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Original Research Article

Preterm Neonates Admitted to the Neonatal Intensive Care Unit at a Tertiary Care Centre

Harsha[1], Rahul R.S.[2], Sahana K.[3]

[1]Assistant Professor, Department of Pediatrics, KIMS, Koppal, India
[2]CMO, KHPIMS, Gadag, Karnataka, India
[3]Junior Resident, Department of Pediatrics, KHPIMS, Gadag, India

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Corresponding Author: Dr. Harsha
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Abstract

Background: Preterm neonates are highly vulnerable to respiratory, infectious, metabolic, and neurological complications and contribute substantially to neonatal intensive care unit (NICU) morbidity and mortality, particularly at lower gestational ages and birth weights.

Objective: To evaluate the clinical profile, indications for admission, mortality patterns, and short-term outcomes of neonates admitted to the NICU, with particular emphasis on prematurity and related risk factors.

Methods: This hospital-based cross-sectional observational study was conducted in the NICU of Koppal Institute of Medical Sciences (KIMS), Koppal, Karnataka, India, from 1 December 2025 to 31st December 2025. A total of 218 neonates were included.

Results: Of the 218 neonates, 135 (61.93%) were male and 147 (67.4%) were inborn. Preterm neonates accounted for 69 (31.7%) admissions, while 146 (67.0%) were full term. Respiratory distress was the most frequent specified indication for admission, occurring in 42 (19.3%) neonates, followed by perinatal asphyxia in 38 (17.4%) and low birth weight <1800 g in 28 (12.8%). Overall mortality was 34 (15.6%). Mortality was substantially higher among preterm than term neonates, 29.0% versus 8.9%. Mortality reached 66.7% among neonates born at <28 weeks and 76.5% among those born at 28 to <32 weeks. Similarly, mortality was 75.0% among neonates weighing <1000 g and 63.6% among those weighing 1000–1499 g.

Conclusion: Prematurity, lower gestational age, and low birth weight were strongly associated with adverse neonatal outcomes. Respiratory distress, birth asphyxia, and low birth weight were major causes of NICU admission, while HIE, respiratory distress syndrome, extremely low birth weight, and sepsis were the principal contributors to mortality.

Keywords: Preterm Neonates; NICU; Low Birth Weight; Respiratory Distress; Neonatal Mortality.

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Introduction

Preterm birth is one of the most prevalent causes of neonatal morbidity and mortality worldwide and is defined as birth occurring before 37 completed weeks of gestation [1]. Despite recent advances in obstetric and neonatal care, the survival of prematurely born infants, especially those born very preterm, remains good, but prematurely born fetuses represent a significant proportion of admissions to neonatal intensive care units (NICUs). Physiological immaturity impairs a variety of organ systems and puts them at higher risk of respiratory, neurological, infectious, metabolic, and gastrointestinal complications, as well as developmental complications during the early neonatal period [2]. Gestational age and birth weight are closely associated with risk of adverse outcomes in preterm neonates. Extremely preterm and very preterm infants produce less surfactant, have less control of breathing, have compromised cerebral blood vessels, gastrointestinal tract and thermoregulatory systems, and a less mature immune system [3]. This results in an increased risk of respiratory distress syndrome, apnea of prematurity, intraventricular hemorrhage, necrotizing enterocolitis, neonatal sepsis, hypoglycemia, hypothermia and feeding intolerance. Prematurity is frequently accompanied by low and very low birth weight, and these also create a high need for intensive monitoring and supportive care [4].

There are several factors related to the mother and to pregnancy that are associated with preterm delivery. Such as hypertensive disorders of pregnancy, multiple pregnancy, maternal infection, antepartum hemorrhage, cervical insufficiency, fetal growth

restriction and previous preterm birth. Sometimes, delivering the baby early is medically necessary when it is safer for the mother or baby if the baby is born early [5]. Being able to identify these factors during antenatal care is crucial as antenatal steroids can be administered early if indicated, the mother can be transferred appropriately, and neonatal resuscitation preparedness can be improved, which will have a positive impact on early neonatal outcomes [6]. Preterm neonates admitted to the NICU often need respiratory support, temperature control, parenteral and/or enteral nutritional support, treatment for infection, correction of metabolic disturbances, and extended hospital stay. Respiratory problems continue to be one of the major reasons for intensive care admission, especially respiratory distress syndrome due to surfactant deficiency [7]. Treatment may involve supplemental oxygen, continuous positive airway pressure, mechanical ventilation and surfactant replacement depending on gestational age and severity of the disease. Meanwhile, attentive fluid management, early feeding with breast milk, infection prevention, and developmental supportive care are important aspects of neonatal care [8]. Premature neonates have widely varied clinical outcomes. Other factors that increase the risk of death and long-term disability are related to the decreasing gestational age and birth weight of many moderately preterm infants [9]. Very low birth weight children can continue to have risks of bronchopulmonary dysplasia, retinopathy of prematurity, hearing loss, cerebral palsy, neurodevelopmental delay, and poor growth. Long stays in the NICU also place a significant emotional and financial strain on families and have a higher impact on health care resources [10-13].

Objective

To evaluate the clinical profile, indications for admission, mortality patterns, and short-term outcomes of neonates admitted to the NICU, with particular emphasis on prematurity and related risk factors.

Methodology

This is a cross-sectional observational study carried out in the Neonatal Intensive Care Unit (NICU) of Koppal Institute of Medical Sciences (KIMS), Koppal, Karnataka, India, from 1st December, 2025 to 31st December 2025. Non-probability consecutive sampling was used to include 218 neonates admitted to the NICU over the study period. Only preterm neonates (those born before 37 completed weeks of gestation) admitted to the NICU during the study period were included in the study. The obstetric assessment, last menstrual period, or early antenatal ultrasonography was used to establish the gestational age when obstetric dating was not available, or clinical judgment when the latter was not available. Preterm neonates with a gestational age of less than 37 completed weeks who were admitted to the NICU during the study period and who had complete clinical records of the mother, obstetric, delivery, and neonatal history were included. Neotrixation was open to both inborn and outborn neonates and neonate of both sexes. The neonates were excluded if they were born at the time of gestation ≥37 weeks, neonates with major lethal congenital malformations or chromosomal abnormalities, and those neonates whose clinical records were incomplete and lacked information on gestational age, birth weighting, diagnosis on admission, or the outcome. Preterm neonates were classified as extremely preterm gestation (<28 weeks), very preterm gestation (28-<32 weeks), moderate preterm gestation (32-<34 weeks), and late preterm gestation (34-<37 weeks). Birth weight was measured and classified as extremely low birth weight (<1000 g), very low birth weight (1000–1499 g), low birth weight (1500–2499 g), and ≥2500 g.

Data Collection: Data were gathered from NICU admission registers, neonatal case records, delivery notes and maternal obstetric records by employing a structured proforma. Data collected were sex, gestational age, birth weight, age at admission, place of delivery, source of admission, mode of delivery, Apgar score at birth, need for resuscitation, and length of NICU stay. Maternal and obstetric information recorded were: age of mother, parity, antenatal care, hypertension in pregnancy, anemia, diabetes mellitus, multiple pregnancy, premature rupture of membranes, antepartum bleeding, maternal infection, fetal growth restriction, fetal abnormal presentation, fetal distress, and mode of delivery. Each neonate had a chief reason for admission to the NICU. The clinical conditions assessed were respiratory distress syndrome, apnea of prematurity, neonatal sepsis, birth asphyxia, neonatal jaundice, hypoglycaemia, hypothermia, feeding intolerance, NEC, neonatal convulsions and other complications of prematurity. Documented where appropriate, requirement for oxygen therapy, continuous positive airway pressure, mechanical ventilation, surfactant, intravenous fluids, phototherapy, antibiotics and nutritional support. The main goal was to characterize clinical features and short-term outcomes of preterm neonates admitted to the NICU. Secondary outcomes were neonate distribution by gestational age and birth weight, typical reasons for admission to the NICU, major neonatal complications, respiratory support needs, NICU stay and mortality. Outcomes included discharged, referred to another health care unit, left AMA, and expired in hospital.

Statistical Analysis: The data were inputted into the computer spreadsheet program "Microsoft Excel" and analyzed on the computer using "IBM SPSS Statistics". Continuous variables like gestational

age, birth weight and length of stay in NICU were presented as mean ± SD or median (IQR) depending upon the data distribution. Frequencies and percentages were used to summarize categorical variables. p values < 0.05 were deemed statistically significant.

Results

Among 218 neonates admitted to the NICU, 147 (67.4%) were inborn and 71 (32.6%) were outborn. Males predominated, accounting for 135 (61.93%) admissions, while 83 (38.07%) were females. Most neonates were admitted within the first day of life, 135 (61.9%), followed by 65 (29.8%) at 1–3 days, 10 (4.6%) at 4–7 days, 6 (2.8%) at ≥15 days, and 2 (0.9%) at 8–14 days. Full-term neonates constituted 146 (67.0%) admissions, while 69 (31.7%) were preterm and 3 (1.4%) post-term. Gestational age was 37 to <42 weeks in 146 (67.0%), 34 to <37 weeks in 34 (15.6%), 28 to <32 weeks in 17 (7.8%), 32 to <34 weeks in 15 (6.9%), <28 weeks in 3 (1.4%), and ≥42 weeks in 3 (1.4%). Regarding admission weight, 106 (48.6%) weighed ≥2500 g, 93 (42.7%) weighed 1500–2499 g, 11 (5.0%) weighed 1000–1499 g, and 8 (3.7%) weighed <1000 g.

Table 1: Demographic and admission characteristics of neonates (n=218)

Variable	n (%)
Admission source	
Inborn	147 (67.4)
Outborn	71 (32.6)
Sex	
Male	135 (61.93)
Female	83 (38.07)
Age on admission	
<1 day	135 (61.9)
1–3 days	65 (29.8)
4–7 days	10 (4.6)
8–14 days	2 (0.9)
≥15 days	6 (2.8)
Maturity	
Preterm	69 (31.7)
Full term	146 (67.0)
Post-term	3 (1.4)
Gestational age	
<28 weeks	3 (1.4)
28 to <32 weeks	17 (7.8)
32 to <34 weeks	15 (6.9)
34 to <37 weeks	34 (15.6)
37 to <42 weeks	146 (67.0)
≥42 weeks	3 (1.4)
Weight on admission	
<1000 g	8 (3.7)
1000–1499 g	11 (5.0)
1500–2499 g	93 (42.7)
≥2500 g	106 (48.6)

Miscellaneous indications accounted for the largest group of NICU admissions, with 48 (22.0%) cases. Respiratory distress was the most frequent specified indication, occurring in 42 (19.3%) neonates, followed by perinatal asphyxia in 38 (17.4%) and low birth weight <1800 g in 28 (12.8%). Neonatal jaundice was present in 15 (6.9%), meconium aspiration in 9 (4.1%), and prematurity <34 weeks and hyperthermia >37.5°C in 8 (3.7%) each. Congenital malformation and neonatal convulsions were each recorded in 5 (2.3%), while refusal to feed, baby of a diabetic mother, hypothermia <35.4°C, and other specified indications were each observed in 3 (1.4%) neonates.

Table 2: Indications for NICU admission (n=218)

Indication for admission	n (%)
Any other	48 (22.0)
Respiratory distress	42 (19.3)
Perinatal asphyxia	38 (17.4)
Low birth weight <1800 g	28 (12.8)
Neonatal jaundice	15 (6.9)
Meconium aspiration	9 (4.1)
Prematurity <34 weeks	8 (3.7)
Hyperthermia >37.5°C	8 (3.7)
Congenital malformation	5 (2.3)
Neonatal convulsions	5 (2.3)
Refusal to feed	3 (1.4)
Baby of diabetic mother	3 (1.4)
Hypothermia <35.4°C	3 (1.4)
Other indication as labeled in source	3 (1.4)

Mortality was slightly higher among females than males, 14 (16.9%) versus 20 (14.8%), and among outborn than inborn neonates, 13 (18.3%) versus 21 (14.3%). Preterm neonates had substantially higher mortality than full-term neonates, 20 (29.0%) versus 13 (8.9%), while 1 of 3 (33.3%) post-term neonates died. Mortality was highest among neonates born at 28 to <32 weeks, 13 (76.5%), followed by <28 weeks, 2 (66.7%), ≥42 weeks, 1 (33.3%), 32 to <34 weeks, 3 (20.0%), 37 to <42 weeks, 13 (8.9%), and 34 to <37 weeks, 2 (5.9%).

Table 3: Mortality according to neonatal characteristics (n=218)

Variable	Admissions, n	Mortality, n (%)
Overall	218	34 (15.6)
Sex		
Male	135	20 (14.8)
Female	83	14 (16.9)
Admission source		
Inborn	147	21 (14.3)
Outborn	71	13 (18.3)
Maturity		
Preterm	69	20 (29.0)
Full term	146	13 (8.9)
Post-term	3	1 (33.3)
Gestational age		
<28 weeks	3	2 (66.7)
28 to <32 weeks	17	13 (76.5)
32 to <34 weeks	15	3 (20.0)
34 to <37 weeks	34	2 (5.9)
37 to <42 weeks	146	13 (8.9)
≥42 weeks	3	1 (33.3)
Weight on admission		
<1000 g	8	6 (75.0)
1000–1499 g	11	7 (63.6)
1500–2499 g	93	10 (10.8)
≥2500 g	106	11 (10.4)
Age on admission		
<1 day	135	27 (20.0)
1–3 days	65	5 (7.7)
4–7 days	10	1 (10.0)
8–14 days	2	0 (0.0)
≥15 days	6	1 (16.7)

Among 34 neonatal deaths, HIE/moderate-to-severe birth asphyxia was the leading cause, accounting for 14 (41.2%) deaths, followed by respiratory distress syndrome in 7 (20.6%), extremely low birth weight in 6 (17.6%), sepsis in 6 (17.6%), and pneumonia in 1 (2.9%).

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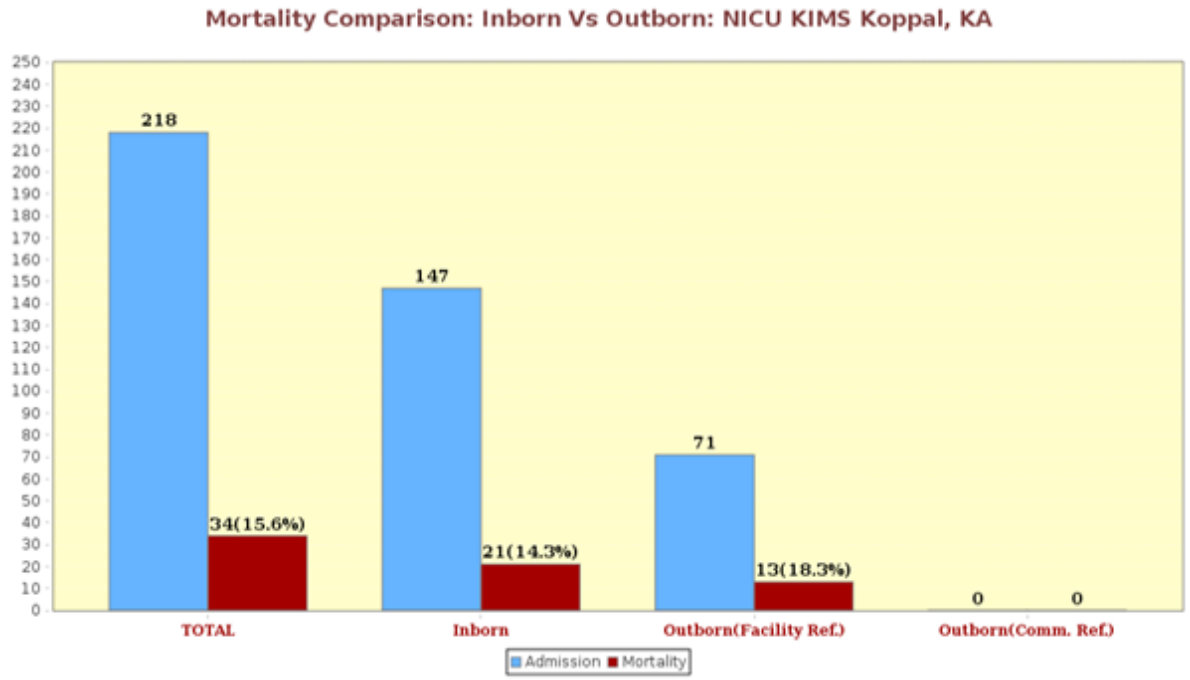

Figure 1: Causes of neonatal mortality according to inborn and outborn status (n=34)

Among the 198 neonates with documented treatment outcomes, 151 (76.3%) were discharged, 34 (17.2%) expired, 8 (4.0%) left against medical advice, and 5 (2.5%) were referred. Among six documented referral diagnoses, congenital heart disease was the most frequent, accounting for 2 (33.3%) cases, while respiratory distress syndrome with meconium aspiration syndrome, duodenal atresia, refractory seizures with suspected inborn error of metabolism, and congenital diaphragmatic hernia each accounted for 1 (16.7%) referral.

Table 4: Treatment outcomes and documented referral diagnoses during December 2025

Variable	n (%)
Treatment outcomes (n=198)	
Discharged	151 (76.3)
Expired	34 (17.2)
LAMA	8 (4.0)
Referred	5 (2.5)
Documented referral diagnoses (n=6)	
Congenital heart disease	2 (33.3)
RDS with meconium aspiration syndrome	1 (16.7)
Duodenal atresia	1 (16.7)
Refractory seizures with suspected inborn error of metabolism	1 (16.7)
Congenital diaphragmatic hernia	1 (16.7)

Discussion

The present study evaluated the demographic profile, indications for admission, mortality patterns, and short-term outcomes among 218 neonates admitted to the NICU at KIMS, Koppal. Preterm neonates constituted 69 (31.7%) of all admissions, while 146 (67.0%) were full term and 3 (1.4%) were post-term. Male neonates predominated, accounting for 61.93% of admissions, and approximately two-thirds of the neonates were inborn. Most admissions occurred within the first 24 hours of life, highlighting the concentration of neonatal morbidity during the immediate postnatal period. Previous research from tertiary neonatal units has similarly demonstrated that prematurity, respiratory morbidity, birth asphyxia, and low birth weight account for a substantial proportion of early NICU

admissions. Respiratory distress was the most frequent specified indication for admission, affecting 42 (19.3%) neonates, followed by perinatal asphyxia in 38 (17.4%) and low birth weight below 1800 g in 28 (12.8%). Neonatal jaundice, meconium aspiration, prematurity below 34 weeks, and hyperthermia were other important causes of admission. Previous research has consistently identified respiratory distress syndrome as a major contributor to morbidity among premature neonates because of structural and functional pulmonary immaturity and inadequate surfactant production. The relatively high contribution of perinatal asphyxia in the present study also emphasizes the importance of effective intrapartum monitoring and immediate neonatal resuscitation [14].

Overall mortality among the 218 NICU admissions was 34 (15.6%). Prematurity was strongly associated with poorer survival, with mortality occurring in 20 (29.0%) preterm neonates compared with 13 (8.9%) full-term neonates. This finding is consistent with previous research showing a strong inverse relationship between gestational age and neonatal survival. Physiological immaturity among preterm infants affects respiratory control, thermoregulation, cardiovascular adaptation, immunity, gastrointestinal function, and neurological stability, resulting in substantially increased vulnerability during the neonatal period. The relationship between gestational age and mortality was particularly striking. Mortality was 66.7% among neonates born before 28 weeks and 76.5% among those born between 28 and <32 weeks, compared with only 20.0% among those born at 32 to <34 weeks and 5.9% among late-preterm neonates born at 34 to <37 weeks. Previous research has similarly demonstrated that extremely and very preterm infants experience the greatest risk of death because of severe respiratory distress syndrome, apnea, sepsis, intraventricular hemorrhage, feeding difficulties, and other complications of immaturity [15,16]. The sharp improvement in survival among neonates beyond 34 weeks observed in this study reflects the important influence of advancing fetal maturation on neonatal outcome. Mortality was also higher among outborn neonates than among inborn neonates, 18.3% versus 14.3%, respectively. Previous research has reported similar differences, particularly in settings where referred neonates experience delays in stabilization and transportation [17,18]. Outborn infants may arrive with hypothermia, hypoglycemia, respiratory compromise, infection, or advanced illness, all of which may adversely influence survival. Strengthening neonatal transport systems, pre-referral stabilization, thermal protection, airway and respiratory support, and timely communication between referring and receiving facilities may therefore contribute to improved outcomes. The treatment-outcome data showed that 151 (76.3%) neonates were discharged successfully, while 34 (17.2%) expired, 8 (4.0%) left against medical advice, and 5 (2.5%) were referred [19]. Despite the substantial mortality burden, most admitted neonates therefore achieved a favorable short-term outcome. Nevertheless, the high mortality observed among extremely preterm and very-low-birth-weight neonates indicates the need for continued strengthening of antenatal corticosteroid administration, delivery-room stabilization, early respiratory support, surfactant availability, infection prevention, thermoregulation, nutritional support, and monitoring for complications of prematurity [20].

Limitations

This study had several limitations. It was conducted over a short one-month period at a single tertiary-care NICU, which may limit the generalizability of the findings and may not capture seasonal variations in neonatal admissions and outcomes. The study was based primarily on routinely documented hospital records, and some maternal, obstetric, neonatal, treatment, and follow-up variables were not uniformly available for all infants. Although 218 NICU admissions were analyzed, complete treatment-outcome data were available for only 198 neonates, and the documented referral counts also showed some discrepancy, which may have introduced information bias. In addition, the study focused mainly on short-term in-hospital outcomes and did not assess long-term growth, neurodevelopment, chronic lung disease, retinopathy of prematurity, hearing impairment, or other complications among surviving preterm neonates.

Conclusion

Preterm neonates constituted a substantial proportion of NICU admissions and experienced markedly poorer outcomes than term neonates, particularly at lower gestational ages and birth weights. Respiratory distress, perinatal asphyxia, and low birth weight were among the leading indications for NICU admission, while hypoxic-ischemic encephalopathy, respiratory distress syndrome, extremely low birth weight, and sepsis were the major contributors to neonatal mortality. Mortality was especially high among extremely and very preterm infants, very low birth weight neonates, and outborn admissions. Despite these risks, most neonates were discharged successfully.

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