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Neonatal disease presentations at a newly developed center in an LMIC: Insights from the spectrum of illness at SICHN

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Abstract

Objective: To report the pattern of disease among neonates admitted to the NICU and successfully discharged after follow-up.

Methodology: This is an observational study conducted at the newly developed 200-bed Sindh Institute of Child Health and Neonatology between September 2022 and February 2023. A retrospective analysis was done to evaluate the causes of neonatal admissions and their outcomes. A statistical analysis was done using SPSS version 23.

Results: During the period of study, a total of 680 patients were admitted, and 586 were discharged after recovery on follow-up at the NICU of the Sindh Institute of Child Health and Neonatology. Respiratory distress syndrome (RDS) was found to be the most common diagnosis among the patients who were successfully discharged after treatment with a total of 273 cases (19%), followed by preterm/low birth weight with 234 cases (16.3%), sepsis with 199 cases (13.9%), pneumonia with 115 cases (8%), neonatal jaundice with 92 cases (6.4%), meconium aspiration syndrome with 73 cases (5.1%), bacterial meningitis with 65 cases (4.5%), hypoxic-ischemic encephalopathy with 51 cases (3.6%), congenital heart defects with 24 cases (1.7%), acute gastroenteritis with 12 cases (0.8%), hypoglycemia with 12 cases (0.8%), anemia with 8 cases (0.6%), bronchiolitis with 6 cases (0.4%), transient tachypnea of newborn with 4 cases (0.3%), syndromic babies with 4 cases (0.3%), achondroplasia with 3 cases (0.2%), atresia of the esophagus with 3 cases (0.2%), and trisomies (18 and 21) with 3 cases (0.2%) and others. Out of 680 admissions, 94 referral neonates with bacterial sepsis, severe septic shock, hypoxic-ischemic encephalopathies, and respiratory distress syndrome could not survive. Of those neonates who died, 42 (27.6%) had a low birth weight and were born prematurely.

Conclusion: Severe sepsis, prematurity, or low birth weight, along with respiratory distress, were the primary causes of neonatal death in our experience. Early interventions that focus on neonatal health, along with access to good-quality care, are essential to reducing the rate of neonatal admission.

Keywords: Neonates, respiratory distress syndrome, preterm/low birth weight, sepsis, neonatal jaundice, hypoxic-ischemic encephalopathy

Introduction

Each year, 130 million infants are born worldwide, of which approximately 2.4 million die within a month, and almost 90% of these mortalities occur in developing countries [1]. It is indeed a concerning fact that Pakistan lies in the 3rd position among the countries with the highest neonatal mortality rate (42/1000 live births per year) [2]. Unfortunately, Pakistan lies in the third position on the first 28 days of life is the most vulnerable and critical period of any child's life due to the possibility of non-reversible conditions and neonatal deaths are often caused by preventable or treatable conditions. Neonatal fatalities in Pakistan and other low or middle-income countries are due to three major problems: asphyxia (23%), infections (36%), and prematurity (28%) [3]. Birth asphyxia is an inability of a newborn to initiate and/or sustain breathing at birth which can cause permanent irreversible brain damage and even death if not treated quickly. Neonatal infections are mostly vertical and are usually prenatal, yet nosocomial infections are also observed in the nursery. Recently, it has been established that prematurity is not the leading cause of neonatal mortality. Rather, preterm infants are at risk of developing associated conditions such as respiratory distress syndrome (RDS), intraventricular hemorrhage (IVH), certain infections, and asphyxia are the real

culprits [4, 5]. Despite neonatal healthcare being a significant measure of a nation's health system, and equity in healthcare being a central aspect of primary healthcare, neonatal survival remains problematic in numerous rural regions [2, 6]. Further, most neonatal facilities are ill-equipped to provide basic newborn care, necessitating the transfer of the infant to another hospital for specialized care [7]. Likewise, the district of Korangi in Karachi is a comparatively underserved area, lacking basic facilities in the hospital a deprived part of Karachi, and basic facilities are not available in the hospital where newborns are delivered. Therefore, infants with compromised health require immediate referral [8]. The Sindh Institute of Child Health, a newly formed 200-bedded hospital was established to provide better neonatal services to all and reduce neonatal preterm mortality. This study aims to examine the number of registered neonates and their outcomes to emphasize the necessity of NICU in the area, along with their clinical presentation in a newly formed Sindh Institute of Child Health and Neonatology.

Materials and Methods

This observational study was conducted after the IRB approval at the NICU of Sindh Institute of Child Health and Neonatology, Karachi. Hospital records of all patients admitted to NICU were evaluated during a short period of six months since inception, from September 2022 to February 2023. Data was gathered from NICU medical records, including demographic data, clinical information, and treatment outcomes, which were analyzed using descriptive statistics and multiple responses by using SPSS version 23. Data was completely anonymized and all researchers followed the institutional and professional guidelines for data protection and privacy. In this study, prematurity was considered an infant's birth before 37 weeks of gestation, and the low birth weight associated with

prematurity means that babies born prematurely weigh less than 2.5 kg (5.5 lbs). The diagnosis involved a comprehensive assessment of the baby's physical and medical condition, monitoring of the vital signs, and laboratory tests to determine any underlying condition and potential risks. Congenital cardiac anomalies such as septal defects and valve malformation were diagnosed by clinical evaluation supported by the echocardiogram. In the same way, chromosomal abnormalities were first detected by clinical evaluation of babies and then supported by chromosomal analysis through karyotyping.

Results

This research was performed to understand the pattern of clinical presentation of neonates referred to our hospital and also to evaluate the diseases that have already been observed with a high risk of neonatal death. This study revealed that the average age of all admissions at NICU was 2.3 days (2 days and 7 hrs), and the female (234/586) to male (352/586) ratio of the neonates discharges upon follow-up was 1:1.5, however this female (33/94) to male (61/94) ratio increases with up to 1:1.8 in neonatal expiries, and the mode of deliveries was mostly normal vaginal. A total of 680 neonates were admitted during the study period out of which 586 were recovered and discharged with follow-up. These patients were diagnosed with respiratory distress syndrome (RDS) followed by acute gastroenteritis, preterm/ low birth weight, sepsis, pneumonia, neonatal jaundice, meconium aspiration syndrome, bacterial meningitis, and hypoxic-ischemic encephalopathy (Table 1). Approximately >300 babies required ventilator support out of which 94 babies could not be weaned off and passed away. Most of the expiries were experienced due to bacterial sepsis with severe septic shock in preterm babies followed by hypoxic-ischemic encephalopathies and respiratory distress syndrome (Table 2).

Table 1: Clinical Presentation of the neonatal admissions

Clinical Presentation of Neonates Discharged	Responses		Percent of Cases
	N	Percent	
Respiratory Distress Syndrome	273	19.1%	46.6%
Preterm/ Low Birth Weight	234	16.3%	39.9%
Sepsis	199	13.9%	34.0%
Pneumonia	115	8.0%	19.6%
Jaundice	92	6.4%	15.7%
Meconium Aspiration	73	5.1%	12.5%
Meningitis	65	4.5%	11.1%
Hypoxic Ischemic Encephalopathy	51	3.6%	8.7%
Congenital Heart defects	24	1.7%	4.1%
Acute Gastroenteritis	12	0.8%	2.0%
Hypoglycemia	12	0.8%	2.0%
Anemia	8	0.6%	1.4%
Bronchiolitis	6	0.4%	1.0%
Transient Tachypnea of Newborn	4	0.3%	0.7%
Syndromic Babies	4	0.3%	0.7%
Achondroplasia	3	0.2%	0.5%
Atresia of Esophagus	3	0.2%	0.5%
Bronchopulmonary Dysplasia	1	0.1%	0.2%
Kernicterus	2	0.1%	0.3%
Trisomy 21	2	0.1%	0.3%
Trisomy 18	1	0.1%	0.2%
Hypo-calcemic Fits	1	0.1%	0.2%
Congenital Malformation of Adrenal Gland	1	0.1%	0.2%
Arnold Chiari Syndrome	1	0.1%	0.2%
Club feet	1	0.1%	0.2%

Acute Kidney Failure	2	0.1%	0.3%
Congenital Diaphragmatic Hernia	1	0.1%	0.2%
G6PD Deficiency	1	0.1%	0.2%
Hypernatremia	1	0.1%	0.2%
Congenital Laryngomalacia	1	0.1%	0.2%
Cellulitis of back	1	0.1%	0.2%
Spina Bifida	1	0.1%	0.2%
Floppy baby	1	0.1%	0.2%

Table 2: Major causes of neonatal death

Causes of Death	Responses		Percent of Cases
	N	Percent	
Severe Sepsis with Septic Shock	47	30.9%	50.0%
Preterm/ Low Birth Weight	42	27.6%	44.7%
Hypoxic Ischemic Encephalopathy	27	17.8%	28.7%
Respiratory Distress Syndrome	16	10.5%	17.0%
Congenital malformations	7	4.6%	7.4%
Hemorrhagic Fever	4	2.6%	4.3%
Meconium Aspiration	3	2.0%	3.2%
Pulmonary Hypertension	3	2.0%	3.2%
Meningitis	1	0.7%	1.1%
Gastroenteritis and Colitis	1	0.7%	1.1%
Epidermolysis Bullosa	1	0.7%	1.1%

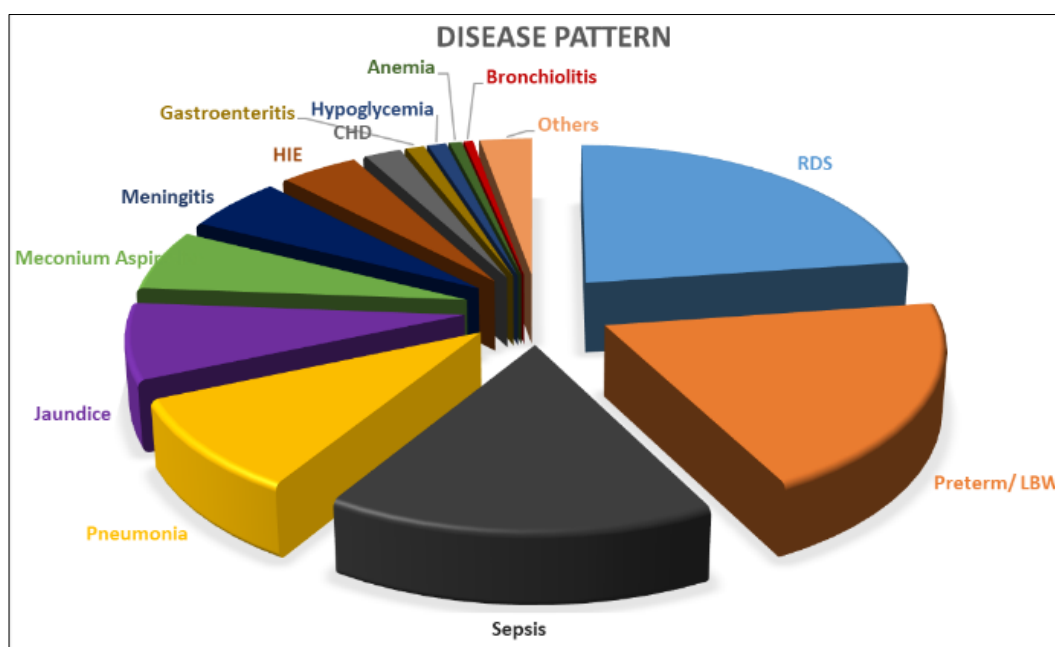


Fig 1: Graphical representation of disease pattern in discharged patients

Discussion

Despite many improvements over the past decade, neonatal mortality specifically remains a serious public health issue and is responsible for the majority of infant deaths in many developing countries like Pakistan. Poor nutrition, inadequate prenatal care, and health services have been the most commonly cited causes of newborn mortality and morbidity. The country’s high population growth rate and poverty exacerbate the situation, as it increases the risk that women and children don’t have access to timely and comprehensive care. Inequalities in access to healthcare between urban and rural areas and among different socioeconomic groups have also been identified as major contributing factors to these deaths.

This six-month retrospective study was conducted to highlight the common cause of neonatal morbidity and mortality in an underprivileged area of Karachi. Here in this study, the number of male neonates was high. Similar

findings have also been reported by Alia RA *et al.*, in 2020 where they mentioned a significantly high number of male neonatal morbidity as well as mortality [8]. We observed a low birth weight as one of the most common causes of neonatal sickness as immaturity tends to increase the severity of the disease. In the same manner Parkash A. *et al.*, in 2015, and Aijaz N. *et al.*, in 2012, reported the frequency of low birth weight neonates in their study and indicated them as the most vulnerable babies [8-9]. Infections play a crucial role in terms of neonatal deaths, estimated as 1-10 per live birth in developed countries however, the frequency reaches up to three times in developing countries. Many researchers have reported sepsis as the leading cause of neonatal expiries [6-8, 10]. Even though, in our data respiratory distress syndrome was the most common clinical presentation of discharged babies. Sivanandan S. *et al.*, in 2017 also mentioned similar findings in their study [11]. Untreated respiratory and gastrointestinal infections and

congenital malformations, as well as birth asphyxia, are also key causes of neonatal mortality consensus to Turhan EE. *et al.*, 2015. Other causes of infant mortality in Pakistan include inadequate neonatal health services and the limited availability of trained healthcare providers in rural areas [6]. Children from the poor quintiles are more vulnerable compared to their counterpart children belonging to richer quintiles, because of many challenges like malnutrition causes weaker immunity, more exposure to risky environments, and lesser or no access to both preventive and curative health [1].

Conclusion

Preterm deliveries or low birth weight of infants, sepsis, and birth asphyxia were the primary reasons for neonatal death in this study. Therefore, babies who are born prematurely and/or with low birth weight may require specialized care in a neonatal intensive care unit (NICU) to help them grow and develop healthily. Secondly, the prevention of sepsis is the most important step to be taken toward the betterment of neonatal health. Proper hand washing techniques and strict infection preventive measures can greatly help especially in developing countries like Pakistan. However, antenatal care, good nutrition to the mother, and timely referral of the babies are a few essential steps to overcome the problem.

Conflict of Interest

Not available

Financial Support

Not available

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