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Research Article

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Pattern and clinical outcome of patients admitted in pediatric intensive care unit of a tertiary care Hospital, Dhaka, Bangladesh

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ABSTRACT

Background: In the developing world, morbidity and mortality in under-five year old children is an important public health problem. Paediatric intensive care unit (PICU) is set aside for managing children with life-threatening illnesses. There is increased survival of critically ill children, with advances in intensive care facilities. Outcome depends on the underlying nature of the disease, associated co-morbidities, clinical condition of the patient at presentation, infrastructure and the quality of care provided in the unit. **Objective**: To examine pattern and clinical outcome of patients admitted in the pediatric intensive care unit. **Methods**: This is a prospective observational study conducted in Pediatric Intensive Care Unit (PICU) of-Bangladesh Shishu Hospital and Institute, Dhaka, Bangladesh from January to December 2021. All patients from age of 1 month to 18 years admitted to PICU meeting the inclusion criteria are included in the study. PICU records of all admissions, transfer out, discharges and deaths were used for this study. Data used from the records included age, sex, diagnosis, and outcome of all the patients admitted to PICU. The outcome is classified as transfers to pediatric wards, discharges, patients who left against medical advice (LAMA), and deaths. **Results**: Total of 431 patients were admitted into PICU. (201) 46.6% were infants, and (230) 53.4% patients aged 1-18 years. Their ages ranged from one month to 18 years, with the mean age being 40.01 ± 45.79 months. There were 264 (61.3%) male and 167 (38.7%) female patients giving an M: F ratio of 1.58:1. The most common cause of admission was respiratory 195 (45.2%), infectious 107 (24.8%), surgical 31 (7.2%), cardiovascular 21 (4.9%), neurological 45 (10.4%), haematological 12(2.8%), renal 04 (0.9%) and others 16 (2.7%). Disorders needing surgical intervention were the commonest condition in children of all age groups. The overall mortality rate was 22.5%. Ninety Seven (22.5%) patients died during the period, consisting of 53 (54.6%) males and 44 (45.4%) females, with their mean age being 53.71 months (range, one month to 18 years). 40 (41.2%) of Respiratory dysfunction, 23 (23.7%) of cardiovascular disorders, 12 (12.4%) of neurological problems, 5 (5.2%) of Haematological disfunction, and 17 (17.5%) patients died in the postoperative period. **Conclusions**: Diseases including infections were the predominant conditions leading to PICU admissions in our setting. In our PICU, mortality is low. Most of the deaths were serious illnesses with poor prognosis that require adequate medical knowledge, facilities, equipment and infrastructure. This forms a major challenge in Low and Middle Income Countries (LMIC). We advocate a focus on continuous development within the sphere of influence. This highlights the importance of addressing critically ill children and expanding intensive care facilities in the region.

Key Words: *Mortality, Morbidity pattern, Intensive care unit, Children.*

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INTRODUCTION

In the developing world, morbidity and mortality in under-five year old children is an important public health problem [1]. Paediatric intensive care unit (PICU) is set aside for managing children with life-threatening illnesses [2]. There is increased survival of critically ill children, with advances in intensive care facilities [3]. Outcome depends on the underlying nature of the disease, associated co-morbidities, clinical condition of the patient at presentation, infrastructure and the quality of care provided in the unit [4].The major causes of death in developing countries in under-five children are preventable and curable diseases like acute respiratory infections, diarrheal diseases and malaria [5]. The majority of childhood deaths in these settings result from preventable and reversible causes [6]. While 10–20% of sick children will be referred to a hospital, the delay in recognition, late presentation, lack of resources, and severity of illness make the first 24 hours of hospitalization the most vulnerable period with one-third of patient deaths occurring during this time [7]. It is usually only offered to patients whose condition is potentially reversible and who have a good

chance of surviving with intensive care support. Since these patients are critically ill, the outcome of an intervention is sometimes difficult to predict. In critical care medicine, intensive care unit (ICU) results can be assessed on the basis of outcomes such as 'death' or 'survival' by means of indicators such as mortality rates. Intensive care facilities are expensive, and consequently, availability is very often limited in developing countries [8]. The selection of cases for admission is often challenging. The main purpose of the PICU is to prevent mortality by intensively monitoring and treating critically ill children who are considered at high risk of mortality. This, however, comes at a huge cost to all the parties involved the hospital, the personnel, and the caregivers of patients.

Materials & Methods

This is a prospective observational study conducted in Pediatric Intensive Care Unit (PICU) of Bangladesh Shishu Hospital and Institute, Dhaka, Bangladesh from January to December 2021. All patients from age of 1 month to 18 years admitted to PICU meeting the inclusion criteria are included in the study.

PICU records of all admissions, transfer out, discharges and deaths were used for this study. Data used from the records included age, sex, diagnosis, and outcome of all the patients admitted to PICU. The outcome is classified as transfers to pediatric wards, discharges, patients who left against medical advice (LAMA), and deaths. Ethical approval was given by the Ethics Committee of the hospital. Inclusion criteria: All pediatric age group patients one month to 18years of age who were admitted to PICU. Exclusion criteria: No exclusion criteria were considered in this study. All the pediatric age groups except neonates (0 to 28 days old), whether Abscond/Referred/LAMA or any other related circumstances of whom the diagnosis was not known, were all included in the study. The data obtained were entered into the Statistical Package for Scientific Solutions (SPSS) version 21 spreadsheet and analyzed. Means, standard deviations, percentages, and ranges were used as appropriate to describe continuous variables.

Results

Total of 431 patients were admitted into PICU. (201) 46.6% were infants, and (230) 53.4% patients aged 1-18 years (Table 1). Their ages ranged from one month to 18 years, with the mean age being 40.01 ± 45.79 months. There were 264 (61.3%) male and 167 (38.7%) female patients giving an M: F ratio of 1.58:1 (Table-2).

Table-1: Age groups distribution of admitted patients.

Infants(28 days to 1 year)	Pediatric age group (1-18 years)	Total
201(46.6%)	230(53.4%)	431(100.0%)

Table-2: Sex distribution of admitted patients.

Male	Female	% of total admission
264(61.3%)	167(38.7%)	431(100.0%)

Table-3: Causes of admission into PICU.

Condition	No of patients	% of total
Respiratory	195	45.2%
Infectious	107	24.8%
Surgical	31	7.2%
Cardiovascular	21	4.9%
Neurological	45	10.4%
Haematological	12	2.8%
Renal	04	0.9%
Others	16	3.7%

The most common cause of admission was respiratory 195(45.2%), infectious 107(24.8%), surgical 31 (7.2%), cardiovascular 21 (4.9%), neurological 45(10.4%), haematological 12(2.8%), renal 04(0.9%) and others16 (2.7%)(Table 3). Disorders needing surgical intervention were the commonest condition in children of all age groups (Table 3).

Table-4: Common diagnosis in PICU.

Diagnosis	No of patient	% of total
Pneumonia	133	30.9%
Dengue shock syndrome	103	23.8%
Mengoencephalits	29	6.7%
Bronchiolitis	19	4.4%
Congenital heart disease	21	4.9%
Congenital diaphragmatic hernia	13	3.0%
Eventration of diaphragm	08	1.9%

Encephalitis	09	2.1%
GBS	09	2.1%
CP with pneumonia	07	1.6%
Typhoid fever	04	0.9%
Tubercular meningitis	05	1.2%
Eosophageal Atresia with trachea-oesophageal fistula	06	1.4%
Bronchial asthma	03	0.7%
Hydrocephalus	02	0.5%
Colostomy	02	0.5%
Seizure disorder	07	1.6%
Haemophilia	03	0.7%
Acute leukaemia	06	1.4%
Aplastic anemia	03	0.7%
Myesthenia gravis	02	0.5%
Acute liver failure	03	0.7%
Wilm's tumor	02	0.5%
Cystic fibrosis	02	0.5%
Posterior Urethral valve	02	0.5%
Steve johnson syndrome	01	0.2%
Total	431	100.0%

Some of the common diseases for which patients were admitted were patients needing pneumonia (30.9%), Dengue shock syndrome (23.8%), Mengoencephalits (6.7%), Bronchiolitis (4.4%), Congenital heart disease (4.9%), Congenital diaphragmatic hernia (3.0%), Eventration of diaphragm (1.9%), Encephalitis (2.1%), GBS (2.1%), CP with pneumonia (1.6%), Typhoid fever (0.9%), Tubercular meningitis (1.2%), esophageal fistula (1.4%), Bronchial asthma (0.7%), Hydrocephalus (0.5%), Colostomy 0.5%), Seizure disorder (1.6%), Haemophilia (0.7%), Acute leukaemia (1.4%), Aplastic anemia (0.7%), Myesthenia gravis (0.5%), Acute liver failure (0.7%), Wilm's tumor (0.5%), Cystic fibrosis (0.5%), Posterior Urethral valve (0.5%), Steve jonson syndrome (0.2%)(Table4).

Table-5: Outcome of admitted patients.

Outcome	**No of patients**	**% of total admissions**
Discharge and transfer out	310	71.9%
LAMA/DAMA	24	5.6%
Death	97	22.5%
Total	431	100.0%

310 (71.9%) patients improved and were transferred to the pediatric wards for further management and later discharged, and 24 (5.6%) left against medical advice (Table 5).

Table 6: Causes of death and sex distribution among them in PICU.

	Male	**Female**	**Total**	**%**
Respiratory dysfunction	21	19	40	41.2%
Cardiovascular disfunction	12	11	23	23.7%
Neurological disfunction	08	04	12	12.4%
Haematological disfunction	03	02	05	5.2%
Post-operative period complications	09	08	17	17.5%
Total	53	44	97	100.0%

The overall mortality rate was 22.5%. Ninety Seven (22.5%) patients died during the period, consisting of 53 (54.6%) males and 44 (45.4%) females, with their mean age being 53.71 months (range, one month to 18 years). 40 (41.2%) of Respiratory dysfunction, 23 (23.7%) of cardiovascular disorders,12 (12.4%) of neurological problems, 5 (5.2%) of Haematological disfunction, and17 (17.5%) patients died in the postoperative period.

Table-7: Final outcome of patients admitted in PICU.

Variable/Diseases	**Admission**	**Outcome**	
		Survivors % of total survivors	**Deaths % of total deaths**
Age			

Infants(1 months-1 year)	201	149(74.1%)	52(25.9%)
Pediatric(1 year-18 years)	230	185(80.4%)	45(19.6%)
Gender			
Male	264	211(79.9%)	53(20.1%)
Female	167	123(73.6%)	44(35.8%)
Length of stay			
<48 hours	101	80 (79.2)	21(20.8)
3 to 7 days	245	184 (75.1)	61(24.9)
>7days	85	70 (82.3)	15(17.7)

DISCUSSION

In various studies, it has been shown that intensive care has a positive outcome for the vast majority of critically ill children. However, caring for the critically ill children is a challenge in developing countries where health needs often outstrip available resources. Necessary equipment is scarce and often malfunctioning, and trained manpower is limited. Management of critically ill patients requires significant human, infrastructural and financial resources. Criteria for admission into the unit are patients needing technological support like mechanical ventilation and/or invasive procedures. Total of 431 patients were admitted into PICU. (201) 46.6% were infants, and (230) 53.4% patients aged 1-18 years. Their ages ranged from one month to 18 years, with the mean age being 40.01 ± 45.79 months. There were 264 (61.3%) male and 167 (38.7%) female patients giving an M: F ratio of 1.58:1. Mean age of the admitted patients (40.01 ± 45.79 months) correlated with studies done in Greece (54.3± 49.9 months) and India (40.0 ± 45.8 months) [8, 9] but was lower compared to Ethiopia (63.0± 61.0) month [10]. It includes patients who are critically ill who need intensive critical care that is not possible in general wards and post-surgical patients needing critical care. The most common cause of admission was respiratory 195 (45.2%), infectious 107 (24.8%), surgical 31 (7.2%), cardiovascular 21 (4.9%), neurological 45 (10.4%), haematological 12(2.8%), renal 04 (0.9%) and others 16 (2.7%) Table 3 include rare and undiagnosed cases although it was not statistically significant however it was confirmed by studies done in Nepal and China [11, 12,13]. Some of the common diseases for which patients were admitted were patients needing pneumonia (30.9%), Dengue shock syndrome (23.8%), Mengoencephalits (6.7%), Bronchiolitis (4.4%), Congenital heart disease (4.9%), Congenital diaphragmatic hernia (3.0%), Eventration of diaphragm (1.9%), Encephalitis (2.1%), GBS (2.1%), CP with pneumonia (1.6%), Typhoid fever (0.9%), Tubercular meningitis (1.2%), esophageal fistula (1.4%), Bronchial asthma (0.7%), Hydrocephalus (0.5%), Colostomy 0.5%), Seizure disorder (1.6%), Haemophilia (0.7%), Acute leukaemia (1.4%), Aplastic anemia (0.7%), Myesthenia gravis (0.5%), Acute liver failure (0.7%), Wilm's tumor (0.5%), Cystic fibrosis (0.5%), Posterior Urethral valve (0.5%), Steve jonson syndrome (0.2%). Kapil and Bagga [14] reported septicemia (14.8%) as the commonest indication for admission in their series while a study from Pakistan found post cardiac surgery (34%) to be the most common condition [15]. It shows that pediatric intensive care admissions vary within the same region of different countries and one should be aware of the prevalent conditions to develop the facilities and prepare treatment protocols accordingly. In order to ensure a successful outcome for these patients, the key aim of the PICU is to avoid death by intensively tracking and treating critically ill children deemed to be at high mortality risk. While our patients covered the entire continuum from low to high-risk patients, our retrospective analysis could not objectively assess the seriousness of the conditions of our patients using tools such as the Pediatric Risk of Mortality (PRISM) and the Pediatric Mortality Index (PIM) because they were not used from the start and were not part of the medical records. The overall mortality rate was 22.5%. The reported mortality varied from 9.8-35% in different series by other authors [16,17]. Ninety Seven (22.5%) patients died during the period, consisting of 53 (54.6%) males and 44 (45.4%) females, with their mean age being 53.71 months (range, one month to 18 years). 40 (41.2%) of Respiratory dysfunction, 23 (23.7%) of cardiovascular disorders, 12 (12.4%) of neurological problems, 5 (5.2%) of Haematological disfunction, and 17 (17.5%) patients died in the postoperative period. The ability to measure the risk of death of patients is very significant because such estimation will be helpful in achieving several different objectives, such as assessing the prognosis of patients, the efficiency of ICUs and the use of ICU resources, as well as evaluating treatments, monitoring and matching the seriousness of the disease in clinical trials. In order to address the lack of continuity, reliability and precision in the subjective opinions of physicians about patient status and in response to increasing focus on the assessment and monitoring of health services, quantitative clinical scoring schemes have been created. Kapil and Bagga recorded lower mortality (9.8%) in long-stay patients (patients who stayed for more than 13 days) than in short-stay patients (24.6%) [14]. In this study, there was no significant relationship between LOS and outcome, as was documented by Patil et al [18]. The severity of illness before ICU admission and the presence of co-morbid conditions are also significant factors in patient survival. Our observed mortality rate was low. Important factors that may have contributed to survival in these patients include adequate manpower and equipment and provision of continuing medical education on pediatric critical care from time to time for staff by the institution. This study included a large amount and a variety of patients. Despite the large sample size, this study is limited by the fact that it is a single centric study, the results of which will not show the admission pattern among entire generalized population of various areas. This study was conducted in a rural tertiary care centre located far away from city in a tribal area, hence results of this study will not show pattern among urban population and developed areas of country.

CONCLUSION

Diseases including infections were the predominant conditions leading to PICU admissions in our setting. In our PICU, mortality is low. Most of the deaths were serious illnesses with poor prognosis that require adequate medical knowledge, facilities, equipment and infrastructure. This forms a major challenge in Low and Middle Income Countries (LMIC). We advocate a focus on continuous development within the sphere of influence. This highlights the importance of addressing critically ill children and expanding intensive care facilities in the region.

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