Morbidity and Mortality Profile of Late Pre-Terms in Comparison to Term Newborns at a Tertiary Care Centre in Vijayawada - An Observational Study

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ABSTRACT

BACKGROUND

Prematurity is a major cause of neonatal morbidity and mortality. In recent years, there has been a lot of interest in the late preterm neonates. During the recent past, the proportion of these late preterm births has increased. The purpose of this study was to determine morbidity, mortality, and outcome at one month of age amongst late preterm neonates.

METHODS

This is a hospital based descriptive observational study (Cohort study) conducted at Siddhartha Medical College, Government General Hospital, Vijayawada from January 2019 to December 2020. This study has got Institutional Ethics Committee approval (Regn. No: IEC/2019/062/SMC, Dt: 04/02/2019). The study included 300 late preterm neonates and 300 term neonates (as controls). They were enrolled after considering inclusion, exclusion criteria and parental consent.

RESULTS

A total of 300 late preterm neonates were taken as cases and for each late preterm one term infant was included as controls. Late preterm neonates had a mean gestational age of 35 weeks. Term neonates had a mean gestational age of 38 weeks. Late preterm neonates are 2.5 times more likely to develop hyperbilirubinaemia compared to their term counterparts. Late preterm neonates are twice as likely to develop hypoglycaemia compared to their term counterparts. 7.3 % of late preterm neonates are found to have hypothermia compared to 1.67 % of term neonates. 10.67 % of late preterm neonates have sepsis compared to 2.33 % of term neonates. After initial discharge, 5.33 % of late preterm neonates required readmission in the hospital due to various causes. Late preterm neonates had a total mortality of 3 %, and term neonates had a mortality of 0.67 %.

CONCLUSIONS

Late preterm neonates are physiologically immature and have limited compensatory responses to the extra-uterine environment when compared with term neonates. They are at a significantly higher risk of morbidity during the neonatal period compared to term neonates. Considering this, they should be treated as preterm neonates, monitored carefully and should not be looked upon as near-term.

KEYWORDS

Late Preterm, Preterm, Term, Neonates

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BACKGROUND

Globally 130 million babies are born every year and of these, 4 million die during the neonatal period, i.e. first 4 weeks of life.[1,2] India accounts for highest number of annual births (25.6 million) and neonatal deaths (0.76 million or 30 % global burden).[1,2] Prematurity is a major cause of neonatal morbidity and mortality. The frequency of preterm births is increasing in many countries around the world and this increase is mainly due to a rise in late preterm births. The proposed reasons for the increasing trend in late preterm birth include increasing surveillance of the mother and the foetus, increasing maternal age, use of reproductive technologies that lead to multiple gestations. As a result of increased surveillance, foetuses normally considered to be at a higher risk of still birth, like those with intra uterine growth restriction (IUGR), premature rupture of membranes, foetal anomalies, and intrapartum asphyxia, are being identified earlier, resulting in more deliveries at 34 to 36 weeks of gestation.[3] There is limited published data from India related to incidence and morbidities of late preterm neonates. In a prospective cohort study conducted by Jaiswal et al.[4] in India, late preterm births constituted 11.24 % of the total births, which is similar to a study done in Jammu Kashmir by Ghulam Nabi Rather et al.[5] where the incidence was 11.58 %. Most of the studies and advances done in the field of preterm care are for babies < 34 weeks period of gestation, who have high mortality and morbidity. The term "Late Preterm" is used for neonates born between 34 0/7 and 36 6/7 weeks of gestation.[6] The term and the gestational age limits for it, were set by an expert panel convened by the National Institute of Health and the National Institute of Child Health and Human Development in July 2005. An estimated 15 million preterm babies are born every year throughout the world.[7] The exact number of preterm and late preterm births in many of the developing and poor countries is missing. In the United States in 2015, 9.63 % of the total live births were preterm, of which 71.4 % were late preterm births. Since 1981 in the United States, there has been two thirds raise in the proportion of late preterm births.[8] The aetiology of late preterm birth is very complex and multifactorial. Some of the most important causes of late preterm birth are premature rupture of membranes (PROM), iatrogenic causes, idiopathic preterm labor, pre-eclampsia, and incorrect gestational age assessment. Though late preterm neonates are large and do not look like their tiny preterm counterparts, they are at an increased risk of many complications related to prematurity. It is due to their physiological immaturity that they are prone to a host of clinical problems like, respiratory distress, hypothermia, hypoglycaemia, hyperbilirubinaemia, sepsis, feeding difficulties, need for resuscitation, and readmission.[4] In the recent years, there has been a lot of interest in the late preterm neonates. Previously they were referred to as near terms, as they were closer to term gestation, in the appearance and weight. They were thought to be as almost mature neonates not requiring much additional attention as the term neonates. As the late preterm neonates are larger than the usual preterm neonates, these babies are managed in a similar way as term neonates. They are roomed in with the mother immediately after delivery and are discharged like full term neonates. Recent studies done on this subset of neonates has indicated that these late preterm neonates are at a higher risk or morbidity when compared to term neonates. It was observed that many of these neonates being discharged less than 72 hours post-delivery are requiring readmission. The common factors for admission to the neonates intensive care unit (NICU) in the late preterm neonates are respiratory distress, hypothermia, hyperbilirubinaemia, sepsis, and hypoglycaemia. Most of the available literature on late preterm neonates is from western nations. This study was conducted to find out the problems being faced by the late preterm neonates, in the Indian context. These findings will also be compared to full term neonates.

Aims and Objectives

Primary Objective

To determine morbidity, mortality and outcome at one month of age amongst late preterm neonates.

Secondary Objective

To compare the morbidly variables and mortality/outcomes between late preterm and term neonates

METHODS

This hospital based descriptive observational study (Cohort study) was conducted at Siddhartha Medical College, attached to Government General Hospital, Vijayawada from January 2019 to December 2020. This study has got Institutional Ethics Committee approval (Regn. No: IEC/2019/062/SMC, Dt: 04/02/2019). The study included 300 Late preterm neonates and 300 Term neonates (as controls) born at Government General Hospital, Vijayawada, form 1st January 2019 to 31st December 2020. These were enrolled after taking consent from the parents.

Inclusion Criteria

All term and late preterm neonates born at Government General Hospital, Vijayawada, form 1st January 2019 to 1st January 2020,

Exclusion Criteria

Neonates born with major congenital anomalies;
Neonates with clinically identifiable chromosomal syndromes and
Parents not willing to give consent to be part of the study were excluded.

Once included in the study, the neonates were subjected to a gestational age assessment, using Modified New Ballard's scoring.[9] The neonate is considered as a late preterm if the gestational age falls between 34 0/7 to 36 6/7 weeks. Diagnosis of the neonatal clinical condition

(Morbidity) was made as per guidelines given by NNF (National Neonatology Forum).[10] The details entered in the predesigned proforma regarding neonatal morbidly parameters such as need for resuscitation at birth, hypoglycaemia, hypothermia, hyperbilirubinaemia, respiratory distress, sepsis, requiring mechanical ventilation, need for readmission, weight gain at one month of postnatal age and outcome.

All the neonates enrolled in the study were followed up to 1 month of postnatal age for any mortality and morbidity. All the details collected were entered into an Excel spreadsheet for further analysis.

Statistical Analysis

The data collected of both the late preterm and term neonates was entered in an Excel sheet. Statistical analysis was done by using statistical products and services solutions (SPSS) software version 17.0. Data analysis was done by descriptive statistics as frequency (number) and percentage. Comparison was done by applying frequency and percentage. Descriptive statistic methods were used for this study. Chi square test applied to sets of categorical data. A p value of < 0.05 is considered as statistically significant. Microsoft Word and Excel were used to generate tables.

RESULTS

A total of 300 late preterm neonates were taken as cases and for each late preterm, one term infant was included. The total population included is 600 neonates. Late preterm neonates had a mean gestational age of 35 weeks. Term neonates had a mean gestational age of 38 weeks. Late preterm neonates had a mean birth weight of 2.14 kg. Term neonates had a mean birth weight of 2.87 kg (Table - 1). 24.67 % of late preterm neonates have respiratory distress compared to 8.67 % in term neonates (Figure-1). This is statistically significant with a p-value < 0.0001. Late preterm neonates are 3 times more likely to develop respiratory distress compared to their term counterparts (Table-2). Hyperbilirubinaemia was seen in 34.67 % of late preterm neonates, whereas only 14 % of term neonates developed hyperbilirubinaemia (Figure-2). This is statistically significant with a p-value < 0.0001. Late preterm neonates are 2.5 times more likely to develop hyperbilirubinaemia compared to their term counterparts (Table-2). 16 % of late preterm neonates have hypoglycaemia compared to 8.67 % of term neonates (Figure-3). This is statistically significant with a p-value of .006306. Late preterm neonates are twice as likely to develop hypoglycaemia compared to their term counterparts (Table-2). 7.3 % of late preterm neonates are found to have hypothermia compared to 1.67 % of term neonates (Figure-4). This is statistically significant with a p-value of. 000814 (Table-2). Late preterm neonates are 4.5 times more likely to develop hypothermia compared to their term counterparts. 10.67 % of late preterm neonates have sepsis compared to 2.33 % of term neonates (Figure-5). This is statistically significant with a p-value of .000035 (Table-2). Late preterm neonates are about 5 times as likely to develop sepsis as their term counterparts. Resuscitation was performed in 18 % of the late preterm neonates, whereas only 5 % of term neonates needed resuscitation (Figure-6). This is statistically significant with a p-value < 0.00001 (Table-2). Late preterm neonates are 3.5 times more likely to require resuscitation at birth when compared to term neonates. After initial discharge, 5.33 % of late preterm neonates required readmission in the hospital due to various causes. Only 1.33 % of term neonates required readmission (Figure-7). This is statistically significant with a p-value of .00635 (Table-2). Late preterm neonates are 5 times more likely to require readmission, compared to term neonates. At one month of age, 73.67 % of late preterm neonates had adequate weight gain, compared to which 93.22 % of term neonates had good gain (Figure - 8). This is statistically significant with a p-value < 0.00001 (Table-2). Mechanical ventilation was done for 4 % of late preterm neonates, whereas only 0.67 % of term neonates required mechanical ventilation (Figure-9). This is statistically significant with a p-value of .006844 (Table-2). Late preterm neonates are 4 times more likely to require mechanical ventilation compared to term neonates. Late preterm neonates had a total mortality of 3 %, and term neonates had a mortality of 0.67 % (Figure-10). This is not significant as the p value is .33155 (Table-2). Though the difference is not significant, 3 times as many late preterm neonates died compared to term neonates.

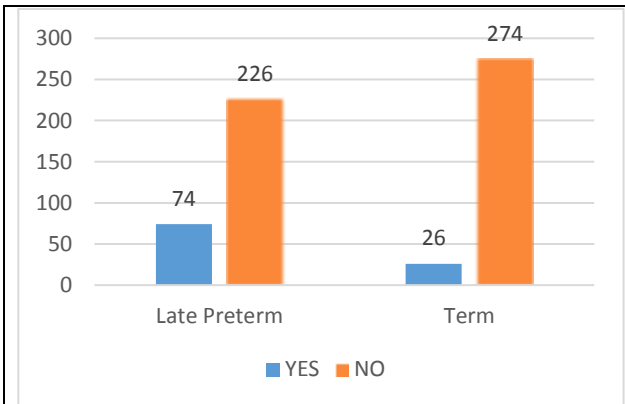

Figure 1. Distribution of Respiratory Distress among Late Preterm and Term Neonates in the Present Study Population

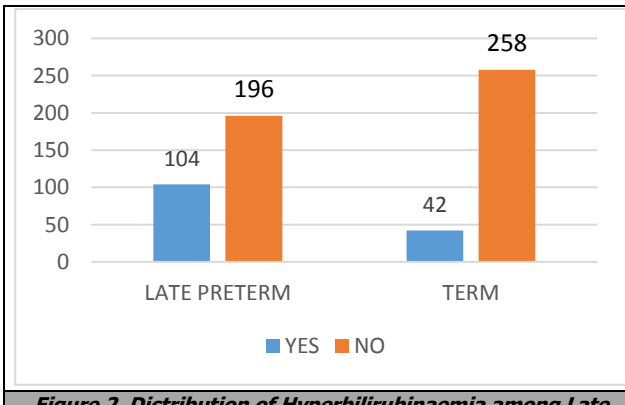

Figure 2. Distribution of Hyperbilirubinaemia among Late Preterm and Term Neonates in the Present Study Population

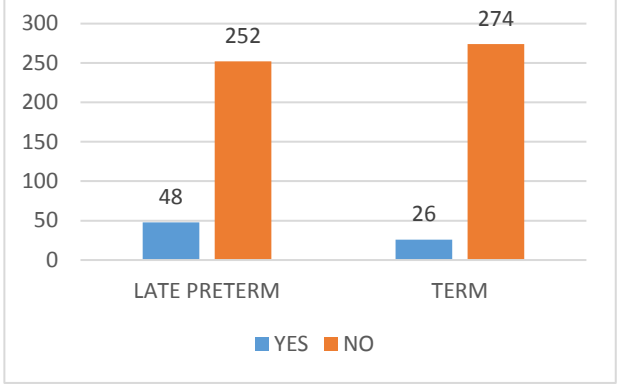

Figure 3. Distribution of Hypoglycaemia among Late Preterm and Term Neonates in the Present Study Population

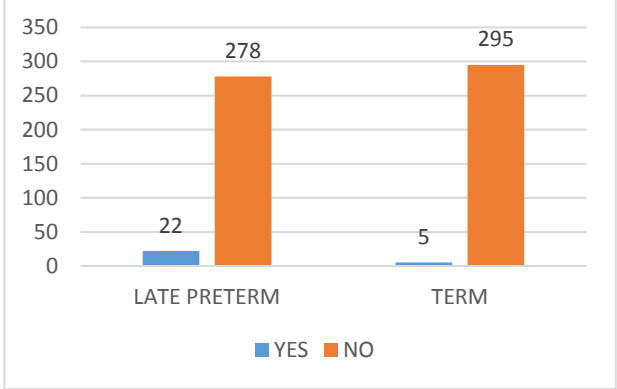

Figure 4. Distribution of Hypothermia among Late Preterm and Term Neonates in the Present Study Population

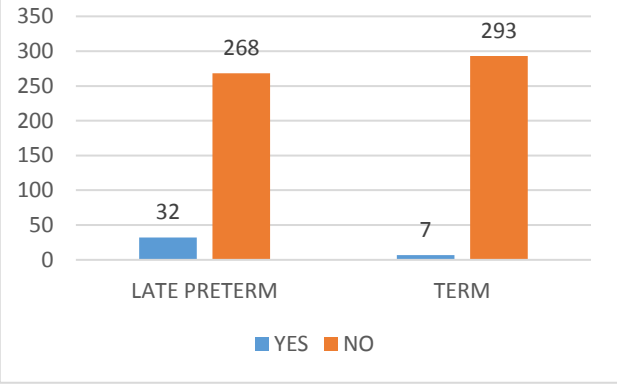

Figure 5. Distribution of Sepsis among Late Preterm and Term Neonates in the Present Study Population

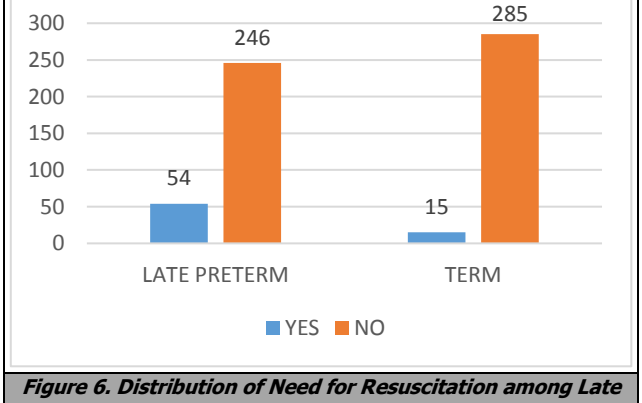

Figure 6. Distribution of Need for Resuscitation among Late Preterm and Term Neonates in the Present Study Population

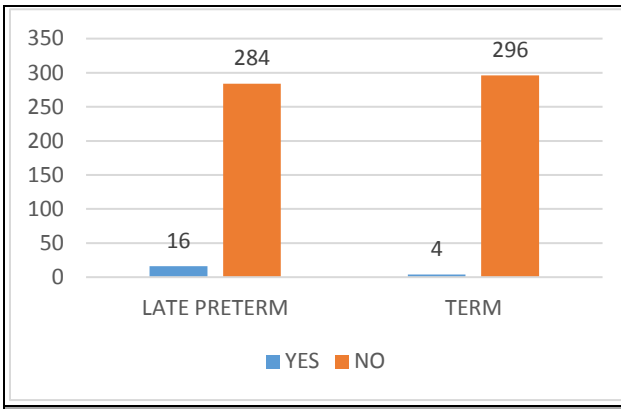

Figure 7. Distribution of Hospital Readmission among Late Preterm and Term Neonates in the Present Study Population

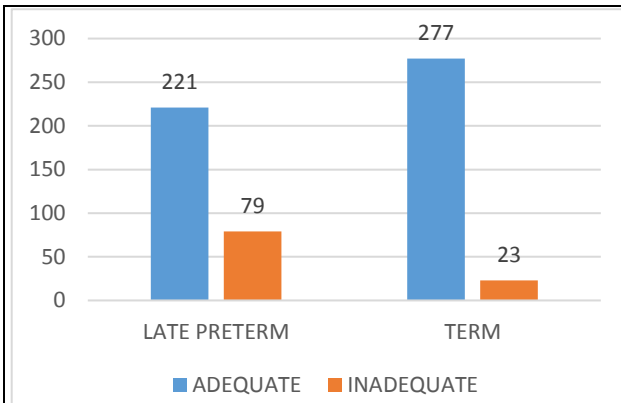

Figure 8. Distribution of Weight Gain among Late Preterm and Term Neonates in the Present Study Population

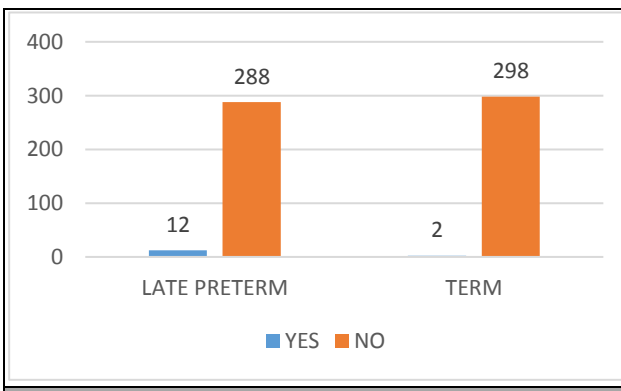

Figure 9. Distribution of Need for Mechanical Ventilation among Late Preterm and Term Neonates in the Present Study Population

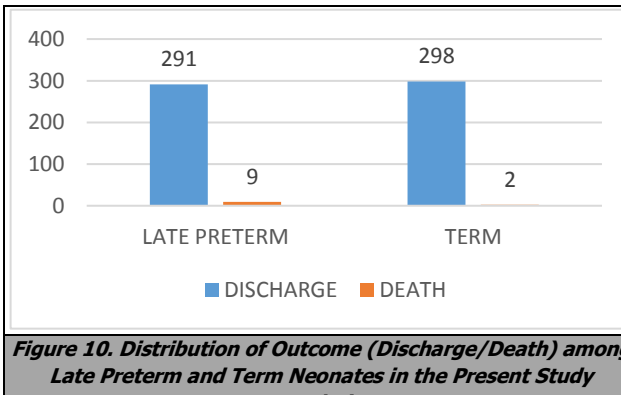

Figure 10. Distribution of Outcome (Discharge/Death) among Late Preterm and Term Neonates in the Present Study Population

Neonatal Parameters		Mean
Mean gestational age of the neonates (weeks)	Late preterm	35 weeks
	Term	38 weeks
Mean birth weight of the neonates (kg)	Late preterm	2.14 kg
	Term	2.87 kg

Table 1. Mean Gestational Age and Mean Birth Weight among the Present Study Population

Neonatal Parameters (Morbidity/Mortality)	Late Preterm Number (%)	Full Term Number (%)	p Value
Respiratory distress	74 (24.67 %)	26 (8.67 %)	< 0.0001
Hyperbilirubinaemia	104 (34.67 %)	32 (10.67 %)	< 0.0001
Hypoglycaemia	48 (16 %)	26 (8.67 %)	.006306
Hypothermia	22 (7.33 %)	5 (1.67 %)	.000814
Sepsis	32 (10.67 %)	7 (2.33 %)	.000035
Resuscitation	54 (18 %)	15 (5 %)	< 0.0001
Hospital readmission	16 (5.33 %)	4 (1.33 %)	.00635
Inadequate weight gain	79 (26.33 %)	23 (7.67 %)	< 0.0001
Mechanical ventilation	12 (4 %)	2 (0.67 %)	.006844
Mortality	9 (3 %)	2 (0.67 %)	.33155

Table 2. Distribution of Neonatal Morbidity /Mortality Parameters among Late Preterm and Term Neonates in the Present Study

DISCUSSION

Late preterm neonates are physiologically immature and have limited compensatory responses due to which they are at significantly higher risk of morbidity during the neonatal period compared to term neonates. In the present study, a major cause of hospitalization of the neonates is respiratory distress. Respiratory distress could be due to many causes with important ones being respiratory distress syndrome, transient tachypnoea of new born, congenital pneumonia, and meconium aspiration syndrome. In our study, 24.67 % of the late preterm neonates developed respiratory distress, while only 8.67 % of the term neonates developed respiratory distress. Our study reveals significantly ($p < 0.0001$) higher incidence of respiratory distress in late preterm neonates when compared to term neonates. Though the percentage of neonates suffering from respiratory distress was higher in the present study while compared to previous studies, all of them also show that the late preterm neonates have a higher chance of developing respiratory distress. In the study conducted by Leone et al.[11]in Switzerland, the risk of developing respiratory distress was 7.5 times higher in late preterm neonates than full term neonates, and they were 7.4 times more likely to be oxygen dependent and needing prolonged hospital stay due to the respiratory distress. This also shows us that respiratory distress is a very important problem in late preterm neonates.

In the present study, hyperbilirubinaemia constituted major morbidity in late preterm neonates, which lead to NICU admission. Of the 300 late preterm neonates, 104 (34.67 %) of them developed hyperbilirubinaemia, requiring either phototherapy or exchange transfusion, whereas only 10.67 % of the term neonates developed hyperbilirubinaemia. There was a significant increase in the incidence of hyperbilirubinaemia in late preterm neonates when compared to term neonates with a p value < 0.0001. The result is similar to previous studies by Rather et al. and Leone et al.[11]All the above studies defined hyperbilirubinaemia to be a level of total serum billirubin, that requires at least phototherapy. Immaturity of the hepatic function and low concentration of UDPGT enzyme seems to be the reason behind higher incidence of hyperbilirubinaemia in late pre term neonates. These studies were performed in the South east Asian countries, yielding a similar result, but the one conducted in the United States by Wang et al.[12]shows a high rate (37.9 %) of jaundice even in term neonates, and the p value is 0.027 (not significant). This difference could be attributed to a genetic variation or also a variation in the temperature, feeding and cultural practices between South east Asian countries and the United States of America, which can have an impact on the development of hyperbilirubinaemia.

In the present study, 16 % of the late preterm neonates developed hypoglycaemia, compared to 8.67 % of the term neonates. This was a significant difference between the two with the p value being 0.006306. Though there is a difference in the overall incidence, findings of the present study match with studies by Wang et al.[13] Rather et al. and Leone et al.[11] in the fact that late preterm neonates have a significantly higher chance of developing hypoglycaemia when compared to their term counterparts. One cross sectional study conducted by Savitha et al.[13] in Mysore, India shows the incidence of hypoglycaemia to be more in term neonates than late preterm neonates. This might be because the sample size was only 110 neonates, which is smaller when compared to the other studies. The increase in frequency of hypoglycaemia in late preterm neonates may be due to developmentally immature hepatic enzymes for gluconeogenesis and glycogenolysis. At the same time, they also have inadequate adipose tissue and decreased hepatic glycogen stores when compared to term neonates. Poor oromotor tone and difficulty in feeding of the late preterm neonates has also been attributed to be one of the causes of hypoglycaemia. Majority of the times hypoglycaemia is asymptomatic, but it can have disastrous neurological sequelae, so late preterm neonates need to be screened for hypoglycaemia.

Hypothermia in the neonatal period is an important issue worldwide. In the present study, 7.33 % of the late preterm neonates developed hypothermia, while only 1.67 % of the term neonates had it. This difference was significant with a p value of 0.000814. There are studies done in different parts of the world like United States of America, Taiwan, India, and Switzerland all showing a similar result, with an increased incidence of hypothermia in late preterm neonates. From literature, it is understood that the cause of this heightened risk of hypothermia in late preterm neonates due to their immature thermoregulatory system. Late preterm neonates have decreased amount of brown adipose tissue which plays the major role in non-shivering thermogenesis. The late preterm neonates have relatively smaller size, and increased ratio of surface area to body weight, resulting in greater heat loss compared to term neonates. All of these together add up and lead to an increased risk of hypothermia in late preterm neonates.

Neonatal sepsis is a very important condition, with it being recognized as the most common cause of neonatal mortality globally. In the present study, 10.67 % of the late preterm neonates had sepsis, compared to 2.33 % of

the term neonates. This was a significant difference with the p value being 0.00035. The study by Savitha et al.[13] conducted in Mysore, India has a comparable incidence on sepsis to the present study. Other studies have taken a different approach to sepsis, in that they have checked whether the neonates required to be investigated for sepsis (probable sepsis). In the study by Wang et al.[12] 36.7 % of the late preterm neonates, and 12.6 % of the term neonates underwent sepsis evaluation based on clinical features. In the study by Khashu et al.[14] infectious morbidity was 5.2 times higher in late preterm neonates than term neonates. But a study by Melamed et al.[15] from Israel found a 30-fold increase in infectious morbidity in late preterm neonates. This higher incidence may be due to the difference in the populations, risk factors for sepsis, and due to different definition for sepsis. The exact reason for the increased risk in late preterm neonates has not been mentioned in the studies, but looking into literature it can be seen that late preterm neonates have an immature immunologic system, which makes them more susceptible to infections.

The need for resuscitation soon after birth is a vital parameter and can lead to further morbidity or mortality. This is an aspect not extensively covered by investigators. Resuscitation implies that the neonate was experiencing apnoea or bradycardia and showed some degree of distress associated with perinatal asphyxia. Perinatal asphyxia could further increase the incidence of the morbidity related to late preterm birth like respiratory distress, hypoglycaemia, hypothermia and jaundice. In the present study, 18 % of the late preterm neonates required resuscitation, compared to 5 % of the term neonates. The study by Savitha et al.[13] conducted in Mysore, has a similar result to the present study. De Almeida et al.[16] conducted a multi-centric study, and it was concluded that late preterm neonates are at a much higher risk of needing resuscitation than term neonates. They even went into the details of the resuscitative procedures required, and it shows that a significantly higher number of late preterm neonates required positive pressure bag and mask ventilation, intubation and medications during resuscitation. The 1 minute and 5-minute APGAR (appearance, pulse, grimace, activity and respiration) scores were also lesser in late preterm neonates, signifying that they are at a much higher risk of long term neurological sequelae.

Along with resuscitation, the present study also showed that late preterm neonates required mechanical ventilation more frequently when compared to their term counterparts. In the present study, 4 % of the late preterm neonates required ventilation and only 0.67 % of the term neonates did. This is a significant difference with a p value of 0.006844. The studies by Gilbert et al.[17] Rather et al. and Natalie et al.[18] show a similar result to the present study, with more number of late preterm neonates requiring mechanical ventilation. Natalie et al. looked into the reasons requiring mechanical ventilation, and the most common cause was respiratory distress syndrome (RDS), followed by apnoea. The study also noted that late preterm neonates were more likely to develop air leak syndromes (1.3 % vs 0.1 %). The study also shows that late preterm neonates required mechanical ventilation for a longer period of time, prolonging hospital stay and increasing the cost of care.

Adequate weight gain is an important indicator of the health status of the neonates. If the weight gain is inadequate, the first most common reason would be feeding difficulties, with other reasons like diarrhoea, infections, anaemia also playing a role. In the present study, 26.33 % of the late preterm neonates had inadequate weight gain, compared to 7.67 % in term neonates. In a study conducted by Gupta et al.[19] in Meerut, India, which compared growth parameters between term and late preterm neonates, late preterm neonates had 5.6 times more risk of being underweight, and 3.6 times the risk of being wasted when compared to term neonates. In that study, late preterm neonates also had a lot of feeding difficulties 32 %, compared to 18.5 % of the term neonates. The troubles in feeding mainly included trouble in latching, not enough milk production, sleepy baby, and difficulty in the initiation of breast feeding. The results of the present study match in the sense that, it also portrays a higher incidence of inadequate weight gain in late preterm neonates. There has been lots of research in the feeding difficulties, and they show that late preterm neonates are at significantly higher risk of having feeding difficulties. Inadequate weight gain, and growth faltering was observed even in late preterm neonates that did not require any NICU admission at birth. This shows that late preterm neonates are a high-risk group and need to be monitored closely even if they seem to be well at the time of birth. They need to be followed up in high-risk clinics with special monitoring of growth faltering and feeding difficulties.

Once discharged from the hospital after birth, neonates sometimes require readmission to the hospital for various reasons. In the present study, 5.33 % of the late preterm neonates required hospital readmission compared to 1.33 % of the term neonates, with a p value of 0.00635. Studies by Jain et al.[20] and Escobar et al.[21] also show similar results, with the late preterm neonates requiring readmission to the NICU more often compare to the term neonates. In the study by Jain et al. the cause for the readmission was investigated, and it was found that late preterm neonates had jaundice, feeding problems and apnoea in a higher proportion compared to term neonates. Though not very common, hypothermia was also seen more often in late preterm neonates. The study by Kumar et al.[22] also had similar finding, but they divided the readmissions into 1st 2 weeks and 2nd 2 weeks. The causes within 2 weeks of life included jaundice, infection and feeding problems, whereas after 2 weeks the main causes included fever, pneumonia, and gastrointestinal problems. Kumar et al. noted that late preterm neonates were 3 times as likely to get readmitted. In a study by Oddie et al.[23] in the United Kingdom, they noted that late preterm neonates had the highest rate of readmission due to infectious disease, more so than jaundice. This was attributed to the differing approach in the management of jaundice in the UK. Shapiro-Mendoza[24] found that late preterm neonates being discharged early (< 4 days) were

at a greater risk of neonatal morbidity and readmission. With the late preterm neonates being at a higher risk of morbidity, it is surprising in the present study that they were not found at higher risk of mortality. In the present study, 3 % of the late preterm neonates had died, and 0.67 % of the term neonates did. Though the number is higher, the difference between the two was not significant with a p value of 0.033. Studies by Savitha et al. Rather et al. in contrary to the present study show that late preterm neonates had a higher rate of mortality. The difference in the findings might be attributed to the increased quality of care of the late preterm neonates over the past few years, which has then lead to decrease in mortality.

The present study showed that late preterm neonates were at an increased risk of morbidity when compared to term neonates, but with the increasing quality of care the mortality of the late preterm neonates has been decreasing, though the economic burden remains high. This study shows us that, late preterm neonates should be considered more like preterm neonates and need to be monitored carefully, to prevent adverse outcomes.

Contrary to the earlier belief that late preterm neonates are nearly mature, the present study proved that they suffer from significant increased risk of morbidity when compared to their term counterparts. The present study demonstrated the importance and magnitude of the risks of intercurrent conditions to which late preterm neonates are subjected to. Studies by Wang et al.[12] Rather GH et al. and Savitha M et al.[13] also share a similar result of increased risk of morbidity associated with a late preterm birth.

CONCLUSIONS

Late preterm neonates are physiologically immature and have limited compensatory responses to the extra uterine environment when compared with term neonates. They are at a significantly higher risk of morbidity during the neonatal period compared to term neonates. At birth they are more likely hospitalized than term neonates and are diagnosed with respiratory distress, hypoglycaemia, hypothermia, jaundice, and sepsis. They require resuscitation at birth and even mechanical ventilation more likely than their term counterparts. Late preterm neonates have a higher chance of rehospitalisation as well. Considering the significant morbidity faced by them, they should be treated as preterm neonates and monitored carefully and should not be looked upon as near-term. There is a need for further studies with a larger sample size including more centres so as to formulate evidence based separate plans of care for these late preterm neonates. There is a need to educate health care providers and parents regarding the vulnerability of late preterm neonates to the various morbidities. Appropriate discharge criteria and discharge advice, follow up plan is to be framed for late preterm neonates that is different from the term neonates. Given the high rate of acute complications, there is also a need for assessment of long-term outcome in this high-risk group.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.
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Disclosure forms provided by the authors are available with the full text of this article at jebmh.com.

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