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Assessment of Initial Morbidity Patterns in Late Preterm Infants Relative to Those at Term

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Abstract:- The purpose of this research was to assess the patterns of morbidity and mortality in late preterm neonates—that is, neonates born before 37 weeks of gestation. Preterm births are a major contributing factor to many deaths in children under five, with a larger percentage of deaths occurring during the neonatal era. The study was a prospective observational cohort study carried out at DDU Hospital in New Delhi in the neonatal intensive care unit of the pediatrics department.

While term neonates had a mean gestation distribution of 38.64 weeks, late preterm newborns had a mean distribution of 35.39 weeks. The distribution of mean birth weight was 2.35 (±0.48) and 3.04 (±0.43) kg. Males were seen often in both research groups.

The distribution of hypoglycemia among the study groups showed a significant difference, with late preterm infants having a higher incidence of the condition. The rate of post-resuscitation care varied significantly as well, with late preterm infants needing greater attention.

A statistically significant increase was observed in the incidence of respiratory distress in late preterm newborns. Compared to the other group, late preterm infants had a higher prevalence of jaundice and sepsis.

The study finds that compared to term newborns, late preterm infants had a higher risk of morbidity. To have a better understanding of these children's neonatal outcomes, more research is required.

I. INTRODUCTION

Babies born before the 37th week of pregnancy are called premature by the World Health Organization. (1) The Department of Health and Human Services has defined and defined the term "late preterm" for infants born between the 34th and 36th weeks of pregnancy. This term was previously used for babies close to term (2). The term “late preterm newborn” refers to a baby born between 340/7 and (36+6) weeks of gestation. However, the term newborn is defined as a child born between 370/7 and 416/7 weeks of gestation (3,4).

Research shows that these premature babies are overworked, either physically or metabolically, depending on the size and weight of the time it takes for birth. The difference between them is the neonatal results. Children born early and late are more likely to have childhood problems and long-term diseases than babies (4). jaundice, hyperbilirubinemia, apnea, hypothermia, necrotizing enterocolitis, anemia, infection, sepsis and bleeding (5). It is also important that these children have a higher risk of staying in the hospital for a longer period of time and being readmitted during pregnancy (6). One study found that premature babies had a seven times greater risk of childhood cancer and death than newborns (5). In addition to the main problems mentioned above, these children also face many nutritional problems, especially immaturity of absorption, swallowing reflexes and delayed breastfeeding (7). These problems also affect the child's development during infancy, causing growth to slow down, weight gain and failure to develop (8-10).

Although premature babies are an important group in the small group, they have not been researched much according to the language group. India's environmental science, in particular, is not encouraging. It is estimated that this group of premature births accounts for approximately 10% of all births in the world, so even a small increase in their rate could have enough impact on our current healthcare system. This stress is exacerbated by the increasing number of premature babies admitted to intensive care units (NICUs) around the world, especially in developing countries such as India. Studies on neonatal outcomes (morbidity and mortality) in these preterm babies are needed. (11)

For this reason, we conducted this study to evaluate the morbidity and mortality patterns in the premature baby group and focused on early side effects such as the need for reoperation, development of hypoglycemia, jaundice, and morbidity rate. sepsis and respiratory distress.

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II. MATERIAL AND METHODS

The study was conducted in the Pediatric Neonatal Intensive Care Unit of DDU Hospital, New Delhi, after obtaining ethics committee approval.

➢ *Study Population*

Late preterm and term newborns delivered in DDU Hospital, recruited in 2017. NICU after completing the inclusion criteria. If the patient does not remember the last menstrual period, the number of weeks + days of pregnancy is determined according to the last menstrual cycle or ultrasound.

➢ *Study Design*

A prospective observational study.

➢ *Study Period*

The study was conducted for one year, from April 2021 to September 2022, over a half-year period.

A. Methodology

The study was conducted at Deen Dayal Upadhyay Hospital, New Delhi, over a period of 18 months. All babies born prematurely and meeting the inclusion criteria during the NICU admission period were included in this study. Pregnancy is determined as weeks + days according to the woman's menstrual period or ultrasound. Babies were divided into three groups according to their gestational weight: AGA/SGA/LGA (Part 1). Preconfigured forms are used to collect information on sociodemographic details and medical information regarding pediatric diagnoses and examinations. After obtaining permission from the parents, analysis was carried out and relevant information was collected and entered into the data collection form. Newborns are then discharged or until they die. Morbidity included in the study was defined as follows:

- Post-resuscitation care: Post-resuscitation care should be provided according to the new NRP rules. (Appendix 2).
- Hypoglycemia: Blood sugar below 40 mg/dL. Monitor blood glucose every 12 hours at all stages of premature, IUGR (intrauterine growth restriction), IDM (infants of mothers with diabetes) and LGA (height, weight > 2SD) babies. Blood tests for anemia were also performed on all babies showing symptoms, in accordance with the doctor's decision.
- Jaundice: Clinically visible jaundice requires treatment or change according to the hour-specific total serum bilirubin (TSB) nomogram (AAP report (Appendix 3)). The following criteria: respiratory rate 60/min, subcostal/intercostal depression, expiratory grunt/dryness, and need for oxygen therapy.
- Sepsis: There will be sepsis. Positive sepsis screen (two out of five parameters, e.g. TLC <5000/mm or >15000/mm, band/total polymorph ratio >0.2, total neutrophil count <1800/mm3 or >7200/mm3, C-reactive protein > 0.5 mg/dL, platelets <100,000 mm); or confirmed sepsis: isolated from blood or cerebrospinal fluid or urine.

The process includes:

- Group 1: All premature babies between 340/7 weeks and 36+6 weeks.
- Group 2: Babies born in DDUH and admitted to the NICU between 370/6 and 416/7 weeks of gestation were included in this study.

➢ *Exclusion Criteria:*

- Babies with serious congenital anomalies.

➢ *Sample Size: 180*

➢ *Sample Size Calculation:*

The sample size was calculated according to the formula: Cochran's formula

$$\text{Sample size } N = \frac{r+1 \;\; x(z\alpha + z1\text{-}\beta)^2 * (p1*(1-p1) + p2*(1-p2))r}{(p1 - p2)^2}$$

The sample size for the study was based on a study by Jaiswal et al (2010) who reported the prevalence of any morbidity in late pre term and term babies as follows: (10)

Table 1 Prevalence of Any Morbidity

	Prevalence of Any Morbidity
Late Preterm	70.8%
Term	29.1%

r (ratio of number of patients in each arm) = 1p1 (prevalence in cases) = 0.708

p2 (prevalence in controls) = 0.291 Type I error (α) = 5%, $z\alpha$= 1.96

Type II error (β) = 1%, Power = 1 – β = 99%, $z1\text{-}\beta$= 2.326

Based on the formula given above, using the mentioned values, the sample size required wascalculated to be 87.27 (~**90**) per arm.

Thus, assuming 99% power and 95% confidence interval, the sample size required was finallyestimated to as **90** patients per arm (total 180).

➢ *Evaluation of Results of Interest*

- Premature babies requiring post-resuscitation care, hypoglycemia, jaundice, respiratory distress and sepsis, as well as the incidence of early cancer.
- Comparison of diseases of premature and term babies.

B. Research Methods:

Data were recorded and coded in the MS Excel spreadsheet program. Data analysis was performed using SPSS v23 (IBM Corp.). Descriptive statistics are presented as median/standard deviation and median/IQR for continuous variables, frequency and percentage for categorical variables. Where appropriate for data visualization, data is presented using histograms/boxes and charts/graphs for continuous data and charts/graphs for categorical data. In comparing continuous data groups, independent sample "t" is used when two groups are

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compared, and one-way analysis is used when more than two groups are compared. If the distribution is not normal, use the appropriate non-normality test in the form of the Wilcoxon test/Kruskal Wallis test. Chi-square test was used to compare categorical data. Statistical significance was maintained at $p<0.05$.

III. OBSERVATION AND RESULTS

Table 2: Sociodemographic Characteristics of the Study Participants (N=180)

Characteristics	Late preterm, n (%)or Mean (SD)	Term neonates, n(%) or Mean (SD)
Gestation (wks)	35.39 (±0.78)	38.64 (±1.11)
Birth weight (Kg)	2.35 (±0.48)	3.04 (±0.43)
APGAR at 1 min	7.43 (±0.8)	7.72 (±0.7)
APGAR at 5 min	8.49 (±0.6)	8.77 (±0.5)
Sex		
Female	40 (44.4)	43 (47.7)
Male	50 (55.6)	47 (52.3)
Weight for Gestation		
AGA	60 (66.7)	67 (74.4)
SGA	20 (22.2)	12 (13.3)
LGA	10 (11.1)	11 (12.2)
Mode of delivery		
Vaginal	37 (41.1)	41 (45.5)
Caesarean	53 (58.9)	49 (54.5)
Any previous morbidity		
Yes	43 (47.7)	40 (44.4)
No	47 (52.3)	50 (55.6)
Booking status		
Yes	75 (83.3)	72 (80.0)
No	15 (16.7)	18 (20.0)

Table 2 describes the sociodemographic characteristics of the study participants. The mean distribution of gestation among the late preterm infants was observed to be 35.39 (±0.78) and term neonates were observed to be 38.64 (±1.11) weeks. The mean birth weight distribution was observed to be 2.35 (±0.48) and 3.04 (±0.43) kgs among late preterm and term neonates. The mean distribution of APGAR scores at 1 min and 5 minutes among late preterm and term neonates were also overserved to be 7.43 (±0.8) vs 7.72 (±0.7) and 8.49 (±0.6) vs 8.77 (±0.5).We observed that males were commonly encountered in both study groups. Small for gestational age children were commonly seen among the late preterm infants when compared to term infants. C section were also commonly observed among the late preterm infants compared to term infants. Almost half of the infants in both study groups had some comorbidityor the other. With respect to the booking status we observed that almost 4/5 of the study participants in both study groups had been previously booked.

Table 3: Comparison of General Characteristics and Clinical Characteristics of the StudyParticipants between the Study Groups (N=180)

Characteristics	Total,	Late preterm, n(%) or Mean (SD)	Term neonates,n (%) or Mean(SD)	P value
Age group				
Gestation (wks)	37.39 (±0.58)	35.39 (±0.78)	38.64 (±1.11)	0.49
Birth weight (Kg)	2.89 (±0.81)	2.35 (±0.48)	3.04 (±0.43)	0.35
APGAR at 1 min	7.53 (±0.7)	7.43 (±0.8)	7.72 (±0.7)	0.78
APGAR at 5 min	8.69 (±0.9)	8.49 (±0.6)	8.77 (±0.5)	0.13
Sex				
Male	83	40 (44.4)	43 (47.7)	0.78
Female	97	50 (55.6)	47 (52.3)	
Weight for Gestation				
AGA	127	60 (66.7)	67 (74.4)	0.65
SGA	31	20 (22.2)	12 (13.3)	
LGA	21	10 (11.1)	11 (12.2)	
Mode of delivery				
Vaginal	78	37 (41.1)	41 (45.5)	0.91
Caesarean	102	53 (58.9)	49 (54.5)	
Any previous morbidity				

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Yes	83	43 (47.7)	40 (44.4)	0.47
No	97	47 (52.3)	50 (55.6)	
Booking status				
Yes	147	75 (83.3)	72 (80.0)	0.56
No	33	15 (16.7)	18 (20.0)	

Table 3 explains the comparison of general characteristics and clinical characteristics of the study participants between the study groups (N=180). We noted that the groups were comparable with respect to socio demographic and clinical characteristics indicating that thegroups were comparable with respect to the baseline characteristics (p value >0.05)

➢ *Outcome Measurement:*

Table 4: Comparison of Outcome Parameters Between the Study Groups (N=180)

Characteristics	Total,	Late preterm,n (%)	Term neonates, n(%)	P value
Post resuscitation care				
Yes	23	16 (17.7)	7 (7.7)	0.04
No	157	74 (82.3)	83 (92.3)	
Hypoglycaemia				
Yes	8	6 (6.7)	2 (2.3)	0.05
No	172	84 (93.3)	88 (97.7)	
Respiratory distress				
Yes	40	31 (34.4)	9 (10.0)	0.001
No	140	59 (65.6)	81 (90.0)	
Jaundice				
Yes	24	17 (18.8)	7 (7.7)	0.04
No	156	73 (81.2)	43 (92.3)	
Sepsis				
Yes	24	20 (22.2)	4 (4.4)	0.001
No	156	70 (77.8)	86 (95.6)	

Table 4 represents the comparison of outcome parameters between the study groups. We observed that there was significant difference in the distribution of hypoglycaemia across the study groups with late preterm infants accounting for more hypoglycaemia cases (p value 0.05),we also observed that there was significant difference in the incidence of post resuscitation care across the study groups with late preterm infants requiring more care (p value 0.04) With respect to incidence of respiratory distress also we observed that late preterm infant had higherincidence and was found to be statistically significant (p value 0.001) In cases of incidence ofjaundice (p value 0.04) and sepsis (p value 0.001) also we observed that late preterm infants had more incidence of cases when compared to the other group .

IV. DISCUSSION

A prospective observational study was conducted in the neonatal intensive care unit of a tertiary hospital to compare the prevalence of preterm birth and infants born at neonatal term over 18 months. The primary objective is to estimate the incidence of early neonatal complications such as post-resuscitation care, hypoglycemia, jaundice, respiratory distress, and sepsis in premature newborns and compare with infants. Existing studies in this field have focused on the western region, and there is no information from India, especially Northern India. (12)

Research shows that the average gestational age of premature babies is 35.39 weeks, and the average gestational age of term babies is 38.64 weeks. Mean birth weight was 2.35 (± 0.48) and 3.04 (± 0.43) kg, which is consistent with previous studies showing a higher dispersion of infants born prematurely.

According to previous studies, the distribution of APGAR scores for preterm and term newborns are 7.43 (± 0.8) and 7.72 (± 0.7) and 8.49 (± 0.6) respectively. It was 8.77 (± 0.5). Most men were in both study groups, but this difference may be due to study variables such as demographic characteristics, comorbidity profile, and education. (13, 14)

Smallness for gestational age in preterm babies and cesarean delivery suggests that SGA is an important risk factor in determining the outcome of preterm birth. SGA increases the mortality rate of preterm and early deaths in infants, possibly due to the additive effect on other morbidity and mortality or the increase of two types of disease in the body. Studies by Pulver et al and Baretto et al have shown that SGA and preterm newborns are at risk for problems such as prematurity, neonatal asphyxia,

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hypothermia, hypoglycemia, hypocalcemia, polycythemia, sepsis and higher mortality. The outcome of preterm cesarean delivery may be due to problems during pregnancy and fetal hypoxia, which may lead to elective or emergency cesarean section. (15) The study found that hypoglycemia was more common in premature babies than in term babies. This finding is similar to those of Morrochella et al., who found a significant difference in the incidence of hypoglycemia between preterm and term infants.

According to study findings, post-resuscitation care is more common in preterm infants compared to term infants, and there are significant associations. This finding is consistent with previous research by Rasania et al. and Kabilan et al. Respiratory distress is also more common in premature babies than in term babies. This relationship has also been found to be important. There were also significant differences in the incidence of sepsis between premature and term infants; There was a significant difference between premature babies. These findings are consistent with previous studies by Garg et al. Jaiswal et al also found a significant difference in the incidence of sepsis between premature and term infants. Overall, this study highlights the importance of postoperative care, respiratory distress, jaundice, and sepsis distribution in nursing care.(16, 17)

Understanding the risk of morbidity in preterm babies is important for caregivers to predict and manage the morbidity of preterm babies. The patient remained at home and was later discharged. (18) This information can also guide decisions about non-urgent obstetric interventions. In a study conducted in Northern India, it was reported that morbidity increased in preterm babies compared to term babies and significant differences in case distribution were detected, and further research was needed on this subject. (19, 20)

V. CONCLUSION

A total of 180 babies, 90 late preterm and 90 term, were included in our study. We observed a mean gestational age distribution of 38.64 (± 1.11) weeks between infants and premature infants, with a majority of males in both groups. Analysis of the results using the chi-square test showed significant differences in infant rates of hypoglycemia, postnatal care, respiratory distress, jaundice and sepsis, preterm birth and time compared. Based on our findings, we concluded that premature babies are more likely to contract infection than normal babies.

VI. STRENGTHS AND LIMITATIONS

➢ *Strengths*

Our study had several strengths:

- Ours was one among the very few studies that compared the clinical presentation late preterm and term infants of from a North Indian hospital-based setting.
- Ours was one among the very few studies that tried to establish the association between the incidence of morbidities between late preterm and term infants from a North Indianhospital-based setting.

➢ *Limitations*

Despite all our study had certain limitations:

- Limitations of this study are generally attributed to the observational nature of this study and the constraints of the ability to establish causal relationships between the exposure and outcome
- The findings are generalisable only to similar study settings, as the study was conducted only from one single centre in North India

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