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ORIGINAL ARTICLE

Examine the Incidence and Predictors of Neonatal Surgical Mortality

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ABSTRACT

Objective: Aim of current study is to determine the incidence and predictors of neonatal surgical mortality.
Study Design: Observational/Prospective study
Place and Duration: Children Hospital PIMS.Nov-2021-April 2022
Methods: There were 130 neonates were presented in this study. Included neonates had age 1-25 days admitted to hospital for thoracic and abdominal surgery. After getting informed written consent from the parents, detailed demographics of neonates delivery was recorded. Frequency of mortality and its predictors were assessed in this study. SPSS 23.0 was used to analyze all data.
Results: Among 130 neonates, 80 (61.5%) were male neonates and 50 (38.5%) were females. Mean gestational age at delivery was 35.4 ±11.9 weeks and mean age at surgery was 11.8±4.52 days. Mean weight at birth was 2.10±1.27 kg. Frequency of abdominal surgery was found in 70 (53.8%) cases, followed by thoracic surgery in 35 (36.9%) cases and superficial surgery in 25 (19.2%) cases. Frequency of mortality was found in 41 (31.5%) neonates. Predictors of mortality was prolong duration of surgery, higher ISS >10, gestation age <36weeks, prolong ventilation, re-operations, high vasopressors and low birth weight with p value <0.004.
Conclusion: The incidence of NSM was found to be highly reliant on both preoperative stress and postoperative treatment. As the margin for error in neonatal surgery is so small, skilled professionals are required to ensure the best possible outcomes and the shortest possible operating times. Our findings encourage the development of a risk classification score for neonatal operations.
Keywords: Surgical Neonates, Complications, Mortality, Predictors

INTRODUCTION

The Highest Infant mortality is defined as the number of babies who die in the first 28 days of life for every 1,000 live births [1]. A kid's neonatal period begins at birth and ends when 28 days have passed since birth, and it is during this time that the child is at greatest risk of not making it [2]. The bulk of newborn deaths happen in the first week of life, hence this time frame is divided into two subcategories: early neonatal (the first seven days) and late neonatal (the remaining 21 days) [3].

An important public health issue around the world [4] is neonatal mortality (NM). The majority of the roughly 2.7 million neonatal deaths that occur annually [6, 10] are concentrated in poor nations. Nearly half (44%) of all child deaths are attributable to NM [5, 6], and nearly all of these deaths (99.99%) occur in low- and middle-income nations. The 2018 UNICEF report found that the NMR for the entire world was 19 per 1000 live births and that it was 26 in the world's least developed countries [1]. As a result, the incidence of the condition is greatest in South Asia (SA), West and Central Africa (WCA), and sub-Saharan Africa (SSA) [1]. Ethiopia also has a higher NMR (said to be 30 per 1000 live births), with the highest rate being seen in the Amhara national regional state (with an estimated 47 per 1000 live births) [7,8].

Acute physiologic problems, such as hypothermia, hypoglycemia, poor peripheral perfusion, and other disorders due to improper newborn transport, pose a challenge to the survival and excellent outcomes of referral neonates, according to evidence from many regions of the world. Mortality rates ranged from 21.2% to 79.1% in newborns with hypothermia and from 60.9% to 75.2% in those with inadequate peripheral perfusion upon admission [9,10]. A total of 60% of referred infants with oxygen saturation 90% at admission died, and 14% developed hypoglycemia. Infants admitted in a clinically unstable state had a fivefold greater fatality rate than those referred in a stable state [11,12].

Referral neonates in resource-limited countries may have to travel great distances without access to emergency care, resuscitation equipment, or appropriately trained personnel in order to reach their destination for specialised treatment [13]. Many studies have demonstrated that socioeconomic variables, neonatal and maternal factors, and health-related factors all have an impact on the health of neonates [14,15]. Insight into the rates of death among referred newborns and the criteria that might be used to predict their survival is an urgent and important concern. Consequently, the purpose of this research was to determine the frequency and risk factors for newborn mortality among recommended neonates admitted to a hospital in Pakistan.

MATERIAL AND METHODS

This observational/ prospective study was conducted at Children Hospital PIMS and comprised of 130 neonates admitted to hospital for surgery. After getting informed written consent from the parents, detailed demographics of neonates delivery was recorded. In this particular study, postoperative neonatal admissions were not included.

A surgical neonate is one who was born at >37 weeks of gestation (term neonate) and was less than 29 days old on the day of surgery, or was born at 37 weeks of gestation (preterm neonate) and was less than 50 weeks post conception. One observer documented data before, during, and after surgery. Each neonate who underwent surgery had their preoperative, intraoperative, and postoperative experiences assessed on a scale from 0 to 2. Vital signs (blood pressure, pulse rate, respiration rate, and temperature) were taken within the first two hours after admission to reduce the possibility of treatment bias. Physiological measures, including pH and platelet count, were measured at presentation to establish an underlying illness severity score (ISS). If the ISS was between 0 and 4, it was given a 2, if it was between 5 and 8, it was given a 1, and so on. NSM (defined as in-hospital death or death within 30 days of neonatal surgery) and survival were the outcome variables studied (documented at 1 month after discharge). Chi-square tests were performed to see if there was any correlation between each independent variable and the final status (alive or dead). All of the qualitative factors were given an odds ratio (OR) and a corresponding confidence interval (CI). The optimal ranges for the quantitative variable used to predict NSM were found using receiver operator characteristic (ROC) analysis. A multivariate backward elimination analysis was conducted to determine the predictors of mortality, and variables that were shown to be linked with unfavourable outcomes were included. Significant results were defined as those with a p value less than 0.05 and a 95% confidence interval. SPSS 23.0 was used to analyze all data.

RESULTS

Among 130 neonates, 80 (61.5%) were male neonates and 50 (38.5%) were females. Mean gestational age at delivery was 35.4 ±11.9 weeks and mean age at surgery was 11.8±4.52 days. Mean weight at birth was 2.10±1.27 kg. Majority of the cases had blood culture negative.(table-1)

Table-1: Included details of neonates

Variables	Frequency	Percentage
Gender		
Male	80	61.5
Female	50	38.5
Mean gestational age at delivery (weeks)	35.4 ±11.9	
Mean age (days)	11.8±4.52	
Mean Weight at Birth (kg)	2.10±8.27	
Blood Culture		
Positive	18	13.8
Negative	112	86.2

Frequency of abdominal surgery was found in 70 (53.8%) cases, followed by thoracic in 35 (36.9%) cases and superficial surgery in 25 (19.2%) cases.(figure-1)

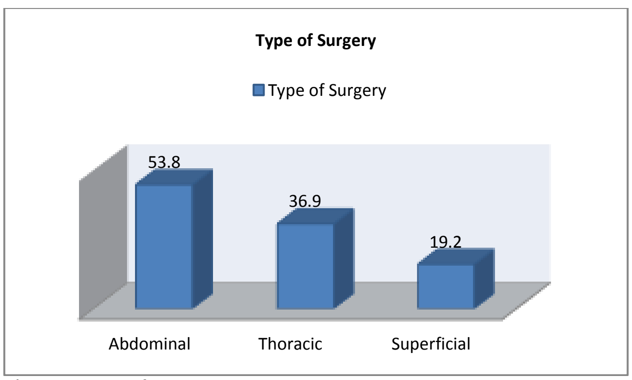

Figure-1: Type of surgery among neonates

Frequency of mortality was found in 41 (31.5%) neonates and 89 (68.5%) neonates were survived.(Figure-2)

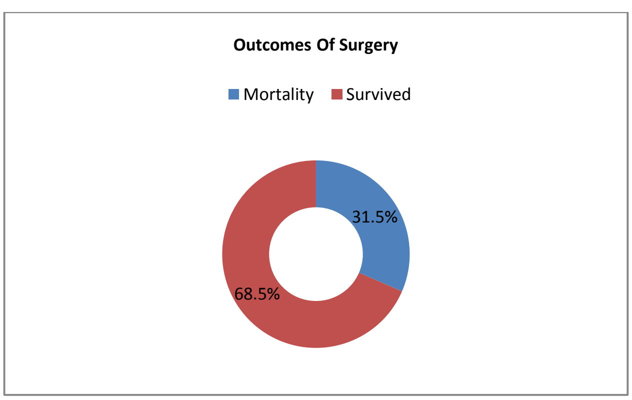

Figure-2: Frequency of mortality and survived neonates

Predictors of mortality was prolong duration of surgery, higher ISS >10, gestational age <36weeks, prolong ventilation, re-operations, high vasopressors and low birth weight with p value <0.004.(table-2)

Table-2: Frequency of predictors among died and survived neonates

Variables	Non-Survival (41)	Survivals (89)
Duration of Surgery		
>2 hours	38 (92.7%)	5 (5.6%)
<2 hours	3 (7.3%)	84 (94.4%)
ISS >10		
Yes	36 (87.8%)	3 (3.4%)
No	5 (12.2%)	86 (96.6%)
Gestational Age <36weeks		
Yes	34 (82.9%)	4 (4.5%)
No	7 (17.1%)	85 (95.5%)
Prolong Ventilation		
Yes	40 (97.6%)	2 (2.2%)
No	1 (2.4%)	87 (97.8%)
Reoperations		
Yes	41 (100%)	0
No	0	89 (100%)
High Vasopressors		
Yes	39 (95.1%)	4 (4.5%)
No	2 (4.9%)	85 (95.5%)
Low Birth weight		
Yes	37 (90.2%)	1 (1.1%)
No	4 (9.8%)	88 (98.9%)

DISCUSSION

The level of healthcare available in a country can be gauged by looking at its neonatal death rate. The need for surgery to correct congenital abnormalities accounts for nearly 10% of neonatal fatalities. [16] As a result, NSM plays a major role in the death rate of infants. NSM rates vary widely between regions, with just 4% reported in the United States, 6%-7% in Japan, 35%-45% in India, 52.7% in Uganda, and 62.2% in Nigeria. [17,18,19] According to this series, NSM was 31.5 percent, which is consistent with previous reports from India but significantly higher than the 5 percent from industrialised countries. [20] Extreme preterm, very low birth weight, and congenital abnormalities of the heart, lungs, kidneys, and central nervous system (CNS), as well as inborn errors of metabolism, are the leading causes of NSM in industrialised countries. [21] Nearly all of the prior research has focused on describing preoperative (patient-related) variables as predictors of NSM. Few research [22] have identified intraoperative and postoperative factors that influence NSM. [21]

In the present research, risk factors were collected and used to create a composite score based on events occurring before, during, and after surgery. The mean preoperative score was similar between survivors and non-survivors, but the mean intraoperative and postoperative scores were much higher for the latter group. NSM in this study was found to be highly dependent on intraoperative stressors and postoperative care, indicating that patient characteristics were similar between the two groups. Although birth weight has always been seen as an important prognostic marker for surgical neonates, its role as a standalone determinant of NSM has come under scrutiny in recent years. The ability to care for low birth weight, very low birth weight, premature, and small for gestational age (SGA) surgical babies means that it is no longer a relevant characteristic in the prognosis risk category in most industrialised nations. [23]

A greater mortality rate was seen in the current study among neonates who were hypothermic and had an oxygen saturation of less than 90% on admission, compared to those who were neither hypothermic nor had an oxygen saturation of less than 90%. Transportation-related hypothermia and oxygen desaturation (90%) were significant risk factors for newborn mortality. consistent with a prior study done in Pakistan. [24] Different neonatal ISSs have been reported in the literature; such examples include the Clinical Risk Index for Babies (CRIB), CRIB II, the Score for Neonatal Acute Physiology (SNAP), and the SNAP-PE. Based on our data, we were able to identify two high-risk subgroups: I infants born at a birth weight of less than 2 kg, at a gestational age of less than 32 weeks, and with an ISS of less than 5, who had a 90% mortality rate; and (ii) infants with a delayed presentation of more than 48 hours and an ISS of less than 66.67%. There was a statistically significant difference in mortality rates between those who did not need postoperative ventilation (9.27%), those who needed for 24 hours (22.2%), and those who did for >24 hours (88.63%) (P = 0.000). The odds of dying after surgery increased by a factor of 2.79 for ventilation lasting less than 24 hours and by a factor of 76.29 for ventilation lasting longer than 24 hours. Consistent with the findings of Snajdauf et al., who followed 101 newborns with EA and showed the need for ventilators increased the odds of mortality by 2.9 times, we find that. [25] In this research, the need for additional surgery was the leading cause of death for newborns.[26]

CONCLUSION

The incidence of NSM was found to be highly reliant on both preoperative stress and postoperative treatment. As the margin for error in neonatal surgery is so small, skilled professionals are required to ensure the best possible outcomes and the shortest possible operating times. Our findings encourage the development of a risk classification score for neonatal operations.

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