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CLINICAL PROFILE AND OUTCOME IN A PAEDIATRIC INTENSIVE CARE UNIT OF A TERTIARY CARE HOSPITAL IN PAKISTAN

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ABSTRACT

Objective: To study the characteristics of the patients admitted in paediatric intensive care unit of Pak Emirates Military Hospital Rawalpindi and record their outcomes in terms of mortality and discharge.
Study Design: Prospective observational study.
Place and Duration of Study: Paediatric Intensive Care Unit, Pak Emirates Military Hospital Rawalpindi, from Sep 2017 to Mar 2017.
Methodology: All consecutive paediatric intensive care unit admissions were prospectively studied till discharge or death. The following data were collected prospectively: age; sex; diagnosis at the time of admission; elective/ emergency status; operative status; the need for mechanical ventilation; paediatric intensive care unit length of stay (LOS) and the outcome in terms of mortality and discharge. Descriptive statistics were calculated for all variables.
Results: Among 531 children admitted in 6 months, 308 (58%) were boys and 223 (42%) were girls. The average length of paediatric intensive care unit stay was 4.11 ± 1.88. Mortality rate in our unit was 26.6%. The majority died due to respiratory diseases and LRTI (25.5%). The median age was 8 months (range: 1 day old to 13 years) and 59.3% admissions were less than 1 year of age that also included neonates. One hundred and forty-one children (23%) received mechanical ventilation, while around 30% received vasoactive drugs.
Conclusion: The clinical profile and outcomes in paediatric intensive care unit at Pak Emirates Military Hospital Rawalpindi appears to be almost at par with minor differences in certain aspects with the other paediatric intensive care units in Pakistan.

Keywords: Frequency, Intensive care, Mortality.

INTRODUCTION

Paediatric intensive care unit (PICU) has got an important role in management of critically ill infants and children. The management is aimed at providing vital organ function support and intensive monitoring in critically ill children at risk of organ dysfunction[1]. Advancements in knowledge and practices of medical sciences have improved the outcomes of critically ill children, up to five times, and various conditions are now treatable which were fatal previously[2]. The quality of paediatric medical care is reflected by the presence of functioning Paediatric Intensive Care Units in a country[2]. In contrast to the developed countries very few studies are available from Pakistan showing the characteristics of PICU[3-6]. Paediatric intensive care is an evolving speciality in Pakistan and with increasing health awareness demand of Paediatric Intensive care Units are increasing[3]. The aim of this study was to study the clinical profile of children admitted to the paediatric intensive care unit of Pak Emirates Military Hospital (PEMH) Rawalpindi to find the disease distribution, the age distribution and outcome in terms of discharge or mortality.

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METHODOLOGY

The study design was prospective observational study. Ethics approval for this study was sought from ethics committee PEMH Rawalpindi. The sample size was calculated using an online sample size calculator for observational study. In this study 531 patients who were admitted in PICU 10th Sep 2017 to 10th Mar 2018 were studied

prospectively till discharge or death. The patients who died within 6 hours of admission and whose data was missing were excluded from study. The patients who required re-admission, their data on first admission was included only. All the deaths happened in PICU and patients were discharged to paediatric wards due to lack of intermediate step-down ward or high dependency unit. The following data were collected prospectively: age; gender; diagnosis at the time of admission; elective/emergency status; operative status; PICU length of stay (LOS); the need for mechanical ventilation and the outcome in terms of mortality and discharge. Descriptive statistics were calculated for all variables. Discrete variables were expressed as counts (percentage) and continuous variables as means ± standard error of mean (SEM). Data was analysed using SPSS-24.

RESULTS

Among 531 children admitted in 6 months, 308 (58%) were boys and 223 (42%) were girls. Out of the total cases 264 (49.7%) were via emergency room and 267 (50.3%) were either post-operative cases or transferred from wards. The

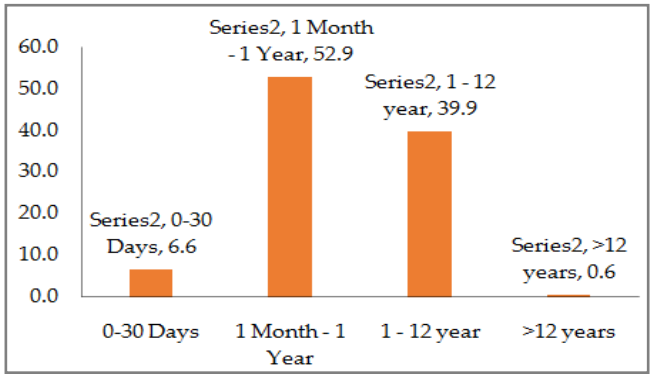

Figure: Distribution of various age groups.

average length of PICU stay was 4.11 ± 1.88 days. One hundred and forty-one patients died in PICU given a mortality rate of 26.6%. Patients admitted from hospital paediatric wards had higher mortality rate compared to the patients taken from emergency department (14.9 vs 11.7%). The majority died due to respiratory diseases and LRTI (25.5%). Mortality in patients less than 1 year of age was found to be 31.3%. The median age was 8 months (range: 1 day old to 13 years) and 59.3% admissions were less than 1 year of age that also included neonates. Age wise distribution of PICU admissions is shown in figure. One hundred and forty-one children (23%) received mechanical ventilation, while around 30% received vasoactive drugs. The major disease categories are their frequency with results and characteristics of PICU patients are summarized are shown in table.

Table: Demographic characteristics of patients.

Age	Frequency, n(%)
<1 year	59.3%
1-12 years	39.9%
>12 years	0.6%
Median Age	8 months
Gender	
Male	308 (58%)
Female	223 (42%)
Admissions	
Emergency Department	267 (50.3%)
Post op/Wards	264 (49.7%)
Primary System Involved	
Cardiology	64 (12.1%)
Respiratory	212 (39.9%)
Neurology	93 (17.5%)
Gastroenterology	54 (10.2%)
Nephrology	24 (4.5%)
Metabolic Diseases	15 (2.8%)
Post op Cases	19 (3.6%)
Mixed Diseases	8 (1.5%)
Miscellaneous	42 (7.9%)
Mean LOS	4.11 ± 1.88 days
Mechanical Ventilation	23%
Vasoactive Drugs	30%
Outcome	
Discharged	390 (73.4%)
Expired	141 (26.6%)

DISCUSSION

PICUof PEMH Rawalpindi is a 10 bedded unit. The hospital, established in 1857 (as Indian Military Hospital), has 1200 beds for in-patient treatment. There is a separate in-patient paediatrics unit called child complex that is 250 bedded and has a paediatric intensive care unit separate from the neonatal intensive care unit. Paediatric intensive care unit receives patients from the emergency department, wards, transfers from

other hospitals, as well as post-operative patients requiring PICU care except post-operative cases of congenital heart diseases. The hospital mainly looks after entitled patients from Pakistan army and their treatment is free of cost. But due to general lack of medical facilities and especially the paediatric intensive care units in the region and peripheral areas that can provide treatment at affordable costs, the hospital also takes self-paying patients of various socioeconomic classes. The study unit is a resource limited setup as compared to international standards[7,8]. It is staffed by only one intensivist, supported only by paediatric trainees who can only provide supervised intensive care. The nurse to patient ratio is 1:5 that include the ventilated patients which is far below optimal[2,7]. Ventilators are handled by paediatric intensivist and paediatric residents. Suction and nebulizer therapy is routinely handled by PICU nurses. Chest physiotherapy is provided by nurses as ordered by the paediatric intensivist. There is no separate laboratory for the PICU, however the hospital emergency laboratory is functional round the clock with turnaround time of minimum 4 to 6 hours for laboratory results. Some of the investigations are available immediately such as arterial blood gas analysis, electrolytes, and ionized calcium. Admission age in our PICU is 10 years but patients of ages 14 years and under can be admitted to PICU if they need PICU admission.

In our study, we experienced a variety of patients including cardiac and cardio respiratory, respiratory, neurological, trauma patients, patients with septic shock, malaria, multiorgan failure requiring mechanical ventilation, inotropes, and various critical care treatment modalities such as peritoneal dialysis and haemodialysis and hepatic support. Our patients median age was 8 months a with 59.3% of patients less than 1 year of age that included neonates as well. Although the median age is comparable, but the proportion of infants less than 1 year old is much higheras compared to the figures reported earlier from Pakistan[3,4,9]. The proportion of male children were somewhat higher than female 57% vs 43% and is somewhat midway between the internationally reported figures and data from Pakistan[3,4,10]. Among the 49.7% of the emergency admissions 92.2% patients were medical emergencies and rest were surgical emergencies that included the head injuries as well. This contrasts with the local and international studies that showed surgical patients as a big proportion 20-55%[3,4,11]. Mechanical ventilation rate was 23% which is comparable to the regional and international figures[4,12]. Our study demonstrated that biggest contributor to the PICU admission and mortality is respiratory diseases especially in >1 year of age. The severity of respiratory disease, nutritional and vaccination status of the child were important factors determining the mortality. Some of the patients had chronic lung disease secondary to bronchopulmonary dysplasia, cystic fibrosis, pulmonary tuberculosis and interstitial disease whose disease course was complicated by recurrent infections. One of the unusual patients was a 20-day old new born diagnosed as Down syndrome admitted to PICU with respiratory distress. Further work up revealed chylothorax. Although no correlation was statistically calculated, it was largely observed that the children who were malnourished had an increased mortality due to respiratory tract infection. There was increased severity of disease observed in children whose primary vaccination series was not complete. It was also observed that infants >1 year of age who were fed fresh cow's milk rather than mothers feed or formula feed had an increased severity of respiratory disease. However further study is required to validate this observation. Being a developing country, respiratory infections are a major disease burden in Pakistan due to general lack of health awareness and inability to control infections[13-15]. Internationally published data shows that the major cause of PICU admission as cardiovascular diseases in contrast to data from developing countries like Pakistan which shows respiratory and CNS diseases as major cause[9,12,16]. Variety of cardiovascular diseases were encountered during this study. The major cardiovascular cause of admission in PICU

was acute heart failure. The leading cause of acute heart failure was acute myocarditis followed by congenital heart diseases. In contrast to the developed world where congenital heart disease remains the top cause of acute heart failure, acute myocarditis is still prevalent in the developing countries like Pakistan where the burden of infectious diseases is high. Heart failure secondary to severe anaemia and severe haemolysis due to malaria is also prevalent in the developing countries. Spectrum of neurological illnesses that we encountered were CNS infections, status epilepticus and traumatic brain injuries. Status epilepticus in patients with cerebral palsy is particularly of note. During this study it was observed that significant number of patients with cerebral palsy had acquired cause. Many of the acquired causes are preventable such as birth asphyxia syndrome, TORCH infections and post meningitis sequalae. The burden of cerebral palsy secondary to preventable cause is one area that needed to be explored further by generating substantial data from multiple centres. Gastroenteritis leading to severe dehydration and acute renal failure, upper and lower gastrointestinal (GI) bleeds, acute liver failure and chronic liver disease (CLD) complications were the major cause of PICU admissions due to gastrointestinal diseases. Acute renal failure secondary to severe gastroenteritis was the most frequently encountered gastrointestinal emergency sometimes requiring renal replacement in the form of peritoneal dialysis or haemodialysis and fortunately with an excellent outcome. Massive lower GI bleeds due to GI ulcers and Meckel diverticulum usually required surgical intervention after initial stabilization. Other causes of acute and chronic renal failure included obstructive uropathy, congenital renal diseases, haemolytic uremic syndrome and focal segmental glomerulonephritis. These causes did not have favourable outcome and were contributors to the mortality. Metabolic diseases although a small percentage (2.8%) also had poor outcome. The diagnostic facilities for metabolic diseases in our setup are not very advanced. A very limited number of metabolic conditions are diagnosed timely and managed accordingly. International studies quote the mortality in PICU from 2-14%[12,16,17]. The mortality in our PICU was 26.6% with age related mortality being highest (31.3%) in less than 1 year of age. The mortality in males and females were almost equal (25 vs 27%). There are very few studies that show the characteristics of PICU in Pakistan. These studies report a mortality rate of 14-29%[3,6,9,18]. The high mortality rate in our PICU can be attributed not only to resource limitations of our setup but also to the fact that most of the patients develop severe complications before they land in PICU, since there is a lack of basic healthcare facilities in peripheral areas of Pakistan as well as scarcity of PICUs in thecountry[2]. Ventilator associated complications also contribute since resource limited setups cannot aggressively alleviate the risk factors associated with ventilator associated infections[19]. The average LOS was 4.11 ± 1.88 (Mean ± SEM). Previous studies from Pakistan quote an average length of stay at 3-12 days[3,6,18]. Despite the resource constraints it is very encouraging for us that our average length of stay was near to the lower values reported. Implementing very basic infection control techniques can reduce the average length of stay since the nosocomial infections can lead to prolong length of stay (6.6 vs 13.1 days)[5].

CONCLUSION

The clinical profile and outcomes in Paediatric intensive care unit at Pak Emirates Military hospital Rawalpindi appears to be almost at par with minor differences in certain aspects with the other PICUs in Pakistan in terms of admissions, length of stay and outcomes despitethe resource constraints in which the setup is functioning[3]. The outcomes in terms of mortality is like other PICUs in Pakistan[1]. The demographics also do not differ very much. The minor differences can be attributed to the fact that MH PICU mainly cares for the entitled population of the Pakistan Armed Forces who have comparatively better access to health care facilities as compared to the general population of the country. There are however differences from the developed coun-

tries in terms of spectrum of diseases especially the vaccine preventable infectious diseases and mortality[20]. Most of the severe infectious diseases that required the PICU admissions were vaccine preventable infections such as pneumococcal infections. Other infections such as cerebral malaria or tuberculous meningitis can also be prevented by good public health care and improved general health awareness. These vaccine preventable diseases have dramatically reduced in Western countries due to effective vaccine practices and public health measures which are still a big burden in our society[20]. The concept of PICU is still new in Pakistan and very few centres are functioning currently. As the advance healthcare facilities in public and private sector in Pakistan expand, more data and studies are required to provide an overall picture of paediatric intensive care in Pakistan.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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