late preterms had hypoglycemia in this study group. The incidence was almost the same between 34 to 36 weeks of gestation. Jain *et al* [4] reported a 30% incidence of hypoglycemia. The incidence of hypoglycemia was 8.8% in the study by Jaiswal *et al* [6]. Melamed *et al* [7] found that 6.8% of the late preterms had hypoglycemia with a higher incidence in the late preterms towards 34 weeks of gestation. In the study by Leone *et al* [11] 14.3 % of the late preterms were hypoglycaemic. In the study by Celik *et al* [13], a 4% incidence of hypoglycemia was noted. Late Preterm babies have more chance of hypoglycemia after birth because they have decreased enteral absorption of milk due to developing gut maturity, immature liver glycogenolysis capacity and poor adipose tissue lipolysis, deficient hepatic gluconeogenesis and ketogenesis and hormonal dysregulation.

**Hypothermia**

In the current study, the risk of hypothermia was 2% with higher than 35 weeks of gestation. The Incidence of hypothermia was 0.7% in the study by Melamed *et al* [7]. In their study, a higher incidence of hypothermia was found towards the 34 weeks of gestation. 2.5% of the late preterms had hypothermia in the study by Leone *et al* [11]. Late-preterm babies have relatively higher body surface area, increased heat loos via the skin, respiratory tract and less white adipose tissue for insulation, and they cannot generate heat from brown adipose tissue as effectively as infants born at term, thus making them prone to hypothermia.

**Hyperbilirubinemia**

The incidence of hyperbilirubinemia was 14% in our study. It was found that the incidence of hyperbilirubinemia was more towards 36 weeks of gestation. Out of the total 7 late preterms with hyperbilirubinemia, 5 responded to double surface phototherapy, 1 patient needed single surface phototherapy and another 1 patient underwent exchange transfusion. Jain *et al* [4], found that neonatal hyperbilirubinemia requiring treatment in the form of phototherapy was much higher in late preterm babies as compared to term babies (50.8 vs. 10.4%). In the study by Jaiswal *et al* [6], hyperbilirubinemia was the most common early morbidity in the late preterm group with an incidence of 55%. In the study on late preterms by Melamed *et al* [7], the incidence of neonatal hyperbilirubinemia was 18 % with higher incidence towards 34 weeks of gestation. The high incidence of significant neonatal jaundice in late preterms may be attributed to decreased hepatic UDP glucuronyl transferase enzyme activity and a poor post-natal maturity of hepatic bilirubin uptake. their inability to handle bilirubin load. In the present study, the incidence of neonatal jaundice was low as compared to most other studies. Our study showed an increased incidence of hyperbilirubinemia towards 36 weeks of gestation like most of the other studies. As compared to the term infants, bilirubin binding to albumin is less in late preterm infants. Late preterm infants have delayed follow up visits and sub-optimal milk intake.

**Sepsis**

The neonatal sepsis incidence was12% in our study. It was further classified into clinical and culture-proven sepsis. The incidence of neonatal sepsis was altered by weeks of gestational in late preterm but we have not compared with term babies. In the study conducted by Jain *et al* [4]. the incidence of sepsis was 9.6%. In the study by Jaiswal *et al* [6], the incidence of probable sepsis was 4.1% and that of confirmed sepsis was 1.1%. In the study by Melamed *et al* [7] incidence of probable sepsis was 19 % and that of confirming sepsis was 0.4. Current studies showed more culture sepsis, and have more sepsis-related neonatal mortality, and morbidity as compared to term babies.

**Outcome**

The mortality rate in our study was 2% with 1 death who was of 34 weeks of gestational age delivery however, 98% of late preterm babies were sent home with recovery. In a study by McIntire *et al* [13], late preterm mortality rates per 1,000 live births were 1.1, 1.5, and 0.5 at 34 weeks, 35 weeks and 36 weeks of gestation, respectively, compared with 0.2 at 39 weeks of gestation. Kalyoncu *et al* [14], found the incidence of mortality was 2.3% in late preterm delivery. The morbidity is significantly more in late preterm neonates than in term ones. The mortality in the first week of life, 2 to

3 weeks of life and infancy (4 weeks to 1 year) periods was 6, 3, and 2 times higher respectively in late preterm infants than in term babies in a study conducted by Shapiro – Mendoza *et al* [9]. The common causes of neonatal deaths are prematurity, congenital malformations, neonatal sepsis, atelectasis, maternal complications and sudden infant death syndrome (SIDS). SGA babies are more prone to increased neonatal mortality.

## 4. Tables and figures

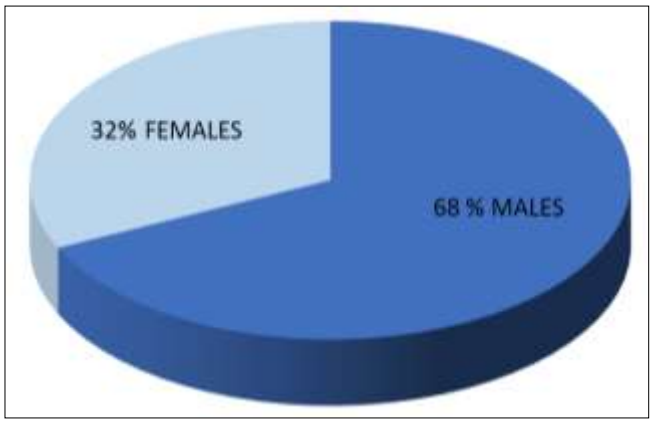


**Fig 1**: Classification of late preterm neonates based on sex

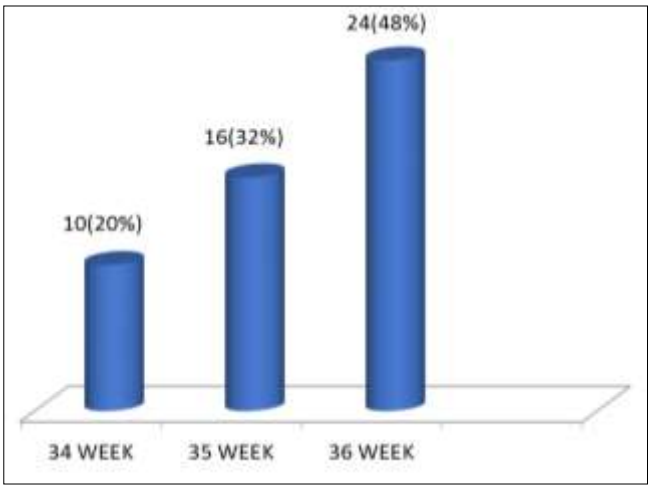


**Fig 2:** Classification of late pre term on the basis of Weeks of gestation

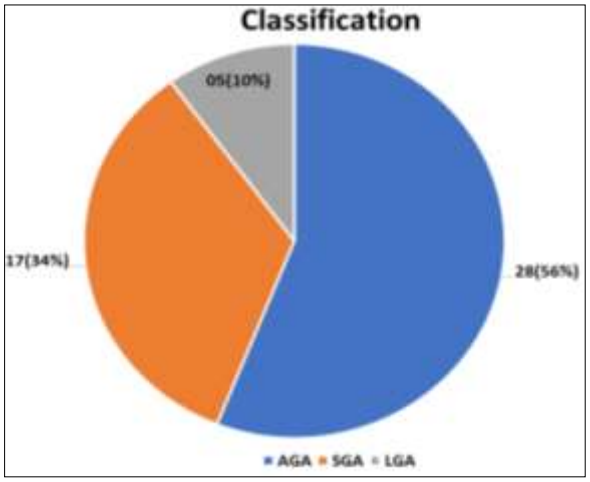


**Fig 3:** Classification of late preterms on the basis of Lubchenco charts.

**Table 1:** Maternal High-risk factors associated with late pre term delivery.

| Maternal history | Number | Percentage (%) |
|---|---|---|
| No high-risk factors | 20 | 40% |
| IUGR | 07 | 14% |
| Elampsia | 06 | 12% |
| PROM | 05 | 10% |
| GDM | 04 | 08% |
| Elderly | 03 | 06% |
| Multipara | 02 | 04% |
| Fever and Uti | 02 | 04% |
| Heart Disease | 01 | 02% |

**Table 2:** Outcome of Late pre term at birth

| Outcome at birth | Number | Percentage |
|---|---|---|
| BCIAB | 40 | 80% |
| BNCIAB | 10 | 20% |

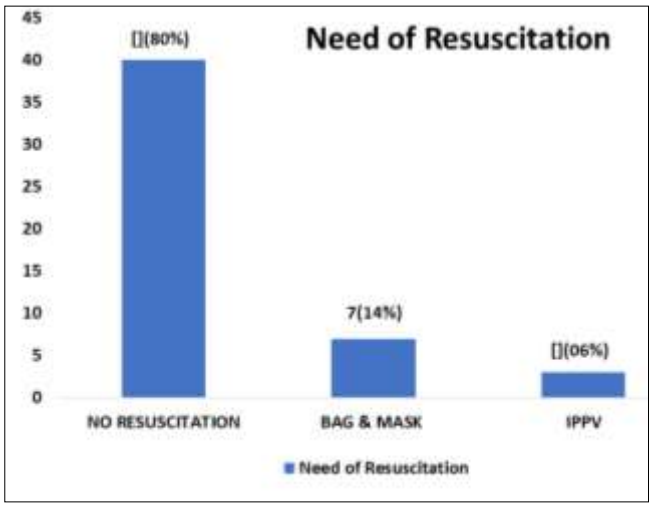


**Fig 4:** Need of resuscitation

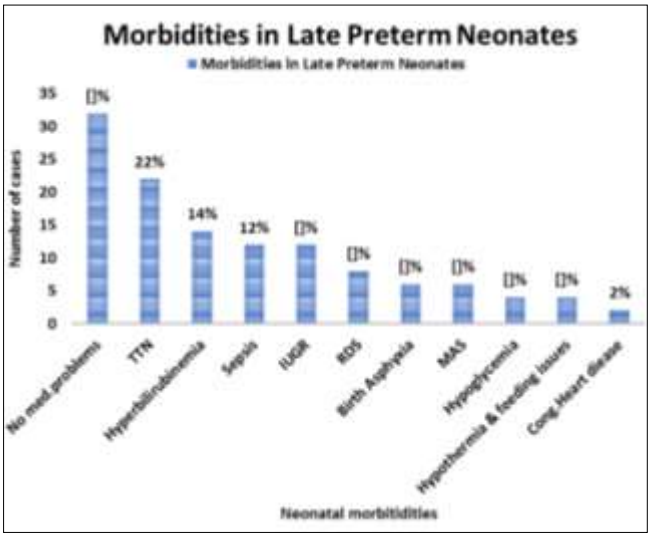


**Fig 5:** Early Morbidities in Late Preterm Neonates

**Table 3:** Relation between mode of delivery and respiratory morbidities in late preterm new-borns.

| Issues | LSCS | Normal Vaginal delivery |
|---|---|---|
| TTN | **07** | 04 |
| Birth Asphyxia | 01 | 02 |
| Meconium stained liquor | 02 | 01 |
| RDS | 01 | 03 |
| Total | 11 | 10 |

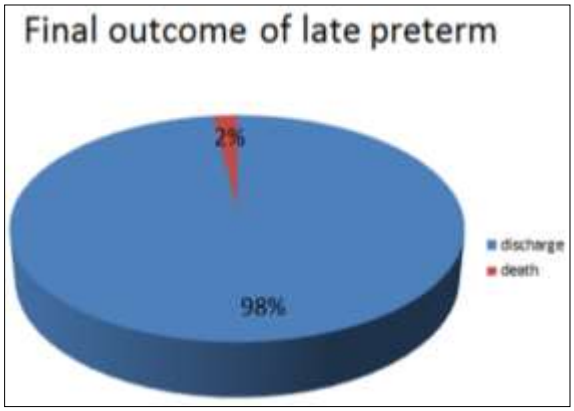


**Fig 6:** Final outcome of late preterm babies

## 5. Conclusions

- Late preterm babies are at risk for increased early neonatal morbidities such as respiratory distress, neonatal jaundice, hypothermia, feeding difficulties, hypoglycemia, and neonatal sepsis.
- Many maternal and neonatal risk factors like pregnancy-induced hypertension and IUGR are associated with late preterm births.
- Mortality was more in late preterm babies.

## 6. Key Messages

Late preterm babies are significantly having higher morbidity and neonatal mortality rate.

Approximately 70% of neonatal deaths can be avoided with cost-effective measures like regular follow up of high-risk pregnancies and mandatory institutional deliveries and careful antenatal check-up.

## 7. References

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