RESEARCH ARTICLE

Emergency department's resource utilization by the neonates: experience from emergency department at a tertiary care hospital of a LMIC

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Abstract

Objective: To evaluate neonatal presentation patterns in an emergency care setting.

Method: The retrospective chart review was conducted at the Emergency Department of Aga Khan University Hospital, Karachi, in February 2021, and comprised data of neonates presenting from January to December 2019. Data was analysed using SPSS 21.

Results: There were 1,403 paediatric patients with median age at presentation 6 days (interquartile range: 3-11 days) and median weight 2.8kg (interquartile range: 2.4-3.17kg). The major complaint at presentation was yellow discolouration of skin in 659(47%) patients. Neonatal jaundice was the most common diagnosis 660(47%), followed by sepsis 338(24%). The length of stay was <4 hours for 631(45 %) of the neonates. A total of 1,138(81%) patients required intravenous cannulation, 650(46%) were managed with phototherapy and 91(7%) were ventilated. In terms of outcomes, 722(52%) neonates were admitted to step-down unit, and 314(22%) to neonatal intensive care unit, while 27(2%) died.

Conclusion: Neonatal jaundice was found to be the most common diagnosis in neonates presenting to the emergency department of a tertiary care hospital.

Key Words: Neonates, Newborn, Health resource, Emergency treatment.

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Introduction

Pakistan ranks first in the global neonatal mortality rate and <5-year mortality.[1] According to a World Health Organization (WHO) report, 6.3 million babies were born in 2021, and the reported mortality was 39.44% per 1,000 live births.[2] Despite serious efforts made in improving healthcare, there has been a lack of improvement in these statistics over decades. There are multiple contributing factors that strongly correlate with neonatal mortality in low- and middle-income countries (LMICs), especially in Pakistan, that include antenatal care, maternal education, number of healthcare facilities available, poverty, neonatal infections, prematurity and parity.[3] Most of such deaths are preventable with cost-effective and timely interventions. Additional problems encountered in newborns aged day 0 to day 28 that require evaluation and management by healthcare facilities include neonatal jaundice (NNJ), feeding problems, care of prematurity, sepsis, respiratory distress, hypoxia, dehydration and electrolyte imbalance.[4]

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There is a wide spectrum of resources that is often required in emergency departments (EDs) to address these conditions under trained healthcare professionals. These include intravenous (IV) cannulation, thermal care, oxygenation with modalities, like continuous positive airway pressure, high flow, airway management and invasive ventilation, inotropic support, antibiotics, IV fluids, phototherapy, tube feeding, blood products transfusion and monitoring.[5] Besides, a vast number of investigations are ordered by neonatal healthcare providers that involve blood testing and radiological investigations. Therefore, limited availability of tertiary care EDs brings challenges in providing required newborn care, and is a reflection on overall morbidity and mortality that occur due to lack of proper resources and well-equipped neonatal facilities in LMICs.[6] It is, therefore, important to identify the magnitude of the problems faced by EDs for efficient identification, resource utilization and management.

The current study was planned to evaluate neonatal presentation patterns in an emergency care setting.

Materials and Methods

The retrospective chart review was conducted at the paediatric ED of Aga Khan University Hospital, Karachi, in February 2021, and comprised data of neonates presenting from January to December 2019. After approval from the institutional ethics review committee, data of all neonates up to age 28 days was analysed. As

there was less influx of patients in 2020 and 2021 due to the active phase of the coronavirus deisease-2019 (COVID-19) pandemic, data of patients presenting from January to December 2019 was collected for better understanding and true representation of the population. The study was conducted in line with the Strengthening The Reporting of Observational Studies in Epidemiology (STROBE) guidelines.[7] Data was excluded in case of duplication, clear age misclassification, and if the records lacked essential identifiers or key outcome fields. Data was retrieved from the institutional electronic records system by two trained data collectors using a standardised proforma under the supervision of the primary investigator. A double-data entry process was used in Microsoft Excel, and discrepancies were resolved through cross-checking of original records. No informed consent was necessary as there was no direct patient interaction. Also, since all the eligible cases were included, therefore, no a-priori sample size calculation was performed.

The primary investigator checked a random 10% sample of the dataset to ensure it was accurate and complete. Predefined procedures were used to deal with missing data. Variables with missing values were reported with the right denominators, and no statistical imputation was done.

The data retrieved included age, gender, time of arrival, length of stay, diagnosis, treatment and disposition. Presenting complaints were noted on the basis of the verbatim information given by parents on ED arrival.

Data was analysed using Microsoft Office Excel 2007 and SPSS 21. Data was tabulated and analysed using frequencies and percentages of all the variables. Descriptive statistics were computed using median and interquartile range (IQR).

Results

There were 11692 paediatric patients, out of this 1403 represented neonatal group with median age at presentation 6 days (IQR: 3-11 days) and median weight 2.8kg (IQR: 2.4-3.17kg). The average per-month patient load was 116.9. Most neonates 895(64%) were born to multigravida mothers, and most were delivered at or after 37 weeks of gestation (Table 1).

Regarding delivery methods, nearly half of the neonates were born via spontaneous vaginal delivery (SVD), while others were delivered by caesarean section (CS) (Table 1). Further, 668(48%) subjects were born at AKUH, while the rest were delivered at various medical facilities or at home except for 393(28%) neonates for whom data in this regard was missing.

Table-1: Demographic, disposition and outcome data of the neonates.

Characteristics	Total
N	**1403**
	Median (IQR)
Age in Days	6 (11 - 3)
Weight in Kg	2.8 (3.17 - 2.4)
Duration of ED Stay (in hours)	5 (8 - 3)
Gestation in weeks	37 (38 - 36)
Gender	**N (%)**
Male	842 (60)
Female	561(40)
Gestation in weeks	**N (%)**
< 37 Weeks	459(33)
≥ 37 Weeks	944(67)
Age Groups	**N (%)**
0-7 days	616(44)
8-14 days	185(13)
15-21 days	99(7)
22-28 days	503(36)
Disposition	**N (%)**
Step Down Admission	722(52)
NICU Admission	314(22)
Discharged Home	184(13)
Transferred Out	42(3)
LAMA	141(10)
Outcome	**N (%)**
Died	27(2)
Survived	1376(98)

ED: Emergency department, NICU: Neonatal intensive care unit, LAMA: Left against medical advice, IQR: Interquartile range.

Table-2: Resource utilisation.

Characteristics	N (%)
IV Cannulation	1138(81)
IV Fluids	1093(78)
Phototherapy	650(46)
Ventilated	91(7)
Inotropic Support	93(7)

IV: Intravenous

Overall, 801(57%) patients presented to ED within the first two weeks of life, and 631(45%) had an ED stay of <4 hours. The most common presenting symptom was yellow discolouration of skin 659 (47%) patients, followed by 244(17%) with respiratory distress, 199(14%) with fever, and 171(12%) with loose stool and vomiting.

NNJ was the most common diagnosis 660(47%), followed by sepsis 338(24%). The other diagnoses included neurological, cardiovascular and pulmonary conditions as well as a few syndromic presentations (Figure).

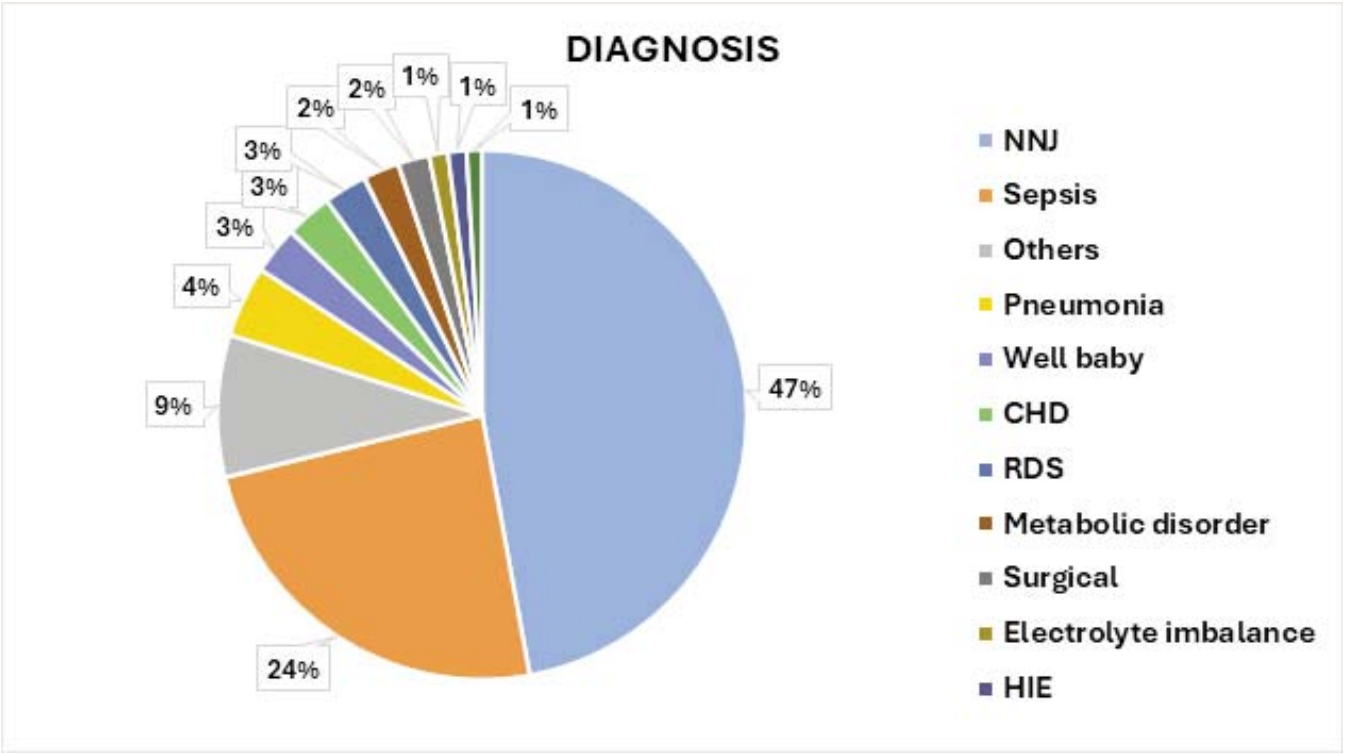

Figure: Diagnosis of the neonates.
NNJ: Neonatal jaundice, CHD: Neonatal jaundice, RDS: Respiratory distress syndrome, HIE: Hypoxic ischaemic encephalopathy

In terms of healthcare utilisation, 1,138(81%) neonates required IV cannulation, 1,093(78%) underwent fluid resuscitation, 634(45%) received IV antibiotics, and intubation and ventilation were needed in 91(7%) cases (Table 2).

In terms of outcomes, 722(52%) neonates were admitted to step-down unit (SDU), and 314(22%) to neonatal intensive care unit (NICU), while 27(2%) died (Table 1).

Discussion

To the best of our knowledge, the current study is the first in Pakistan to describe resource utilisation patterns among neonates presenting to the ED, including details of investigations, interventions and outcomes, over a full calendar year. The study observed emergency visits of neonatal population to be 12% compared to 7.7% ED visits in the United States and 0.9% in Saudi Arabia.[8,9] This contrasts with local data from a public-sector hospital which reported 30% neonatal share of the total paediatric patients.[10] The plausible reason for this higher number is lack of education regarding newborn care, leading to parental anxiety and ED visits. Besides, AKUH is a well-equipped facility with the latest technology and availability of sub-specialty, which makes it an important referral centre for high-risk and complicated cases.

The current analysis highlighted that NNJ and sepsis were the predominant diagnoses. At the AKUH ED, neonates are admitted both from within the hospital and from external locations. Neonates born at AKUH typically have established discharge plans that include follow-up instructions, such as when to check serum bilirubin levels. Other neonates are often brought to the ED by their parents after laboratory personnel informed them that their baby's bilirubin levels are elevated. This process contributes to the high prevalence of NNJ at AKUH. The second most common diagnosis was neonatal sepsis. This is primarily due to the nonspecific nature of symptoms associated with neonatal sepsis. Neonates may present with a variety of symptoms, including fever, vomiting, lethargy, reluctance to feed, respiratory distress, and seizures. As a result, the initial management approach by the paediatric ED professionals is to rule out sepsis and administer empirical treatment. This clinical approach is likely to be responsible for the relatively high incidence of neonatal sepsis in the study population. Besides, the current data aligns with global trends. NNJ is frequently cited as a leading cause of hospitalisation in the early days of life, echoing the importance of robust screening and intervention programmes.[2] A study at the National Institute of Child Health, Karachi, showed 10% of patients with NNJ in contrast to 47% noted in the current study.

The reason for this is multifactorial, including lack of education and the belief in non-medical practices.

The current study observed 6% of patients with cardiac abnormalities, while a study at Combined Military Hospital (CMH) in Pakistan showed 13.7%. This is attributed to less expensive treatment available at public-sector hospital.

The high percentage of neonates admitted to SDUs and NICUs aligns with findings from earlier studies.[4]

In the current study, 1,036(73.8%) neonates required in-facility care, which was in line with numbers reported for other institutions.[11,12,13] Early vs late neonatal discharge plays a crucial role in urgent and non-urgent ED neonatal visits.[14] The most important outcome of mortality highlights a concerning scenario. Major indicators of outcomes demonstrated inadequate resources and expertise in neonatal resuscitation.[15,16] Despite efforts to improve healthcare, these statistics persist, indicating a need for targetted interventions.[17,18]

Literature has rightly emphasised that most neonatal deaths are preventable through cost-effective and timely interventions, and has also identified common issues encountered in newborns, ranging from NNJ, feeding problems and prematurity to more critical concerns, such as sepsis, respiratory distress, hypoxia, dehydration and electrolyte imbalance.[18-20]

The current study also noted the resource utilisation pattern. Comparable studies in other regions have emphasised the necessity of well-equipped EDs to manage diverse neonatal issues. However, challenges in resource availability persist, impacting the quality of care provided in emergency settings.[3]

The insights gleaned from the current study regarding specific resource utilisation, such as IV cannulation, fluid resuscitation and oxygenation modalities, resonate with broader discussions on the challenges and necessities in managing critically ill neonates. Comparable studies stress the importance of continuous training for healthcare professionals to optimise resource utilisation in emergency situations.[5]

The current study's methodology, a retrospective analysis of medical records, shares similarities with previous research on neonatal presentations in EDs.[6]

The current study has limitations associated with retrospective research. Future studies should consider prospective designs and collaborative efforts to enhance the generalisability of findings. Comparative studies with larger sample sizes across diverse settings would provide a more nuanced understanding of neonatal emergencies.

Conclusion

NNJ was found to be the most common diagnosis in neonates presenting to the ED of a tertiary care hospital. While acknowledging the unique challenges faced by the geographical region, a collective understanding of global trends contributes to the development of targetted interventions, aiming at reducing neonatal mortality and improving outcomes. Also, effective resource utilisation in the ED for newborns requires a comprehensive approach. From specialised equipment to well-trained personnel and efficient protocols, optimising resources is crucial for addressing the unique and urgent needs of neonates in emergency settings.

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AUTHORS' CONTRIBUTIONS:
WIV: Concept, methodology, writing-original draft preparation and final revision.
MNS: Formulation, data curation, editing, investigation and final revision.
AR: Design, data analysis, methodology and final revision.
RJ: Data curation, resources and editing.
JF: Data curation and validation.
SB: Concept, design, writing, reviewing, editing and supervision.