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# Pattern and Outcome of Preterm Newborns Admiited to NICU Bacha Khan Medical Complex /Gajju Khan Medical Complex Swabi

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## ABSTRACT

Prematurity remains a leading contributor to neonatal morbidity and mortality, particularly in low-resource countries such as Pakistan. Despite improvements in neonatal intensive care services, preterm infants continue to experience high rates of adverse outcomes. Identifying local determinants of neonatal morbidity and mortality is essential for targeted interventions. To determine the spectrum of morbidities and predictors of clinical outcomes among preterm neonates admitted to the Neonatal Intensive Care Unit (NICU) of Bacha Khan Medical Complex, Swabi.This prospective cohort study was conducted over 18 months (January 2024-June 2025) and included 221 preterm neonates (<37 weeks gestation). Data regarding gestational age, birth weight, gender, maternal and perinatal factors, major morbidities, oxygen requirement, duration of hospital stay, and outcomes were collected. Descriptive statistics and chi-square tests were applied using SPSS version 23, with $p<0.05$ considered significant. The mean gestational age was 31.6 ± 2.1 weeks and mean birth weight was 1558 ± 425 g. Most neonates were very preterm (34.4%) or moderate preterm (33%), and 58.8% were low birth weight. Sepsis (39.4%), jaundice (32.1%), congenital heart disease (8.6%), and oxygen requirement (59.2%) were the common morbidities. Overall, 62.9% of neonates improved while 37.1% expired. Mortality was significantly higher among extremely preterm and extremely low birth weight infants ($p<0.001$). Sepsis and congenital heart disease were also strongly associated with poor outcomes. Prematurity, low birth weight, sepsis, and congenital heart disease are major predictors of adverse outcomes among NICU-admitted neonates. Strengthening antenatal care, infection control practices, and NICU facilities is essential to further reduce neonatal mortality in this region.

## INTRODUCTION

Birth is a complex process which involves various systems of the human body to ensure a safe outcome of that stressful phase of life. Some newborns are born prematurely due to various natural & induced phenomena. (1) Newborns need special care as their body is unknown to the outside world. Preterm specifically requires special attention as their body is not fully developed to bear any kind of stress full situation (2). Therefore, resulting in overall greater morbidity & mortality ratio among children under 5 years of age but in now a day the survival rate of babies, especially premature neonates, has increased dramatically in recent decades due to advancements in neonatal care services. newborn admissions and the ensuing newborn morbidities are therefore increasing (3,4).

In South Asia, Pakistan had the highest death rate (75 deaths per 1000) for children under five, majority being contributed by preterm & term newborns. (5) When it comes to neonatal deaths that happen within the first 24 hours of life, Pakistan is in third place worldwide. It bears the most burden when compared to nearby nations like Bangladesh (17%), India (22.7%), and Afghanistan (37%), with a neonatal mortality rate of 42.0%. (6)

According to the WHO's 2030 Agenda for Sustainable Development, the newborn mortality rate should be reduced to fewer than 12 per 1000 live births. (7) Newborn mortality has generally decreased but still, newborn mortality has continued to drop at a far slower rate. Neonatal mortality is a result of the persistent existence of significant health disparities across a number of factors, including geography, wealth, and ethnicity, both within and between nations. (5,7)

Most common pathologies contributing to pre-term & term mortalities are hypoxic ischemic encephalopathy-the infant's brain didn't get enough oxygen during birth resulting in severe brain injury. (8) Low birth weight when the newborn has less than 2500 grams of weight. (9)



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Respiratory distress syndrome is defined as when newborn lungs don't have enough surfactant resulting in collapsed lung. (10) Neonatal jaundice due to either insufficiency of newborns liver or increased production of peripheral bilirubin. (11) Congenital heart anomalies are resulting in malformed heart or great vessels resulting in severe cardiopulmonary compromise and Sepsis representing severe body response to infection. (11,12)

The objective of this study is to identify the prevalent causes of death and morbidity in our area, the goal of this study is to ascertain the pattern of diseases and their outcomes in neonatal intensive care units (NICUs).

## METHODOLOGY

This is a prospective / cohort study held at the Department of Pediatric in Bacha Khan Medical Complex Swabi.

**Sample Size:** 216 Sample size was calculated considering monthly admissions of preterm at NICU-Bacha Medical Complex Swabi over the time period of 18-months (Starting from 1 Jan 2024 till 30 June 2025).

**Sampling type:** Samples were selected consecutively and followed.

**Duration of study:** 18 months (1 January 2024 till 3rd June 2025)

### Inclusion Criteria

All Preterm born before 37-gestational weeks & admitted at Neonatal intensive care unit (NICU)- Bacha khan medical complex Swabi.

### Exclusion Criteria

Infants born after 37 gestational weeks admitted at Neonatal intensive care unit (NICU)- Bacha khan medical complex Swabi and those Infants who were born dead.

### Data Collection

The data was collected using an online questionnaire which was self-made (considering all variables regarding preterm infant) from the NICU-Pead's Department of Bacha Khan Medical Complex Swabi. The proforma that included the following variables, gestational age of the newborn, birth weight, gender, premature rupture of membranes (PROM), mode of delivery, length of hospital stays, presence of sepsis, jaundice, congenital heart disease (CHD), respiratory distress, need for oxygen support, and final clinical outcome.

### Statistical Analysis

Statistical analysis was be done using online google forms statistical services & SPSS version 23. Descriptive statistics were used to summarize the data. Numerical variables such as gestational age, birth weight, and length of hospital stay were presented as mean ± standard deviation and their skewness were analyzed. Categorical variables such as gender, mode of delivery, PROM, morbidities, oxygen requirement, and final outcomes were expressed as frequencies and percentages. Chi square test was used to assessed the association between categorical variables. A p value of less than 0.05 was considered as statistically significant.

## RESULTS

A total of 221 neonates were analyzed, 123 were male and 98 were female. Table 1 shows the mean gestational age was 31.6 ± 2.1 weeks (range 25–36 weeks) and the distribution was slightly skewed to the left, which shows neonates had gestational ages above the mean. Most of the neonates were very preterm (34.4%) or moderate preterm (33%). Late and extremely preterm were 23.5% and 9 respectively. This means that most of NICU neonates were born 28 and 34 weeks of gestational age.

Table 1 shows that the average weight was 1558.3 ± 425 grams (range 720–2700 grams) and distribution slightly skewed to lower weights, showing that most neonates had birth weight below the mean. Majority of the neonates were low birth weight (58.8%) or very low birth weight (27.1%). Extremely low birth weight accounted for 13.1%, while only 0.9% had birth weights ≥2500 g. This means that most NICU neonates had birth weights range between 1000 and 2499 grams.

The perinatal conditions of mother and neonates shown in table 2 revealed that majority of delivery were Normal Vaginal delivery (NVD) 97.3% and other 2.8 % were delivered from mother with Cesarian or Episiotomy. Premature rupture of membrane (PROM) was observed in only 19.5%.

Table 3 shows perinatal morbidities in this study includes developing of Sepsis, Jaundice, Congenital Heart Disease (CHD) and Oxygen Requirement for the neonates in 87(39.4%), 71(32.1%), 19 (8.6%) and 131 (59.23%) respectively. Figure 1 represents oxygen requirements in details.

In this study the clinical outcomes were measured as 62.9% of study population showed clinical improvement while 37.1% died, indicating that nearly two-thirds of the neonates had a favorable outcome. Further more the length of hospital stays was 5.7 ± 5.8 days (median 4 days, range 1–46 days), indicating that a short group of neonates has long length of hospital stays reflecting the more severe illness and complications.

In table 4 and Figure 2 and 3; represent that lower gestational age and birth weight were significantly associated with mortality of neonates. In neonates with age less than 28 weeks, had 12 expired vs 8 discharged compared with those at 32–33+6 weeks (18 expired vs 55 discharged) and 34–36+6 weeks (13 expired vs 39 discharged). A similar significant pattern was seen for the birth weight, where ELBW shows the highest mortality (22 expired vs 7 discharged) while infants ≥2500 g all survived. Sepsis and congenital heart dissease show significantly more deaths than discharged as shown in table XXX and Figure XXX. In summary these patterns indicate that prematurity, very low birth weight, sepsis, CHD are key clinical predictors of poor outcomes in NICU population.

**Table 1**

*Baseline Demographic Characteristics of Preterm Newborns*

| Variable | Category | n | |
|---|---|---|---|
| Gestational Age (weeks) | Mean ± SD | 31.6±2.1 | |
| | Minimum–Maximum | 25-36 | |
| Gestational Age Categories | <28 weeks (Extreme Preterm) | 20 | 9.0% |
| | 28–31+6 weeks (Very Preterm) | 76 | 34.4% |



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| | | | |
|---|---|---|---|
| | 32–33+6 weeks (Moderate Preterm) | 73 | 33.0% |
| | 34–36+6 weeks (Late Preterm) | 52 | 23.5% |
| Birth Weight (grams) | Mean ± SD | 1558.3±425 | |
| | Minimum–Maximum | 720-2700 | |
| Birth Weight Categories | ELBW (<1000 g) | 29 | 13.1% |
| | VLBW (1000–1499 g) | 60 | 27.1% |
| | LBW (1500–2499 g) | 130 | 58.8% |
| | ≥2500 g | 2 | 0.9% |
| Sex | Male | 123 | 55.7% |
| | Female | 98 | 44.3% |

**Table 2**
*Maternal & Perinatal Factors*

| Variable | Category | n | % |
|---|---|---|---|
| Mode of Delivery | Normal Vaginal Delivery (NVD) | 215 | 97.3% |
| | Cesarean Section (C-Section) | 3 | 1.4% |
| | Episiotomy only | 3 | 1.4% |
| PROM | Yes | 43 | 19.5% |
| | No | 178 | 80.5% |

**Table 3**
*Clinical Characteristics & Morbidities*

| Morbidity / Feature | Present (n, %) | Absent (n, %) |
|---|---|---|
| Sepsis | 8739.4% | 13460.6% |
| Jaundice | 7132.1% | 15067.9% |
| Congenital Heart Disease (CHD) | 198.6% | 20291.4% |
| Oxygen Requirement | 13159.23% | 9040.7% |

**Figure 1**
*Oxygen Requirement in Neonates*

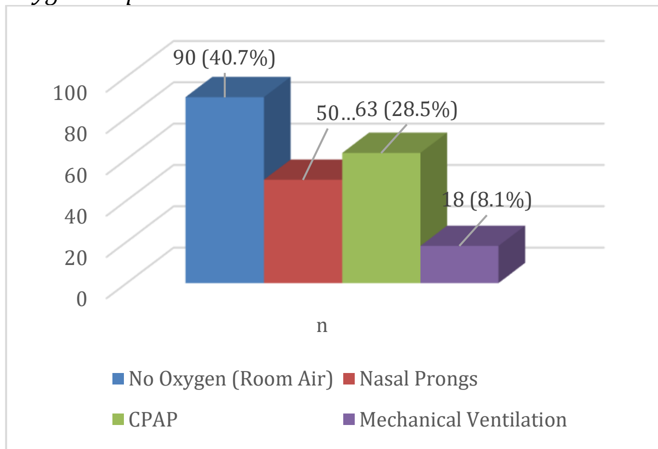


**Figure 2**
*Gestational Age and Outcome*

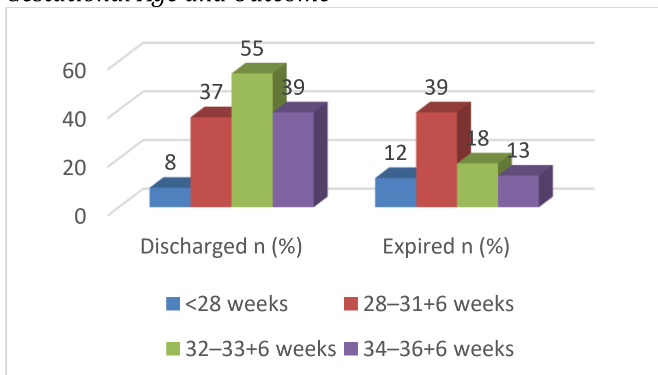


**Figure 3**
*Birth Weight and Outcome*

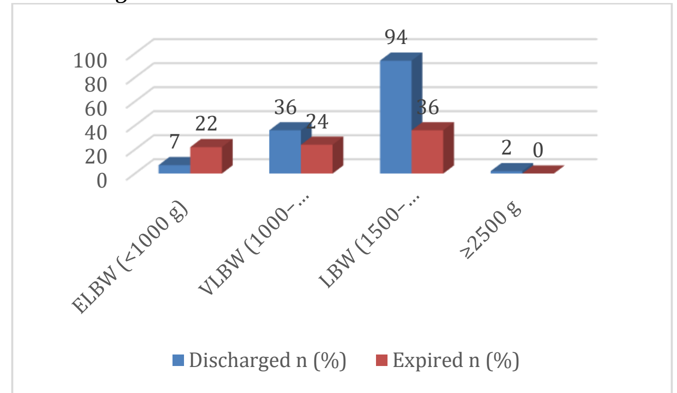


**Table 4**
*Association Between Gestational Age, Birthweight and Outcome*

| Gestational Age Category | Discharged n (%) | Expired n (%) | p-value |
|---|---|---|---|
| <28 weeks | 8 | 12 | |
| 28–31+6 weeks | 37 | 39 | .000 |
| 32–33+6 weeks | 55 | 18 | |
| 34–36+6 weeks | 39 | 13 | |
| **Birth Weight Category** | | | |
| ELBW (<1000 g) | 7 | 22 | |
| VLBW (1000–1499 g) | 36 | 24 | .000 |
| LBW (1500–2499 g) | 94 | 36 | |
| ≥2500 g | 2 | 0 | |
| **Morbidity** | | | |
| Sepsis | 36 | 51 | .000 |
| Jaundice | 60 | 11 | .000 |
| CHD | 7 | 12 | .014 |

## DISCUSSION

This study analyzed the neonates admitted to NICU with a mean gestational age 31.6 and mean birth weight of 1558g, with majority of them were preterm and low birth weight. The high burden of mortality and morbidity are persistent findings in preterm neonates, these findings are consistent with the literature as studied by Susan R. Hintz et al. and Feleke and Kaweti et al. (13,14) These findings highlight the critical importance of gestational maturity and good birth weight in determining the prognosis in NICU. Similarly, Edwards et al. reported that survival rate for infants below 22-25 weeks in U.S. NICUs is below 30%. (15)

The substantial increase in mortality in sepsis and CHD in our cohort was significantly associated with poor outcomes. This is consistent with Aly et al. that preterm neonates with CHD had gigher in hospital mortality. (16) Likewise, Feleke and Kaweti et al. studied that sepsis remains a major contributor to neonatal deaths in low resource settings. (14) Thus our findings reinforce the need for early diagnosis and prompt management of these morbidities.

However, majority of neonates were delivered via NVD and Cesarean section being rare. But the major risk factor for sepsis in literature is observed to be PROM, relatively low prevalence in our cohort suggests that other factors (such as prematurity and low birth weight) play a more dominant role in outcomes. Feleke and Kaweti et al. and Kamal et al. have shown mixed associations between mode of delivery and neonatal survival, with cesarean


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sometimes offering benefits in extremely preterm births. (6,14)

The neonates in our study survived despite severe illness and limited resources but they require prolonged hospital stays. These findings are similar to global NICU reports by Sharma and Sahu et al. where prolonged hospitalization is associated with complications like sepsis, CHD and other congenital anomalies. (17) This study's findings are encouraging compared to resource limited settings.

Our study highlights that prematurity, ELBW, sepsis, and CHD are key predictors of poor outcomes in NICU. The enhancing neonatal resuscitation and strengthening antenatal care, improving infections control and intensive care facilities are essential strategies to reduce mortality and morbidities in these population. We recommend long term follow-up of preterm neonates who remains at risk of poor outcomes and impairments even after the NICU discharge.

Our study was conducted at a single center with limited generalizability and a short follow-up period, which may have resulted in missing long-term outcomes. Future multicenter studies with extended follow-up are needed to better understand survival and quality of life among preterm neonates.

## CONCLUSION

Our study shows that prematurity, low birth weight, sepsis, and congenital heart disease are major predictors of poor outcomes in NICU-admitted neonates. Despite these challenges, nearly two-thirds of the neonates improved, highlighting the importance of timely and effective neonatal care in our settings. Strengthening antenatal services and improving NICU facilities can help reduce mortality and improve survival among preterm newborns.

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