

Original Research Article

Comparison of determinants of morbidities of late preterms and terms

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ABSTRACT

Background: To compare the determinants of neonatal morbidity in late preterms and terms.

Methods: A total of 100 live late preterm (34-0/7 to 36-6/7 weeks) and 100 term infants (37-0/7 to 41-6/7 weeks) admitted in Sri Guru Ram Das Institute of Medical Sciences and Research were randomly selected to participate in this case control study. The study group include 100 neonates within gestation age of 34 0/7 to 36 6/7 weeks. Equal number of terms between 37 0/7 to 41-6/7 gestation age was taken for comparison. The maternal history including both antenatal and natal history as well as new-born profile was taken.

Results: Maternal risk factors have been found to be the major determinants of morbidity in late preterms with PROM ($p < 0.0001$), sepsis and hypertension being significant contributors. Respiratory distress, neonatal jaundice, sepsis has been found to be major morbidity factors in late preterms. The average duration of admission was higher in late preterms than terms.

Conclusions: Late preterm infants have higher risks for acute metabolic complications, mortality and long-term disabilities as compared to term infants. Morbidities like respiratory distress, neonatal jaundice, sepsis, hypoglycaemia and hypothermia are more in late preterms due to their immaturity. The risks associated with late preterm birth suggest the need for refinement of obstetric paradigms to extend pregnancy duration if benefits outweigh risk to fetus and mother. There is need to make obstetricians and families aware of complications pertaining to late preterm birth and improving surveillance of high-risk pregnancies.

Keywords: Determinants, Gestational age, Late preterms, Morbidity

INTRODUCTION

Neonatal period, in spite of its shortness, is considered as most critical phases of life. The first step in improving early neonatal survival is to document the number and rate of deaths and identify their common causes. The morbidity and mortality pattern in neonate varies depending upon their gestation age. As the late preterm neonates subgroup accounts for nearly 10% of all births, even a modest increase in any morbidity will have a huge impact on the over-all health care resources.¹ The interval between 32 and 36 gestational weeks has been subject to a variety of different terminologies, including “late

preterm,” “near term,” “marginally preterm,” “moderately preterm,” “minimally preterm,” and “mildly preterm”, terms which all can be found in the literature.²

The observed increase in number of preterm births is primarily the result of the inclusion of a group of borderline preterm neonates who have been classified as late-preterm neonates (LPTI) since 2005, when the definition of LPTI was established as those neonates born with gestational ages (GA) of 34 0/7 and 36 6/7 by National Institute of Child Health and Human Development (NICHD).³ Late preterm neonates have limited compensatory responses to the extra-uterine

environment, compared with term neonates. Although late preterm neonates are the largest subgroup of preterm neonates, there has been little research on this group till now. This is mainly because of labelling them as “near-term”, thus being looked upon as “almost mature” with little need to be concerned.^{1,4} There are multiple reasons given for increase in number of late preterms like higher number of induced deliveries, caesarean births and efforts to reduce still births. Other causes are low socio economic status, substantial amount of maternal stress during pregnancy, acute or chronic maternal illness (Hypertension, Diabetes mellitus, Hypothyroidism), multiple gestation births, obstetric factors and inadvertent early delivery.⁵ This projects large burden of late preterm neonates in low income countries like India. Therefore, prospective study was undertaken with an aim to compare the determinants of neonatal morbidity and mortality in late preterms and terms.

METHODS

A cross sectional analytical study was carried out after obtaining clearance from ethical committee of the institute. Informed consent from parents was taken in the language they understood.

A total of 100 live late preterm (34-0/7 to 36-6/7 weeks) and 100 term infants (37-0/7 to 41-6/7 weeks) admitted in sri guru ram das institute of medical sciences and research were randomly selected to participate in this case control study. The study group include 100 neonate within gestation age of 34 0/7 to 36 6/7 weeks. Equal number of terms between 37 0/7 to 41-6/7 gestation age was taken for comparison.

The following data was collected

Maternal data

- Relevant antenatal history
- Complications related to pregnancy like pre-eclampsia, antepartum hemorrhages, premature rupture of membranes, Polyhydramnios, oligohydramnios etc.
- Medical and surgical illness like acute fever, acute pyelonephritis, diarrhea.
- Chronic diseases like hypertension, diabetes mellitus, nephritis, decompensated heart disease, Rheumatic Heart Disease, Collagen vascular disease, severe anaemia etc.
- Genital tract infection.

Natal history

- Onset of labour pains and duration of true labour pains.
- Time of rupture of membrane
- Mode of delivery (normal/ LSCS/ assisted)
- Indication for late preterm delivery

Newborn profile

The parameters like gestation (confirmed by New Ballard Criteria), sex, birth weight were noted. Babies were evaluated for cry, color (cyanosis and icterus). APGAR scoring and resuscitation along with date at birth were noted. All neonates included in the study were clinically examined daily till the time of discharge.

In case of NICU admission cause of admission, duration of stay and complications encountered were studied. On admission temperature instabilities, need for intravenous medication and mechanical ventilation was noted.

Following parameters were noted:

Hypoglycemia

According to Cornblath's description healthy full-term infant- <24 hours of age: 30-35 mg/dl blood sugar was acceptable at one time but threshold was raised to 45 mg/dl if it persisted after feeding or if it recurred in first 24 hours.

By definition, Plasma Glucose levels less than 45 mg/dl is considered hypoglycaemia. Blood glucose <40 mg/dl on using glucometer is considered hypoglycaemia.

Hypothermia

Axillary temperature <36.5 OC in term infants and <37.5 OC in late preterms was considered as low temperature. It was done with the help of digital thermometer kept in axilla for 5 minutes.

Neonatal jaundice

Clinically all neonates were screened for jaundice. Serum bilirubin levels according to gestation age and day of life were assessed for diagnosing Neonatal Jaundice.

Sepsis

Sepsis was suspected (where antibiotics are given for at least 2 days on the basis of clinical suspicion of signs and symptoms of baby) Clinical signs like lethargy, refusal to feed, hypothermia, hypoglycaemia, sclerema, bleeding were considered unless proved otherwise.

Probable sepsis on following sepsis markers

- CRP >1 mg/dl or 10 mg/l
- TLC <5000/cumm
- I/T ratio >0.2,
- ANC <1800/cumm

Abnormal mESR- Increase in micro ESR by 15 mm in first hour of life.

Definitive diagnosis of sepsis by blood culture positive sepsis.

Inclusion criteria

- All neonates born between 34 0/7 and 36 6/7 weeks of gestation admitted in NICU.
- All neonates born at term after 37 0/7 weeks of gestation till 41 6/7 weeks admitted in NICU.

Exclusion criteria

- Neonates with major congenital malformations.
- Neonates with clinically identifiable chromosomal anomalies.
- Neonates whose gestation age is not confirmed by ultrasound.
- Neonates with neuromuscular disorders which prevented proper assessment by Expanded New Ballard score.
- Neonates less than 34 weeks gestation age.

Statistical methods

Results on Quantitative data were presented on Mean±SD (Min-Max) and results on categorical measurements were presented in Number (%). Pearson’s chi-square test was used to check association between qualitative variables. Independent T-test was used to compare mean of two groups. 95% confidence interval (CI) was used to represent the probability that unknown parameter lies in the stated interval. The statistical analysis was performed using Statistical Package for Social Science (SPSS) 16.0 software.

RESULTS

In the present study a total sample of 200 neonates were included which were divided into 2 groups namely: group 1 comprising of 100 cases of late preterms and group 2 comprising of 100 cases of terms. The results show that mode of delivery in 69% late preterms and 48% terms was by Caesarean section.

On the other hand, 31% percent of neonates in late preterm group and 52% of neonates in term group had history of normal delivery. (p<0.05 and 95% CI 7.3461% to 33.5896%). Mean gestational age in late preterm neonates is 35.35±0.71 weeks and in term neonates is 37.96±0.64weeks and this difference was statistically significant (Table 1).

It was observed that more number of maternal risk factors were responsible for late preterm birth. Among these, factors like premature rupture of membranes (PROM), sepsis, others (cord of loop around neck, oligohydramnios, early pains) were found in 37% (p<0.0001 and 95% CI of 26.1237% to 45.8141%), 39% (p<0.0001 and 95% CI of 16.2130% to 38.8859%) and 48% (p<0.0001 and 95% CI of 37.7721% to 57.6834%) late preterms.

It was followed by Pregnancy induced hypertension in 19% (p=0.023 and 95% CI of 1.4589% to 20.6024%) late preterms. Differences in the number of cases for the above factors was found to be statistically significant. Obstructed labour was found in 37% terms and 7% late preterms and difference was statistically significant (Table 2).

Table 1: Comparison of late preterms and terms.

Mode of delivery	Late preterms N=100	Terms N=100	p value	95% CI
Vaginal	31 (31%)	52 (52%)	p<0.05*	7.3461% to 33.5896%
Caesarean	69 (69%)	48(48%)		
Mean gestational age (in weeks)	35.35±0.71	37.96±0.64	p<0.0001	4.4794 to 4.7406

Table 2: Distribution and comparison of maternal risk factors associated with late preterm in the study population.

Maternal complications	Late preterms N=100	Terms N=100	p value	95% CI
Hypertension	19 (19%)	8 (8%)	0.023	1.4589% to 20.6024%
Premature rupture of membranes	37 (37%)	1 (1%)	p<0.0001	26.1237% to 45.8141%
Diabetes mellitus	8 (8%)	9 (9%)	p=0.543	7.1580% to 9.2070%
Obstructed labour	7 (7%)	37 (37%)	p<0.0001	18.8956% to 40.4101%
Sepsis	39 (39%)	11 (11%)	p<0.0001	16.2130% to 38.8859%
Others (cord loop, oligohydramnios, pains, abo incompatibility)	48 (48%)	0	p<0.0001	37.7721% to 57.6834%
Nil	0	2 (2%)	p=0.243	1.9733% to 7.0012%

p<0.05 statistically significant

Table 3: Comparison of factors of morbidity between late preterm and term neonates.

Type of morbidity	Late preterms N=100	Terms N=100	p value	95% CI
Neonatal jaundice	68	49	p<0.05*	22.3350% to 47.7816%
Sepsis	55	37	p<0.05*	4.1868% to 30.8778%
Respiratory distress	59	26	p<0.05*	13.5048% to 39.1546%
Temperature instability	28	12	p<0.05*	4.9179% to 26.7251%
Hypoglycaemia	26	9	p<0.05*	6.5164% to 27.2662%
Seizures	9	5	0.268	-3.4639% to 11.7663%
Meningitis	2	1	0.561	-3.6789% to 6.0685%

Table 4: Comparison of average duration of hospital stay of neonates in late preterm and term neonates.

Average duration of hospital stay	Late preterms N=100	Terms N=100	p value
≤7 days	42(42%)	64(64%)	p=0.01973
8-14 days	44(44%)	26(26%)	
15-21 days	10 (10%)	7(7%)	
≥21 days	4 (4%)	3(3%)	

Overall late preterm neonates were associated with higher morbidity factors in comparison to term neonates. In late preterms neonatal jaundice was observed in 68% cases in comparison with 49% cases in term Neonates and this difference was statistically significant (p<0.05 and 95% CI of 22.3350% to 47.7816%), sepsis was seen in 55% cases of Late preterms in comparison with 37% cases of term Neonates which was statistically significant (p<0.05; 95% CI of 4.1868% to 30.8778%). Respiratory distress was seen in 59% late preterms and 26% term neonates (p<0.05; 95% CI 13.5048% to 39.1546%) and temperature instability in 28% late preterms and 12% terms (p<0.05; 95% CI 4.9179% to 26.7251%) and this difference was statistically significant. Another factor which had statistically significant contribution was hypoglycaemia as seen in 26% late preterms and 9% terms. Other factors of morbidity like meningitis and seizures were found to be more in late preterms as compared to terms but this difference was not statistically significant (Table 3).

Hospital stay of late preterm neonates is higher than term neonates, 64% of term neonates required less than 7 days admission in hospital, while 42% late preterm neonates required less than 7 days admission in hospital. This difference was also statistically significant, 44% late preterms needed hospital stay for 8-14 days, 10% for 15-21 days and 4% for >21 days and the difference were statistically significant (p=0.01973) (Table 4).

DISCUSSION

The present study included a total sample of 200 neonates which were divided into 2 groups namely: group 1 comprising of 100 cases of late preterms and group 2 comprising of 100 cases of terms. The purpose of this study was to study and compare the determinants of major neonatal morbidity and mortality in late preterm

and term neonates. 31% percent of neonates in late preterm group and 52% of neonates in term group had history of normal delivery. In a study conducted by Savitha MR⁶ normal vaginal deliveries predominated while in yet another study conducted by de Araujo BF et al, Caesarean deliveries predominated.⁷

In the present study, maternal medical conditions affecting newborn morbidity risk showed that over all late preterms were associated with greater number of maternal risk factors in comparison with terms and maternal risk factors like hypertension (chronic and gestational hypertension), Pre-term Premature Rupture of Membrane (PPROM) and sepsis were found to be statistically significant factors.

In consensus with the present study, Savitha MR reported that the most common risk factors for late preterm delivery were prolonged rupture of membranes, oligohydramnios and pregnancy induced hypertension.⁶ Khashu M et al, and Sahana et al, also presented with similar results.^{8,9}

Shapiro-Mendoza et al, in their study on effect of late preterm birth and maternal medical conditions on newborn morbidity risk concluded that maternal medical conditions are self-determining risk factors for newborn morbidity in the late preterms.¹⁰

Fuchs et al, studied about maternal risk factors responsible for late preterm delivery in detail.¹¹ PROM was on rise in the last decade accounting for more number of late preterm births. The practice of not aggressively attempting to treat PTL after 34 weeks of gestation may have contributed to the increasing rate of late preterm births. In addition, many practitioners actively deliver pregnancies with ruptured membranes beyond 34 weeks, or even earlier if fetal lung maturity

has been documented. Studies have reported an increased incidence of late preterm birth among women with gestational hypertension or preeclampsia. Labour inductions and caesarean deliveries performed between 34- and 37-weeks gestation in pregnancies complicated by preeclampsia estrogenically increase the late preterm birth rate.

Elective labour induction (20.6% in 2003) and caesarean delivery (29.1% in 2004) at maternal request has led to the increased rate of late preterm births. However, because of the inherent inaccuracy of pregnancy dating with margins of error of up to 3 weeks in the third trimester, inductions of labor and elective caesarean section performed at “presumed term” might inadvertently contribute to the increasing incidence of late preterm birth. In the study of women planning elective caesarean birth found the probability of admission to a NICU at 37 weeks was 11.4% and 1.5% at 39 weeks.

Contrary to the belief that late preterms are nearly mature, the present study proves that late preterms suffer significant higher morbidity and mortality. In this study neonatal jaundice, hypothermia, hypoglycaemia, sepsis and respiratory distress were found to be significant factors of morbidity in late preterms. Other factors of morbidity like meningitis and seizures are found to be more in late preterms but the difference from term infants was not statistically significant.

Savitha MR also reported increased sepsis in late preterm neonates.⁶ Similarly incidence of Sahana et al, and Jaiswal A et al, concluded that late preterms are at 3.2 times higher risk of probable sepsis as compared to term neonates.^{9,12}

Modi R et al, observed that 56.90% of late preterm and 29.91% of term neonates had at least one neonatal morbidity for which they require any intervention in NICU.¹³ Compared with term infants, late preterm neonates were at three times higher risk for overall morbidity due to any cause, 3.8 times higher risk for respiratory morbidity, 2.8 times higher risk for jaundice, and 3 times higher risk for hypoglycaemia and any infection. Wang et al, also reported similar findings in their study.³

Melamed, et al, also found that compared with full-term neonates, spontaneous late preterm delivery was independently associated with an increased risk of neonatal morbidity, including respiratory distress syndrome, sepsis, intraventricular hemorrhage, hypoglycaemia, and jaundice requiring phototherapy.¹⁴

These results show that Hospital Stay of late preterm neonates is higher than term neonates. And the difference was also statistically significant. Tomashek, et al, found that late preterm infants were 1.5 times more likely to require hospital-related care and 1.8 times more likely to be readmitted than term infants.¹⁵ Newborn morbidity

was 7 times more likely in late preterm compared with term infants.

CONCLUSION

Late preterm infants are born at 34 0/7 through 36 6/7 weeks after the onset of the first day of mother’s last menstrual period. These infants are physiologically, anatomically, and metabolically premature

Morbidities like respiratory distress, neonatal jaundice, sepsis, hypoglycaemia and hypothermia are more in late preterms due to their immaturity. Predefined strategies are required to diagnose and manage complications during birth and hospitalisations of these infants. The risks associated with late preterm birth suggest the need for refinement of obstetric paradigms to extend pregnancy duration if benefits outweigh risk to fetus and mother.

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