RESEARCH

MORBIDITY AND MORTALITY PATTERN OF LATE PRETERM NEONATES ADMITTED IN A TERTIARY CARE CENTRE

Ramsha Baig[1], Ragini Mutukulla[2], Raghava Polanki[3], Srinivas Kalyani[4]

[1]Post Graduate, Department of Pediatrics, Osmania Medical College/Niloufer Hospital, Lakidikapool, Hyderabad, Telangana, India.
[2]Assistant Professor, Department of Pediatrics, Sultan Bazar, Hyderabad, India.
[3]Assistant Professor, Department of Pediatrics, Osmania Medical College/Niloufer Hospital, Lakidikapool, Hyderabad, Telangana, India.
[4]Professor, Department of Pediatrics, Osmania Medical College/Niloufer Hospital, Lakidikapool, Hyderabad, Telangana, India.

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Corresponding Author:
Dr. Ragini Mutukulla,
Email. raginimbbs01@gmail.com
ORCID: 0000-0001-8115-4439

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Abstract

Background: Mortality rate is seven times higher in moderately preterm (and three times higher in late preterm births (LPBs) than term births. Recent rise in the late preterm birth rates by 25% raises the question as to whether the indications for these births are justified. The reason for the increase in late-preterm births during the last decade is not well understood. The aim is to know the Incidence, etiology, Morbidity and mortality rate of late preterm neonates within first 28 days of life. **Materials and Methods:** It is Prospective observational study at NICU in 135 late preterm neonates who were identified by gestational age assessment. The data was collected about term neonates during the same period through out-patient records and in-patient admissions. Factors which were compared between the 2 groups included general characteristics like birth weight, mode of delivery, level of resuscitation, morbidities and mortalitites. **Result:** A total of 135 (14.19%) late preterm neonates the number of term neonatal and total admissions during this period was 521 (54.78%) and 951 respectively. The incidence of Late preterm neonates admitted was 11.81%. The need for resuscitation was more in late preterm infants at birth with 28.89% of late preterm infants being resuscitated at birth. While in term infants the percentage was much lower of 10.36%, i.e. significant $p<0.00001$. The mortality rates were maximum due to respiratory (17.5%) followed by hypoglycemia (15%) and sepsis (15%) as causes. The overall mortality in late preterm was 22.22% when compared to 7.77% in term neonates. **Conclusion:** Need to find risk factors and diagnosed early ontime and apt intervention taken so as to prevent preterm births and reduce the end morbidity and mortality. Referral centers need to be strengthened so that accurate assessment and referral of right cases that require tertiary level care is done.

INTRODUCTION

Preterm babies are defined as babies born alive before 37 weeks of pregnancy are completed. Every year, an estimated 15 million babies are born preterm (before 37 completed weeks of gestation), and this number is rising. The incidence of preterm births in developing countries ranges from 12% to 18% and India recorded the highest number of preterm births in these developing countries. Late preterm neonates are defined by the gestational age of 34 completed weeks through 36 weeks and 6 days at birth (i.e., 239 to 259 days after the first day of the LMP).[1,2]

The proximity of their gestational age to full term infants had given the late preterm infants the misnomer "near-term". They have higher morbidity and mortality rates than term infants (gestational age>37 weeks), due to their physiologic and metabolic immaturity, even though they near the size and weight of term infants. The lapses in knowledge about the morbidity and mortality patterns of Late preterm infants arises due to the lack of definitive studies about their statistical outcome and thorough follow up. Definition of 'late preterm' arose from a 'US National Institute of Child Health and Human Development workshop' in 2005, which changed the definition of this group of babies from 'near term' to late preterm in order to acknowledge this fact.[3]

The late preterm infants are at increased risk of morbidities like respiratory complications, hypoglycemia, poor feeding, jaundice, infection and re-admission rates after initial hospital discharge. Mortality rate is seven times higher in moderately preterm (32 to 34 weeks of gestation) and three times

higher in late preterm births (LPBs) than term births. Spontaneous preterm delivery is multi-factorial in its etiology and is usually a result of infection, uterine over-distention (hence increased risk of preterm delivery in multiple pregnancy) or changes in the hypothalamic-pituitary-adrenal (HPA) axis.[1] Less is known about the medical indications for late preterm delivery. Recent rise in the late preterm birth rates by 25% raises the question as to whether the indications for these births are justified. The reason for the increase in late-preterm births during the last decade is not well understood. One proposition is that it may be due to increased use of reproductive technologies thus, an increase in multi fetal pregnancies. Another is that advances in obstetric practice have led to an increase in surveillance and medical interventions during pregnancy, as a result, at risk infants like those of intrauterine growth restrictions, fetal abnormalities and anomalies can be identified earlier and hence delivered earlier.[4] Thus keeping the above pointers in mind, the present study focuses on the morbidity and mortality pattern in late preterm infants when compared to their term counterparts and categorization of late preterm births.

MATERIALS AND METHODS

It is Prospective observational study at NICU at Niloufer Hospital, Osmania Medical College, Hyderabad from January 2017 to December 2017 in 135 late preterm neonates

Inclusion Criteria

Out born late preterm babies admitted in Niloufer Hospital.

Exclusion Criteria

Neonates with evident Congenital anomalies, abandoned babies, inborn babies and neonates referred in view of surgical problems.

The out born neonates admitted in the Neonatal Intensive Care Unit of Niloufer hospital were included in the study. The late preterm neonates were identified by gestational age assessment. Gold standard for gestation assessment was considered as early obstetric ultrasound (6-12 weeks). In the absence of early ultrasound, and if the maternal menstrual history is reliable, the gestation was calculated from the date of last menstrual period. In the absence of both, the gestation was calculated from the clinical assessment of gestation by new Ballard score.

The sample size was calculated based on the

Sample formula $n = z^2pq/d^2$,

where z=1.96,

p=prevalence of late preterm infants in Niloufer hospital as per the previous records,

q= (1-p), d=95% confidence interval.

Sample size as calculated by the above formula was 135. The details were recorded from the birth Performa and inpatient medical records.

Baby details like Sex (male/female), Mode of delivery (vainal delivery/ Caesarian section), Cause of premature delivery (spontaneous, premature rupture of membranes, fetal distress, Intra uterine growth restriction, Oligohydramnios), Birth weight distribution, Admission required or not, need for resuscitation, neonatal jaundice, Intervention for neonatal jaundice: Phototherapy and Exchange transfusion, based on AAP and Cockington charts, respiratory morbidities(transient tachypnoea of newborn, respiratory distress syndrome, pneumonia, Meconium aspiration syndrome) and Intervention for respiratory morbidities are noted . Sepsis (clinical, CRP+, culture +): Sepsis was taken into consideration with symptoms like refusal of feeds, dull activity, excessive sleepiness and lab investigations of complete blood counts, CRP positivity and culture positivity. Those with lab investigations within normal limits were considered to have clinical sepsis. Those with CRP positive(>6g/dl) and blood culture incubated for 48 hours negative were considered to have CRP+ sepsis. Those with CRP+ and culture showing growth of sepsis causing organism was present were included in culture positive sepsis

Systemic examination was done and recorded. The chest x-ray was done as and when needed. CBC, serum billuribin (total, direct, indirect), arterial blood gas, serum electrolytes, KFT, serum calcium, serum magnesium, blood group of mother and baby. These investigations were done as and when indicated. Blood sugar was done by Glucostick method & any abnormal values if found were sent to laboratory for confirmation by Glucose oxidase method. Blood culture and sensitivity was done in suspected cases of septicemia. Mechanical ventilation was used as and when indicated. The neonates were followed up to 28 days of their life.

The data was collected about term neonates during the same period through out-patient records and in-patient admissions. Factors which were compared between the 2 groups included general characteristics like birth weight, mode of delivery, level of resuscitation, morbidities and mortalitites.

Data entry was done using MICROSFT EXCEL 2013. Data analysis was done using SPSS 19.0 version. Data presented as percentages. Associations between different variables were studied using Fischer Chi Square test. P value of <0.05 was considered as existence of statistically significant difference.

Intervention for respiratory morbidities, based on Silverman Anderson score5 for preterm infants with respiratory distress.

Score	Upper chest movements	Lower chest retractions	Xiphoid Retractions	Nasal flaring	Grunt

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0	Synchronous	None	None	None	None
1	Lag on inspiration	Just visible	Just visible	Minimal	With stethoscope only
2	See-saw	Marked	Marked	Marked	Audible without stethoscope

Score 0-3: mild respiratory distress (RD)
4-6: moderate respiratory distress
>6: Impending respiratory failure

Downe score.[5]

Score	Cyanosis	Retractions	Grunting	Air entry	Respiratory rate
0	None	None	None	Clear	<60/minute
1	In room air	Mild	Audible with stethoscope	Decreased or delayed	60-80/minute
2	In 40% FiO2	Severe	Audible without stethoscope	Barely audible	>80/minute or apnoea

a. Nasal oxygen for mild RD
b. Nasal CPAP for moderate RD
c. Mechanical ventilation

RESULTS

A total of 135 (14.19%) late preterm neonates admitted in the NICU of Niloufer Hospital were included in the study and the number of term neonatal and total admissions during this period was 521 (54.78%) and 951 respectively. All cases admitted were notably not morbid and were referred with minimal complaints, more so in case of term babies.
The incidence of Late preterm neonates admitted was 11.81% by Late preterm admissions/total number of admissions.
In late preterm neonates there were 65 (48.15%) males and 70 (51.85%) females, while in the term neonates there were 265 (50.86%) males and 256 (49.14%) females.
infants with weight of less than 1.5kg in late preterm were 35(25.92%) while 88((16.89%) in term, weight between 1.5 kg to 2.5kg were 90(66.67%) in late preterm and 134(25.72%) in term infants, weight >2.5kg were 10(7.41%) in late preterm infants and 299(57.39%) in term infants. The mode of delivery of late preterm infants was by Caesarian section in majority of 97 infants (71.85%) while rest 38 infants (28.15%) were delivered by vaginal route. In term infants the mode of delivery was vaginal in 311 infants (59.69%) and LSCS in 210 infants (40.31%).
The need for resuscitation was more in late preterm infants at birth with an absolute of 39 of 135 infants requiring some form of resuscitation at birth amounting to 28.89% of late preterm infants being resuscitated at birth. While in term infants the percentage was much lower of 10.36%, i.e. only 54 of 521 infants required resuscitation at birth($p<0.00001$). The stabilization of late preterm infants required nasal CPAP by majority of 22(55%), oxygen by 15(37.5%) and mechanical ventilation by 3(7.5%), while term babies were mostly stabilized with oxygen 29(46.77%), followed by nasal CPAP 15(24.19%) and 3 required mechanical ventilation (4.8%). Nasal CPAP requirement was statistically significant in late preterm neonates with a p-value=0.0029.
Statistically the overall morbidity was found to be higher in late preterm infants (77.03%) as compared to term infants (55.66%). Late preterm infants are over-represented among infants with extreme hyperbilirubinemia 36. The maximum morbidity in our study was attributable to neonatal jaundice (34.07%) in case of late preterm admissions while that with respect to term admissions was nearly one third (10.17%).
Late preterm infants due to feeding difficulties, incoordination of suck and swallow with delayed initiation of breast feeds due to maternal illnesses, immature liver and hormone dysregulation have a higher risk of hypoglycemia. Our study demonstrated 30(22.22%) out of 135 late preterm infants had hypoglycemia after admission while only 55(10.56%) of the 521 term infants had hypoglycemia(p-value<0.00001). The majority statistically significant (p=0.0023) 19(63.33%) of late preterm infants required a glucose infusion of minimum 6mg per kg per min while only 15(27.27%) of term infants required GIR. Transient hypoglycemia was observed in 11(36.67%) of late preterm infants which was corrected with maintenance fluids and proper feeding practices while 40(72.73%) term infants had transient hypoglycemia. The maximum portion of this jaundice in both late preterm (86.95%) and term (94.34%) infants was physiological. Late preterm infants presented more with pathological jaundice exceeding an average of 14 days 13.04%, when compared to the 5.66% of pathological jaundice in term infants. Late preterm infants are at a higher risk for infection. In the present study 34 of the 135 late preterm infants had sepsis, accounting to 25.18% of total late preterm infants, while 77 of 521 term infants, accounting to 17.78% of total term infants referred for admission to our hospital. 19(55.88%) of late preterm infants and 55(71.43%) of term infants had clinical sepsis. CRP positive sepsis was seen in 8(23.53%) late preterm infants and 15(19.48%) term infants and culture positive sepsis in 7(20.59%) late preterm infants and 7(9.09%) term infants.
The respiratory problems formed the second most common morbidity observed in a late preterm neonate referred to our hospital. In our study 40 out of 135 late preterm infants that were referred for admission had some form of respiratory morbidity accounting for 29% of total morbidities when

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compared with 62(11.90%) term infants. Perinatal asphyxia was seen more commonly in late preterm infants with 30(22.22%) out of the 135 infants being affected in our study whereas only 55(10.56%) of 521 infants being affected. Those in grade I were 16(53.33%) in late preterm infants and 38(69.09%) in term infants. Hypoxic ischemic encephalopathy grade II had 9(30%) and 10(18.18%) in late preterm and term infants respectively, while grade III had 5(16.67%) and 6(10.90%) in late preterm and term infants respectively.

Major of the births in the late preterm category were spontaneous (37.03%), followed by PROM (20.74%), Oligohydramnios (14.07%), Pregnancy induced Hypertension (13.33%), fetal distress/IUGR (8.89%) and lastly placental abruption (5.92%).

The mortality rates were maximum due to respiratory (17.5%) followed by hypoglycemia(15%) and sepsis(15%) as causes. The overall mortality in late preterm was 22.22% when compared to 7.77% in term neonates.

Table 1: Details related to child birth distribution

Gender	Late preterm	Term
Male	65(48.15%)	265(50.86%)
female	70(51.85%)	256(49.14%)
Birth weight		
<1.5 kg	35(25.92%)	88(16.89%)
1.5-2.5 kg	90(66.6%)	134(25.72%)
>2.5 kg	10(7.4%)	299(57.39%)
Mode of delivery		
Vaginal delivery	38(28.15%)	311(59.69%)
LSCS	97(71.85%)	210(40.31%)

Table 2: Resuscitation done in both groups of study

Need for resuscitation	Late preterm	Term	P value
Yes	39(28.89%)	54(10.36%)	<0.0001
No	96	467	
Respiratory morbidities			
Yes	40(29.63%)	62(11.9%)	<0.0001
No	95	259	
Intervention: nasal O2			
Yes	15(37.5%)	29(46.77%)	0.4156
No	25	33	
Intervention: nasal CPAP			
Yes	22(55%)	15(24.19%)	0.0029`
No	18	47	
Intervention: mechanical ventilation			
Yes	3(7.5%)	3(4.84%)	0.67
No	37	59	

Table 3: Outcome after birth in both groups of study

	Late preterm	Term	P – value
Hypoglycemia			
Yes	30(22.22%)	55(10.56%)	< 0.00001
No	105(77.78%)	466(89.4%)	
Neonatal jaundice			
Yes	46(34%)	53(10.1%)	< 0.0001
No	89(66%)	468(88.9%)	
Sepsis			
Yes	34(25.19%)	77(14.78%)	<0.0001
No	101(74.8%)	444(85.2%)	
Hypoxic-Ischemic Encephalopathy			
Yes	30(22.2%)	55(10.5%)	<0.001
No	105(77.8%)	466(89.5%)	
Neonatal seizures			
Yes	6(4.44%)	23(4.41%)	<0.0001
No	129(95.5%)	498(95.5%)	
Congenital heart disease			
Yes	4(3%)	37(7.2%)	<0.0001
No	131(97%)	484(92.8%)	

Table 4: Outcome and treatment after child birth

Outcome of hypoglycemia	Late preterm	Term
Yes	11(36.7%)	40(72.7%)
No	19(63.4%)	15(27.3%)
Outcome requiring GIR		
Yes	19(63.4%)	15(27.3%)

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No	11(36.7%)	40(72.7%)
Patter of neonatal jaundice		
physiological	40(86.96%)	50(94.34%)
Pathological	6(13.04%)	3(5.66%)
Intervention		
Phototherapy	34(73.91%)	28(52.82%)
Exchange transfusion	2(4.35%)	1(1.89%)
Patterns of Sepsis		
Clinical	19(55.88%)	55(71.43%)
CRP +ve	8(23.53%)	15(19.48%)
Culture +ve	7(20.59%)	7(9.09%)
Hypoxic-Ischemic Encephalopathy		
Stage I	16(53.3%)	38(69.09%)
Stage-II	9(30%)	10(18.18%)
Stage III	5916.67%)	6(10.9%)
Cause Neonatal seizures		
Meningitis	2(33.33%)	12(52.17%)
Metabolic	2(33.33%)	8(34.78%)
Unknown	2(33.33%)	3(13.04%)

Table 5: Mortality due to various causes in study

Mortality due to respiratory comorbidities	**Late preterm**	**Term**	**p- value**
Yes	7	2	0.265
No	33	60	
Hypoglycemia			
Yes	6	2	0.0208
No	24	53	
Neonatal jaundice			
Yes	1	1	>0.05
No	45	52	
Sepsis			
Yes	7	5	0.043
No	27	72	
HIE			
Yes	6	13	>0.05
No	24	42	
Neonatal seizures			
Yes	2	6	>0.05
No	4	17	
CHD			
Yes	1	12	>0.05
No	3	25	

Table 6: Deaths at end of 1 month in both groups in study

Deaths at end of 1 month	**Late preterm**	**Term**	**P value**
Yes	30(22.22%)	45(7.77%)	<0.00001
No	105	476	

Deaths at end of 1 month is 22.2% in late preterm and 7.77% in preterm children.

Table 7: Causes of late preterm births

Maternal	PROM	28(21%)
	PIH	18(13%)
	Placental abruption	8(6%)
Fetal	IUGR	12(9%)
	Oligohydraminios	19(14%)
Spontaneous		50(37%)

Table 8: Cause related total mortality

	Late preterm	**Term**
Respiratory	17.5%	2.22%
Hypoglycemia	20%	1.64%
Sepsis	20.59%	6.49%
Perinatal asphyxia	20%	23.64%
NNJ	2.17%	1.59%
NNS	33.33%	26.09%
CHD	25%	32.42%

Morbidity	**Srinivasmurki et al,[12]**	**Wagh S Amargeet al,[9]**	**Modi R. et al,[8]**	**Rather G. N. et al,[7]**	**Present study**

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Late preterm	70.8%	85%	56.9%	76.8%	77.03%
Term	29.1%	16.3%	29.91%	28.38%	55.66%

Study	Morbidities	Percentages
Modi R. et al,[8]	Respiratory Distress Syndrome Jaundice Infection Hypoglycemia	44.83% 23.85% 16.67% 2.87%
Patil and Patil,[6]	Sepsis Hyperbilirubinemia RDS TTN	25% 21.9% 19% 9%
Rather G. N. et al,[7]	Hyperbilirubinemia Hypoglycemia Respiratory morbidities	41.6% 16% 10.9%
Present study	Hyperbilirubinemia Respiratory morbidities Sepsis Hypoglycemia	34.07% 29.63% 25.19% 22.22%

DISCUSSION

This study attempts to find the morbidity and mortality pattern of late preterm infants admitted in a tertiary care centre, the causes for late preterm births and their outcome at 1 month of age. Late-preterm birth rate was calculated as follows: number of late-preterm newborns/total number of newborns during that period (133/1126) The incidence of late preterm in our institute was 11.81% Similar incidences were seen in studies by Anila Haroon et al,[5] it was 10.6%, by Patil and Patil,[6] it was 8% and by Rather G.N. et al it was11.58%.[7]

This study includes 135 late preterm and 521 term neonates in a total of 951 neonates that were referred for admission. The Sex distribution in both groups in this study was statistically insignificant; in late preterm neonates there were 65 (48.15%) males and 70 (51.85%) females, while in the term neonates there were 265 (50.86%) males and 256 (49.14%) females. In a study by Modi R. et al,[8] late preterm neonates had 54.60% males and 45.40% females when compared to term neonates which had 51.12% males and 48.88% females. In study by Rather G. N. et al,[7] males and female neonates were 54.1% and 45.9% in late preterm group and 51.5% and 48.5% in term group respectively.

The mode of delivery of late preterm infants was by Caesarian section in majority of 97 infants (71.85%) while rest 38 infants (28.15%) were delivered by vaginal route. In term infants the mode of delivery was vaginal in 311 infants (59.69%) and LSCS in 210 infants (40.31%).

Wagh S. Amargeet et al,[9] studied consecutively delivered babies and found that 86.8% of late preterm deliveries were through a caesarian section and the remainder 13.2% were through vaginal route. Similar majority requiring Caesarian section in the late preterm group i.e., 65.7% was observed by Rather G. N. et al,[7] while remainder of 34.3% preterm neonates had vaginal delivery.

In our study infants with weight of less than 1.5kg in late preterm were 35 (25.92%) while 88 ((16.89%) in term, weight between 1.5 kg to 2.5kg were 90 (66.67%) in late preterm and 134 (25.72%) in term infants, weight >2.5kg were 10(7.41%) in late preterm infants and 299 (57.39%) in term infants.

The need for resuscitation was more in late preterm infants at birth with an absolute of 39 of 135 infants requiring some form of resuscitation at birth amounting to 28.89% of late preterm infants being resuscitated at birth. While in term infants the percentage was much lower of 10.36%, i.e. only 54 of 521 infants required resuscitation at birth ($p<0.00001$).

Savitha M.R. et al,[10] found in their case-control study that more late preterms (9 of 110) needed resuscitation at birth as compared to term neonates which was statistically significant.[7] Of the neonates who required resuscitation, 12 late preterms required endotracheal intubation as compared to 4 term neonates which was statistically significant ($p=0.04$). Similar results were obtained by Anila Haroon et al,[11] (21.4% in late preterm vs. 1.2% in term) and Wagh S. Amargeet9(14% in late preterm vs. 1.7% in term infants).

Statistically the overall morbidity was found to be higher in late preterm infants (77.03%) as compared to term infants (55.66%). Srinivas murki et al,[12] found overall morbidity 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). Wagh S Amargeet et al,[9] in their study also found that Late preterm babies had more neonatal morbidities compared to term babies (85 % vs 16.3 %).[13,14,15]

Modi R. et al,[16] found 56.9% late preterm neonates with morbidity when compared to 29.91% term neonates. Similar results were observed by Rather G. N. et al,[7] with 76.8% late preterm morbidity vs. 28.38% for term neonates.

In a study carried out by Carrie et al,[13] late preterm birth and maternal condition exposure were independent risk factors for newborn morbidity. The risk for neonatal morbidity was higher if both risk factors were present. Comparing both, late preterm birth was the stronger risk. As per our study major of the births in the late preterm category were spontaneous (37.03%), followed by PROM

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(20.74%), Oligohydramnios (14.07%), Pregnancy induced Hypertension (13.33%), fetal distress/IUGR (8.89%) and lastly placental abruption (5.92%). Reddy et al recently reported that 23% of late preterm births had no clear recorded indications for delivery in the birth certificate.

Justin H. T. Tan et al,[14] in their study found that Mothers with pre-existing medical problems of any type were noted to deliver earlier. Out of the late preterm babies, 43% of them were born to mothers with pre-existing medical problems of any type compared to 27.4% in term babies. Pre-existing hypertension and diabetes as well as pre-eclampsia and gestational diabetes were significantly more prevalent in mothers of late preterm infants. Preeclampsia and gestational diabetes mellitus (GDM) were the 2 most frequently reported antenatal conditions among mothers of late preterm and term infants. Pregnancy conceived via IVF was associated with significantly higher incidence of late preterm deliveries as compared to term deliveries, 10% vs. 2% (*P* <0.001). Other antenatal conditions such as oligohydramnios, polyhydramnios and antepartum haemorrhage were significantly more common with more late preterm births.

Wagh S. Amargeet,[9] Preterm labor and PROM accounted for 53 cases (46.9%) for Prematurity in the study group while maternal /fetal factors such as – PIH, GDM, antepartum hemorrhage, multiple gestation, fetal distress, abnormal doppler and meconium stained amniotic fluid. accounted for 61(53.5%) cases. Labor pain was present in 49.1% mother's of late preterm babies.

Late preterm infants are over-represented among infants with extreme hyperbilirubinemia.[15] The maximum morbidity in our study was attributable to neonatal jaundice (34.07%) in case of late preterm admissions while that with respect to term admissions was nearly one third (10.17%).

Similar result was seen in studies by Rather G. N. et al[7] and Justin HT Tan et al,[14] with late preterm neonatal jaundice equal to 41.6%, 63.3% and 41.2% respectively.

Garcez C et al,[15] also observed that with decreasing gestational age the incidence of hyperbilirubinemia increases.

The maximum portion of this jaundice in both late preterm (86.95%) and term (94.34%) infants was physiological. Late preterm infants presented more with pathological jaundice exceeding an average of 14 days 13.04%, when compared to the 5.66% of pathological jaundice in term infants. Phototherapy is extremely effective in reducing hyperbilirubinemia and avoiding exchange transfusion. Phototherapy and exchange transfusion should be initiated at lower bilirubin thresholds than those used for term infants. In our study, 73.91% late preterm infants with neonatal jaundice required phototherapy compared to 56% term infants. The need for exchange transfusion was 4.35% in late preterm compared to 1.8% in term infants. The loss of life to kernicterus was seen in the late preterm group with one death equivalent to 2.17% of the total late preterm neonatal jaundice. In a study by Bhutani VK,[16] Large for gestational age and late preterm infants disproportionately developed kernicterus as compared with those who were appropriate for gestational age and term.

The respiratory problems formed the second most common morbidity observed in a late preterm neonate referred to our hospital. In our study 40 out of 135 late preterm infants that were referred for admission had some form of respiratory morbidity accounting for 29% of total morbidities when compared with 62(11.90%) term infants. In a study by Miria Natile et al,[17] short term respiratory outcomes of late preterm were studied and 12.4% of late preterm infants had respiratory co morbidities when compared to 0.9% of term infants

The stabilization of late preterm infants required nasal CPAP by majority of 22(55%), oxygen by 15(37.5%) and mechanical ventilation by 3(7.5%), while term babies were mostly stabilized with oxygen 29(46.77%), followed by nasal CPAP 15(24.19%) and 3 required mechanical ventilation (4.8%). Nasal CPAP requirement was statistically significant in late preterm neonates with a p-value=0.0029.

Justin H. T. Tan et al,[14] in their study found that the late preterm infants needed significantly more respiratory support as compared to the term infants. Comparing the late preterm and the term group, 1.7% vs.0.7% required oxygen therapy, 6.8% vs. 1.1% required continuous positive airway pressure (CPAP) and 0.3% vs. 0.1% required mechanical ventilation.

In the study by Murki S. et al,[12] any sort of ventilator support (CPAP, IPPV) was 3% in the late preterm group when compared with 0.8% of term group, with a p-value of <0.001.

Ongun H. et al,[18] observed that the LPT infants had longer intubation periods (P = 0.014 for LPTs and early-terms; P < 0.001 for LPTs and full-term infants) and NICU stays (P < 0.001 for LPTs and early-term infants; P < 0.001 for LPTs and full-term infants).

Late preterm infants are at a higher risk for infection. In the present study 34 of the 135 late preterm infants had sepsis, accounting to 25.18% of total late preterm infants, while 77 of 521 term infants, accounting to 17.78% of total term infants referred for admission to our hospital. 19(55.88%) of late preterm infants and 55(71.43%) of term infants had clinical sepsis. CRP positive sepsis was seen in 8(23.53%) late preterm infants and 15(19.48%) term infants and culture positive sepsis in 7(20.59%) late preterm infants and 7(9.09%) term infants.

Late preterm infants due to feeding difficulties, incoordination of suck and swallow with delayed initiation of breast feeds due to maternal illnesses, immature liver and hormone dysregulation have a higher risk of hypoglycemia. Our study demonstrated 30(22.22%) out of 135 late preterm infants had hypoglycemia after admission while only 55(10.56%) of the 521 term infants had hypoglycemia (p-value<0.00001). The majority statistically significant (p=0.0023) 19(63.33%) of late preterm infants required a glucose infusion of

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minimum 6mg per kg per min while only 15(27.27%) of term infants required GIR. Transient hypoglycemia was observed in 11(36.67%) of late preterm infants which was corrected with maintenance fluids and proper feeding practices while 40(72.73%) term infants had transient hypoglycemia. Wagh S. Amargeet,[9] in their study observed that 30% of late preterm neonates had hypoglycemia when compared to 2.2% term neonates. In the study by Rather G. N. et al,[7] hypoglycaemia occurred in 16% of late preterm neonates and 6.5 % of term babies. Statistically hypoglycaemia was found significantly higher in late preterm neonates as compared to term neonates (p-value=0.0001, OR =2.74, 95% CI = (2.07 - 3.63).

Perinatal asphyxia was seen more commonly in late preterm infants with 30(22.22%) out of the 135 infants being affected in our study whereas only 55(10.56%) of 521 infants being affected. Those in grade I were 16 (53.33%) in late preterm infants and 38 (69.09%) in term infants. Hypoxic ischemic encephalopathy grade II had 9 (30%) and 10 (18.18%) in late preterm and term infants respectively, while grade III had 5 (16.67%) and 6 (10.90%) in late preterm and term infants respectively in our study.

Neonatal seizures in our study did not have significant differences in late preterm and term infants admitted in out tertiary care centre. 6(4.44%) late preterm infants and 23(4.41%) of term infants had neonatal seizures. Of this in late preterm, the cause for seizures was meningitis in 2(33.33%), metabolic in 2(33.33%) and remained unknown in 2(33.33%) while in term the cause for seizures as meningitis was found in 12(52.17%), metabolic in 8(34.78%) and could not be found in 3(13.04%).

Congenital heart defects were more commonly found in term 37 (7.1%) than late preterm infants 4(2.96%). In the study by Modi R. et al,[8] late preterm neonates had more neonatal morbidity compared to term neonates requiring inpatient hospital care. Respiratory distress syndrome (44.83%) followed by jaundice requiring phototherapy (23.85%), any infection (16.67%) and hypoglycaemia (2.87%) were the frequently identified morbidities in late preterm infants.

In a study by Patil and Patil,[6] Among the range of neonatal morbidities studied, sepsis (25%), hyperbilirubinemia (21.9%), RDS (19%), and TTN (09%) were noteworthy with major contribution.

Rather G. N. et al,[7] found the following major morbidities in the late preterm neonates Hyperbilirubinemia (41.6%), hypoglycemia (16%) and respiratory morbidities (10.9%).

The mortality rates were maximum due to respiratory (17.5%) followed by hypoglycemia (15%) and sepsis (15%) as causes. The overall mortality in late preterm was 22.22% when compared to 7.77% in term neonates. In the study by Savitha M.R. et al,[10] the mortality was 10.9% in late preterm neonates as compared to 0.9% in term neonates. Similar results were found in the study by Rather G. N. et al,[7] 2.5% vs 1.1%; Modi R. et al,[8]13.79% vs. 6.25%. The higher mortality in our study was probably attributable to ours being a tertiary care centre where the referred cases are mostly moribund.

CONCLUSION

The overall admission rate, morbidity and mortality are higher in late preterm neonates when compared to term neonates. Despite their relatively large size and being almost term, they should not be regarded as being similar to term infants. Risk factors associated with preterm births found in this study were Pregnancy induced hypertension, fetal distress, IUGR, oligohydramnios and spontaneous births. These need to be diagnosed early on and apt intervention taken so as to prevent preterm births and reduce the end morbidity and mortality. Referral centers need to be strengthened so that accurate assessment and referral of right cases that require tertiary level care is done.

REFERENCES

1. Quinn JA, Munoz FM, Gonik B, Frau L, Cutland C, Mallett-Moore T, et al. Preterm birth: Case definition & guidelines for data collection, analysis, and presentation of immunisation safety data. Vaccine. 2016;34(49):6047-6056. doi: 10.1016/j.vaccine.2016.03.045.
2. Beck S, Wojdyla D, Say L, Betran AP, Merialdi M, Requejo JH, et al. The worldwide incidence of preterm birth: a systematic review of maternal mortality and morbidity. Bull World Health Organ. 2010;88(1):31-8. doi: 10.2471/BLT.08.062554.
3. Raju TN, Higgins RD, Stark AR, Leveno KJ. Optimizing care and outcome for late-preterm (near-term) infants: a summary of the workshop sponsored by the National Institute of Child Health and Human Development. Pediatrics. 2006;118(3):1207-14. doi: 10.1542/peds.2006-0018.
4. Yuce T, Keskin M, Seval MM, Söylemez F. Effect of the timing of delivery on perinatal outcomes at gestational hypertension. Interv Med Appl Sci. 2015;7(2):59-62. doi: 10.1556/1646.7.2015.2.3.
5. Sibai BM, Hauth J, Caritis S, Lindheimer MD, MacPherson C, Klebanoff M, et al. National Institute of Child Health and Human Development Network of Maternal-Fetal Medicine Units. Am J Obstet Gynecol. 2000;182(4):938-42. doi: 10.1016/s0002-9378(00)70350-4.
6. Patil S, Patil KP. Analysis of risk factors of late preterm birth: A case-control study. Indian J Health Sci Biomed Res. 2017;10:283-7.
7. Rather GN, Jan M, Rafiq W, Gattoo I, Hussain SQ, Latief M. Morbidity and Mortality Pattern in Late Preterm Infants at a Tertiary Care Hospital in Jammu & Kashmir, Northern India. J Clin Diagn Res. 2015;9(12):SC01-4. doi: 10.7860/JCDR/2015/16294.6916.
8. Modi R, Modi B, Patel J. Compari-son of Neonatal Morbidity and Mortality among Late Preterm and Term Neonates at Neonatal Inten-sive Care Unit in Gujarat. Ntl J of Community Med. 2015; 6(4):483-486.
9. Khowaja WH, Leghari AL, Hussain AS, Ariff S, Khan IA. Frequency and Early Complications of Late Preterm Infants: A Descriptive Analysis from Two Secondary-care Hospitals of Karachi. Cureus. 2019;11(9):e5789. doi: 10.7759/cureus.5789.
10. Savitha MR, Sanjee SS. Morbidity and mortality profile of late preterm neonates as compared to term neonates from a tertiary care centre in Mysore, India. Int J Contemp Pediatr. 2016; 3(1): 164-168.
11. Tomashek KM, Shapiro-Mendoza CK, Weiss J, Kotelchuck M, Barfield W, Evans S, et al. Early discharge among late

ISSN (O): 2687-5365; ISSN (P): 2753-6556

preterm and term newborns and risk of neonatal morbidity. Semin Perinatol. 2006;30(2):61-8. doi: 10.1053/j.semperi.2006.02.003.
12. Jaiswal A, Murki S, Gaddam P, Reddy A. Early neonatal morbidities in late preterm infants. Indian Pediatr. 2011;48(8):607-11. doi: 10.1007/s13312-011-0105-y.
13. Shapiro-Mendoza CK, Tomashek KM, Kotelchuck M, Barfield W, Nannini A, Weiss J, et al. Effect of late-preterm birth and maternal medical conditions on newborn morbidity risk. Pediatrics. 2008;121(2):e223-32. doi: 10.1542/peds.2006-3629.
14. Tan JH, Poon WB, Lian WB, Ho SK. A Comparison of the Short-term Morbidity and Mortality Between Late Preterm and Term Newborns. Ann Acad Med Singap. 2014;43(7):346-54.
15. Garcez C, Silva N, Pinheiro L, Costa M, Sá C, Abreu E, et al. Late-preterm birth in a level III hospital: incidence and associated morbidity. J Pediatr Neonat Individual Med. 2016;5(1):e050135.
16. Bhutani VK, Johnson L. Kernicterus in late preterm infants cared for as term healthy infants. Semin Perinatol. 2006;30(2):89-97.
17. Natile M, Ventura ML, Colombo M, Bernasconi D, Locatelli A, Plevani C, et al. Short-term respiratory outcomes in late preterm infants. Ital J Pediatr. 2014;40:52. doi: 10.1186/1824-7288-40-52.
18. Consortium on Safe Labor, Hibbard JU, Wilkins I, Sun L, Gregory K, Haberman S, et al. Respiratory morbidity in late preterm births. JAMA. 2010;304(4):419-25. doi: 10.1001/jama.2010.1015.

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