

Demographic Profile and Outcome of Pediatric Intensive Care Unit

Ramchandra Bastola,¹ Shree Krishna Shrestha,¹ Bhawana Sigdel Bastola,¹ Drishti Poudel,¹ Sunita Ghimire,¹ Amrita Ghimire,¹ Khim Bahadur Khadka,² Anjali Basnet³

¹Department of Pediatrics, Pokhara Academy of Health Sciences (PoAHS), Pokhara, Nepal, ²Ministry of Health and Population, Gandaki Province, Nepal, ³Global Star Education Foundation, Kathmandu, Nepal.

ABSTRACT

Background: Pediatric intensive care provides better observation as well as an intensive treatment, which helps to cure, support, and provide better outcomes for sick children. This study aimed to describe the demographic profile and the outcome of PICU patients, and evaluate the relationship of diagnostic categories with treatment and outcome.

Methods: This retrospective cross-sectional study was conducted in a six-bedded PICU from 1 March 2021 to 1 March 2022. Bivariate analysis was used to identify the association between dependent and independent variables.

Results: The infants admitted below 6 months of age were 63 (22.3%) and had male predominance accounting for 64%. The main portal of entry of the admitted cases was emergency ward 214(75.6%). Most of the patients 153(54.1%) were admitted for intensive monitoring of their abnormal vitals along with critical care according to our PICU protocol. Respiratory illness 122(43.1%), neurosurgical illness 59(20.8%), and primary infectious disease 52(18.3%) were the common reason for PICU admission. Post-major surgery 2(66.7%), hematological illness 3(37.5%), and cardiac disorders 1(20%) had high mortality rates. Among the portal of admission, the majority of the children (80.0%) who were admitted to the PICU through the emergency ward died before exiting from the PICU ($p < 0.0001$).

Conclusions: Respiratory illness was the most common cause of admission and post-major surgery had the highest mortality rate. Portal of entry was statistically associated with patient characteristics and had a significant relationship with the outcome. Similar studies in other health institutions are required to further analyze the demographic profile and outcome of pediatric critical care in Nepal.

Keywords: Infants; Intensive care; Patients; Pediatric

INTRODUCTION

Nepal has achieved all the targets under the millennium developmental goal (MDG-4) and is soaring towards sustainable development goals (SDG) including childhood mortality.¹ This has been possible due to preventive health services provided by the Nepal government. Due to improved public awareness of child health, children are being referred to Pediatric Intensive care Unit (PICU) services.²

Nepal remains one of the poorest and slowest-growing economies in Asia, with limited critical care services targeted toward children.³ Child health is costly but considering long-term aspects, it is a necessity for the health system.⁴

PICU in Pokhara Academy of Health Sciences (PoAHS), is a newly established first provincial governmental PICU

of Gandaki Province that serves as a major referral center in this area. This study aimed to determine the demographic profile of patients admitted along with the relationship of the outcome to diagnostic categories and treatment characteristics as well as to determine the risk of mortality.

METHODS

After obtaining approval from the Institutional Review Committee (IRC), a retrospective cross-sectional study design was used. All the patients admitted in a six-bedded PICU from 1 March 2021 to 1 March 2022 were included in the study. Our PICU is monitored by 2 senior consultant pediatrician along with 7 pediatrician with 8 pediatric residents. Two hundred ninety patients were admitted to PICU during the study period while seven patients were excluded from the study, as they did not meet the inclusion criteria. Performa based on a

Correspondence: Dr Ramchandra Bastola, Department of Pediatrics, Pokhara Academy of Health Sciences (PoAHS), Pokhara, Nepal. Email: dr_rc@yahoo.com.

questionnaire adapted by reviewing different literature was used.^{5,6} History and examination details were obtained from the case history sheet from the record section of the hospital by pediatric residents on duty and pediatricians.

Socio-demographic parameters like age, sex, residence, socioeconomic status, a portal of entry, and clinical parameters like primary illness, the indication of PICU admission, and length of PICU stay were extracted from the case history sheet of patients. The neurological status of the patients was evaluated by on-duty pediatric residents using the pediatric version of the Glasgow coma scale (GCS).⁷ Pediatric residents posted in PICU and Pediatricians were employed in the data collection process and the Head of the department (HOD) acted as a supervisor. The patients with incomplete or missed data were excluded. In addition, patients who arrived within 2 hours of admission and later died for whom sufficient time could not be given for optimal care in the PICU were excluded from the study.

Data were entered in Microsoft excel 2007 and analyzed in SPSS (version 21.0). The Chi-square test was used to identify the association between dependent and independent variables. P-value <0.05 was considered statistically significant.

RESULTS

Out of 290 patients admitted to PICU, 283 were included in the study. The number of infants admitted below 6 months of age 63 (22.3%) was higher among the admitted population. 64.0% population was male.

Table 1. Demographics and background characteristics of patients admitted to PICU (n=283).

| Indicators | Male N (%) | Female N (%) | Total |
|-------------------|------------|--------------|------------|
| Age | | | |
| <6 months | 44(69.8%) | 19(30.2%) | 63(22.3%) |
| 6 months - 1 year | 29(63.0%) | 17(37.0%) | 46(16.3%) |
| 1-2 years | 27(60.0%) | 18(40.0%) | 45(15.9%) |
| 2-5 years | 39(69.6%) | 17(30.4%) | 56(19.8%) |
| 5-10 years | 21(53.8%) | 18(46.2%) | 39(13.8%) |
| > 10 years | 21(61.8%) | 13(38.2%) | 34(12.0%) |
| Gender | | | |
| Male | - | - | 181(64.0%) |
| Female | - | - | 102(36.0%) |
| Ethnicity | | | |

| | | | |
|--|-----------|-----------|------------|
| Dalit | 46(60.5%) | 30(39.5%) | 76(26.9%) |
| Janajati | 67(63.8%) | 38(36.2%) | 105(37.1%) |
| Madhesi | 5(83.3%) | 1(16.7%) | 6(2.1%) |
| Muslim | 2(100.0%) | 0(0.0%) | 2(0.7%) |
| Brahmin/Chhetri | 61(64.9%) | 33(35.1%) | 94(33.2%) |
| Address | | | |
| Within Pokhara Valley | 86(64.2%) | 48(35.8%) | 139(47.3%) |
| Outside Pokhara Valley | 95(63.8%) | 54(36.2%) | 149(52.7%) |
| Socioeconomic status(modified kuppuswamy scale) | | | |
| Lower Middle Class | - | - | 2(0.7%) |
| Upper Lower Class | - | - | 59(20.8%) |
| Lower Class | - | - | 222(78.4%) |

The majority of patients belonged to Janajati 105(37.1%) among the ethnic group. The majority of patients arrived from outside Pokhara valley accounting for 149(52.7%). The majority of admitted patients belonged to the lower socio-economic class 222(78.4%) among the overall population as shown in Table 1.

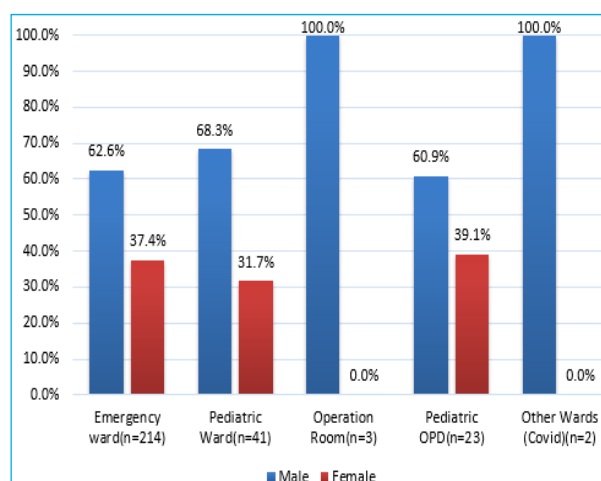


Figure 1. Portal of Entry.

Figure 1 Shows the portal of entry of the admitted cases. The portal of entry from the emergency ward was higher among male patients 62.6% compared to female patients 37.4%. The main portal of entry of the admitted cases was emergency ward 214(75.6%). The portal of entry from the pediatric ward was higher among male patients 68.3% compared to female patients 31.7%. The portal of entry from the operation ward was 100% among male patients. The portal of entry from the Pediatric OPD was higher among male patients 60.9% compared to female patients 39.1% and most of the pediatric patients

were diverted to Pediatric OPD for quick consultant service during OPD time.

Table 2. Primary indication and illness at PICU admission (n=283).

| Primary indication of PICU admission | Male N (%) | Female N (%) | Total |
|--|------------|--------------|------------|
| Respiratory Support | 59(64.1%) | 33(35.9%) | 92(32.5%) |
| Shock | 14(70.0%) | 6(30.0%) | 20(7.1%) |
| Low GCS | 13(72.2%) | 5(27.8%) | 18(6.4%) |
| Intensive Monitoring/Post Up | 95(62.1%) | 58(37.9%) | 153(54.1%) |
| Primary illness | | | |
| Respiratory Illness | 78(63.9%) | 44(36.1%) | 122(43.1%) |
| Hepatobiliary and Gastrointestinal illness | 8(80.0%) | 2(20.0%) | 10(3.5%) |
| Primary Infectious Disease | 36(69.2%) | 16(30.8%) | 52(18.3%) |

| | | | |
|-----------------------------|-----------|-----------|-----------|
| Neurosurgical Illness | 36(61.0%) | 23(39.0%) | 59(20.8%) |
| Foreign body in bronchus | 1(50.0%) | 1(50.0%) | 2(0.7%) |
| Cardiac disorders | 2(40.0%) | 3(60.0%) | 5(1.7%) |
| Hematological illness | 6(75.0%) | 2(25.0%) | 8(2.8%) |
| Renal Disorders | 4(66.7%) | 2(33.3%) | 6(2.1%) |
| ENT Disorders | 1(100.0%) | 0(0.0%) | 1(0.3%) |
| Post major surgery | 3(100.0%) | 0(0.0%) | 3(1.0%) |
| OP poisoning | 3(42.9%) | 4(57.1%) | 7(2.4%) |
| Other Poisoning | 1(33.3%) | 2(66.7%) | 3(1.0%) |
| Snakebite with coagulopathy | 2(50%) | 2(50.0%) | 4(1.4%) |
| Endocrine-DKA | 0(0.0%) | 1(100.0%) | 1(0.3%) |

Most of the patients 153(54.1%) were admitted for intensive monitoring for their abnormal vitals. Respiratory illness 122(43.1%) followed by neurosurgical illness 59(20.8%) and primary infectious disease 52(18.3%) were major and among the common reasons for PICU admission as shown in Table 2.

Table 3. Diagnosis and outcome of patients admitted to PICU categorized by gender and primary illness (n=283).

| Indicators | Male | | Female | | Total | |
|--|-------------------|-----------------|------------------|----------------|-------------------|-----------------|
| | Improved | Died | Improved | Died | Improved | Died |
| Respiratory Illness | 75(96.2%) | 3(3.8%) | 42(95.5%) | 2(4.5%) | 117(96.0%) | 5(4.0%) |
| Hepatobiliary and Gastrointestinal illness | 8(100.0%) | 0 | 2(100.0%) | 0 | 10(100.0) | 0(0.0%) |
| Primary Infectious Disease | 35(97.2%) | 1(2.8%) | 15(93.7%) | 1(6.2%) | 50(96.2%) | 2(3.8%) |
| Neurosurgical Illness | 35(97.2%) | 1(2.8%) | 22(95.7%) | 1(4.3%) | 57(96.6%) | 2(3.4%) |
| Foreign body in bronchus | 1(100.0%) | 0(0.0%) | 1(100.0%) | 0 | 2(100.0%) | 0(0.0%) |
| Cardiac disorders | 1(50.0%) | 1(50.0%) | 3(100.0%) | 0 | 4(80.0%) | 1(20.0%) |
| Hematological illness | 4(66.7%) | 2(33.3%) | 1(50.0%) | 1(50.0%) | 5(62.5%) | 3(37.5%) |
| Renal Disorders ⁹ | 4(100.0%) | 0 | 2(100.0%) | 0 | 6(100.0%) | 0 |
| ENT Disorders | 1(100.0%) | 0 | - | - | 1(100.0%) | 0 |
| Post major surgery | 1(33.3%) | 2(66.7%) | - | - | 1(33.3%) | 2(66.7%) |
| OP poisoning | 3(100.0%) | 0(0.0%) | 4(100.0%) | 0 | 7(100.0%) | 0 |
| Other Poisoning | 1(100.0%) | 0(0.0%) | 2(100.0%) | 0 | 3(100.0%) | 0 |
| Snakebite with coagulopathy | 2(100.0%) | 0 | 2(100.0%) | 0 | 4(100.0%) | 0 |
| Endocrine-DKA | - | - | 1(100.0%) | 0 | 1(100.0%) | 0 |
| Total | 171(94.5%) | 10(5.5%) | 97(95.1%) | 5(4.9%) | 268(94.7%) | 15(5.3%) |

The number of patients admitted to the PICU and their outcomes during discharge about primary illness are in Table 3. The majority of patients 268 (94.7%) were improved by PICU care, and 15(5.3%) patients died during PICU care. Post-major surgery 2(66.7%), Hematological illness 3(37.5%), and cardiac disorders 1(20%) had high mortality rates. Out of 122 patients managed for respiratory illness, 5(4.0%) died. There were 52 patients with primary infectious disease out of which two (3.8%) died, similarly two (3.4%) of the patient died out of 59 admitted cases for neurosurgical illness.

Table 4. Patient characteristics and their relationship to outcome (n=283).

| Indicators(N=283) | Alive N (%) | Died N (%) | P-Value |
|------------------------------------|-------------|------------|---------|
| Age | | | |
| <6 months | 60(22.2%) | 3(20.0%) | 0.571 |
| 6 months - 1 year | 42(15.7%) | 4(26.7%) | |
| 1-2 years | 42(15.7%) | 3(20.0%) | |
| 2-5 years | 54(20.1%) | 2(13.3%) | |
| 5-10 years | 37(13.8%) | 2(13.3%) | |
| > 10 years | 33(12.3%) | 1(6.7%) | |
| Short versus long PICU stay | | | 0.328 |
| < 3days | 144(53.7%) | 10(66.7%) | |
| >3days | 124(46.3%) | 5(33.3%) | |
| Sex | | | 0.822 |
| Male | 171(63.8%) | 10(66.7%) | |
| Female | 97(36.2%) | 5(33.3%) | |
| Portal of entry | | | <0.0001 |
| Emergency ward | 202(75.4%) | 12(80.0%) | |
| Pediatric Ward | 40(14.9%) | 1(6.7%) | |
| Operation Room | 1(0.4%) | 2(13.3%) | |
| Pediatric OPD | 23(8.6%) | 0 | |
| Other Wards (Covid) | 2(0.7%) | 0 | |

Chi-Square Test

There were no statistically significant differences in outcome among children of different age groups, children who stayed in PICU for a shorter or longer duration, and children of different sex. The majority of the children (80.0 %) having PICU admission through the emergency ward among the portal of admission died before exiting from the PICU ward ($p<0.0001$) as shown in Table 4.

DISCUSSION

The number of infants admitted below 6 months of age 63 (22.3%) was higher among the admitted population in our study. While the study in the UK showed the

maximum number of patients under one year (54.16%).⁸ Respiratory illness (43.1%) followed by neurosurgical illness (20.8%) and primary infectious disease (18.3%) were major and among the common reasons for PICU admission. The central nervous system was the most common system causing admission of patients to PICU followed by respiratory, cardiovascular, gastrointestinal, hematological, renal, metabolic causes, Down syndrome, and poisoning in another study.⁸ However majority died from brain death due to head trauma followed by central nervous system infection, stroke, status epileptics, an inborn error of metabolism, and hypoxic-ischemic encephalopathy in another study.⁹

In the present study, post-major surgery was the commonest cause of mortality followed by hematological illness, cardiac disorders, respiratory illness, and neurosurgical illness but the study done in Ethiopia showed that meningitis was the most common cause of mortality followed by cardiogenic shock and pneumonia.¹⁰

PICU admission through the emergency ward among the portal of admission had higher mortality before exit from the PICU ward and showed statistically significant differences ($p<0.0001$) in our study. Another study showed a statistically significant difference in the length of PICU stay ($p=0.007$).¹¹ But there were no statistically significant differences in outcome among children of different age groups, children who stayed in PICU for a shorter or longer duration, and among children of different sex in another study.²

CONCLUSIONS

The most common cause of admission and death being infectious were respiratory illness and post-major surgery. Out of various indicators, the portal of entry was statistically associated with patient characteristics and relationship to outcome. Similar studies in other health institutions are required to further analyze the demographic profile and outcome of pediatric critical care in Nepal.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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