

Analysis of Mortality in PICU of a Tertiary Care Teaching Hospital

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Abstract: ***Background:** Paediatric critical care medicine is a challenging contemporary subspecialty. The development of paediatric intensive care has contributed to the improved survival of critically ill children. **Aim:** To study and analyse the deaths occurring over a period of one year in a Pediatric Intensive Care Unit (PICU) of a tertiary care teaching hospital. **Methods:** A prospective observational cohort study of deaths in PICU was conducted over a period of one year. Data collected was demographic profile, co morbidities, length of stay, diagnosis, ICU therapies like use of inotropes and mechanical ventilation (MV). **Results:** Out of 10,186 patients admitted in Department of Pediatrics in the above time period, 930 patients required Intensive care support. 322 patients succumbed to death, having a high mortality rate of 34.6%. Maximum number of death was observed in the age group of 1 month to 1 year accounting for 32.9% of deaths. The highest mortality in PICU was due to septicemia followed by meningoencephalitis. Among respiratory causes, ARDS and Pneumonia were the major causes. Among cardiac causes, Congenital Cyanotic Heart Disease is the leading cause of death. Other causes of death were hepatic encephalopathy and acute and chronic renal failure. **Conclusion:** By their very virtue, ICUs are resource intensive with respect to both technology and the need for skilled health care providers. A large percentage of hospital costs are attributed to the ICU. As the cost of health care increases, the need to manage the resources of the ICU as efficiently and effectively as possible increases in importance as well.*

Keywords: Causes, length of stay, pediatric intensive care unit, mortality

1. Introduction

The development of paediatric intensive care has contributed to improved survival rates in children with critical illnesses.(1,2).The goal of PICU is the surveillance and support of vital organ function in critically ill or injured children who are at risk for organ dysfunction(3).There are references that support better outcome of PICU patients in tertiary centres, which led to the development of a centralized system of PICUs worldwide(4).Collection, analysis, and interpretation of relevant objective data on the utilization of ICU beds will help plan for reducing the length of ICU stay and facilitate covering more patients who require this care.

Patna Medical College and Hospital has a sixteen bedded paediatric medical intensive care unit (PICU).Whenever a critically ill child presents to the Emergency Services Room, evaluation and management is initiated by the Emergency Room team and then the PICU team. On recovery, children would be transferred to step down unit. The average number of patients admitted in the PICU ranges from 35-50 per month. Research on Intensive Care Unit (ICU) outcomes provides valuable inputs in developing more improved models for patient-centred outcomes, more robust predictions of resource use, better individual outcome prediction and alternative outcome predictions under different treatment paradigms(5). We, therefore, analysed the data of our PICU to find out the demographic profile of the mortality cases which would help in proper resource allocation and better management of critically ill children.

2. Materials and Methods

Study Site

The study was conducted in the Pediatric ICU of Patna Medical College and Hospital, Patna, Bihar.

Study Population

All the pediatric patients requiring Intensive Care admitted during the study period were included in the study.

Ethical Approval

The study was approved by Institutional Ethical Committee of Patna Medical College and Hospital, Patna

Study Type

It is a Observational study conducted in the Department Of Pediatrics, Patna Medical College and Hospital , Patna from August 2018 to July 2019.

3. Data Collection

A prospective observational cohort study was conducted in the PICU from August 2018 to July 2019 for a period of one year. We consecutively collected data from the case sheets of paediatric patients who succumbed to death. The following data were collected: age, gender; final diagnosis, co morbidities, treatment characteristics and length of stay in hospital. Serial clinical and radiological assessments of patients included thorough physical examination, pulse oximetry, arterial blood gas analysis and chest roentgenograms. Along with this the patients were investigated and treated for the primary diagnosis as per requirement of the case. ICU stay was calculated as the number of calendar days from ICU admission to discharge, and was considered prolonged if it exceeded 14 days.

4. Statistical Analysis

Data was collected on a pre- designed structured proforma and entered into Excel sheet. SPSS version 19 was used for statistical analysis. Descriptive statistics like mean, median, standard deviation and proportions were calculated for all the variables .To study the association of outcome with other variables chi square test was used and p value < 0.05 was considered significant.

5. Observation

Out of 10,186 patients admitted in Department of Pediatrics in the above time period, 930 patients required Intensive

care support. 322 patients succumbed to death, having a high mortality rate of 34.6%.

Table 1: Age and Sex Distribution of Patients

Age	Male (%)	Female (%)	Total
1 MON-1 YR	64(19.8%)	42(13.04%)	106(32.9%)
1 YR-5 YRS	37(11.4%)	21(6.5%)	58(18.01%)
5YRS-10 YRS	46(14.2%)	22(6.8%)	68(21.1%)
>10 YRS	62(19.2%)	28(8.6%)	90(27.9%)
TOTAL	209(64.9%)	113(35.09%)	322(100%)

Maximum number of death was observed in the age group of 1 month to 1 year accounting for 32.9% of deaths. Death rates were higher for males which may be due to higher number of males seeking admission in hospitals.

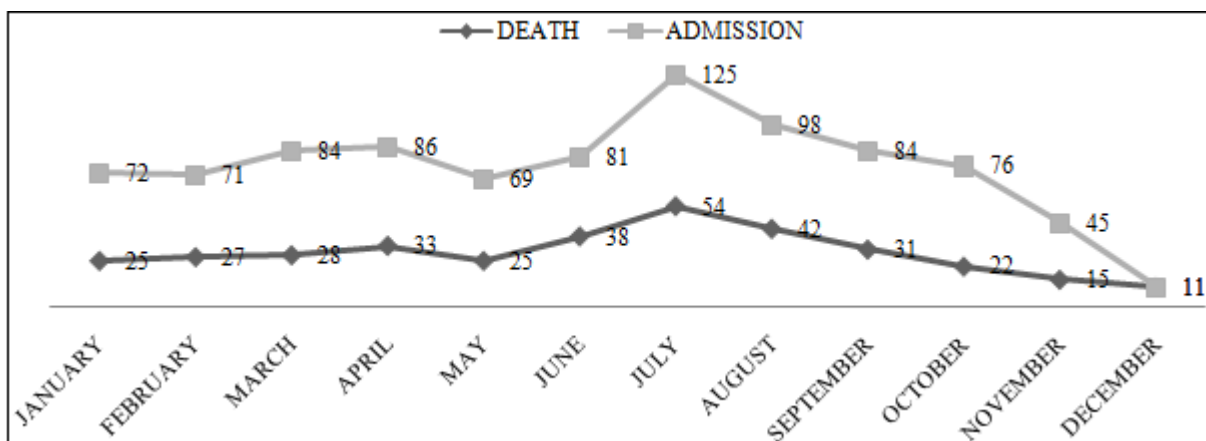


Chart 1: Distribution of Admissions & Deaths Over One Year Period

This chart shows distribution of cases throughout the year. Admissions in Picu were maximum in the month of July and minimum in the month of December. Deaths follow the similar pattern.

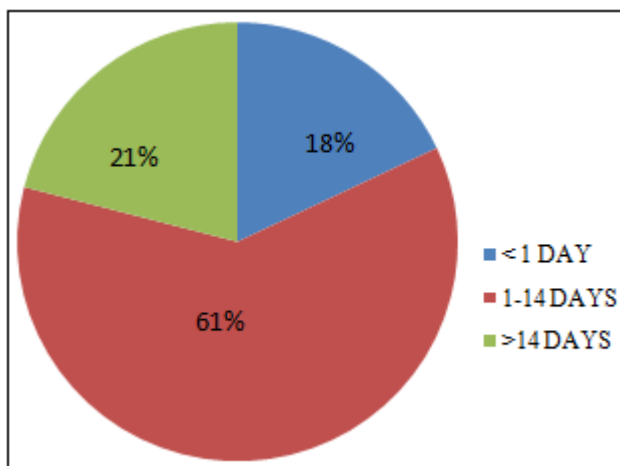


Chart 2: Relationship of Deaths to Length of Stay in PICU

18% of the cases expired within 24 hours of admission, 61 % of the cases survived upto 14 days and 22% of the cases expired after 14 days of PICU care.

Table 2: Causes of Mortality in PICU

Causes of Mortality	No. of Cases	Percentage
Central Nervous System		
• MENINGOENCEPHALITIS	65	20.18%
• ICH	11	3.41%
Respiratory System		
• ARDS	32	9.3%
• PNEUMONIA	21	6.52%
Cardiovascular System		
• ACHD with pneumonia	10	3.10%
• CCHD	21	6.5%
Septicemia	98	30.4%
Hepatic Encephalopathy	43	13.3%
Renal Failure	21	6.5%

The highest mortality in PICU was due to septicemia followed by meningoencephalitis. Among respiratory causes, ARDS and Pneumonia were the major causes. Among cardiac causes, Congenital Cyanotic Heart Disease is the leading cause of death. Other causes of death were hepatic encephalopathy and acute and chronic renal failure.

6. Discussion

In the present study the mortality rate of PICU was 34.6% which was in par with the mortality rates reported in developing countries that varied from 9.8-35%. Often these patients arrived late with multiple complications leading to mortality despite the best available therapy. A study conducted by Campos Mino et al. in 2012 showed 13.29 % mean mortality rate in PICU in Latin American countries; 5.2% in Cuba,25% in Honduras, 4% in Spain and 6% in

Portugal(6). A study conducted in Argentina revealed a lower mortality of 2.6%(7).Gemke in a multi center study showed mean7.1% mortality rate (range1-10%) in PICU patients.(8) One of the reasons of variant rate of mortality related the different severity of disorders.

In the present study, 32.9% of total PICU deaths were infants. A similar figure of 27.9 % in the study conducted by Sands. Ghaffari et al; concluded an infant mortality to be much higher i.e. 68% in his study.(9)

The commonest condition leading to death was pneumonia (29%) which was similar to the study conducted in Nepal in 2014. (10)But a study from Greece revealed neurological causes (23%) and sepsis as major causes of death with pneumonia accounting for only 11% cases.(11)In the present study congenital heart disease were seen in 11.58% of cases, similar to the study conducted by Ghaffari et al which revealed 11% of deaths had congenital heart disease.(12) Sands et al. showed infections and trauma, each with 19.6% were common aetiology of death in PICU(13), however as trauma cases would be shifted to surgical department, the present study did not have any trauma cases enrolled. Duration of stay is important because serious cases succumb early and in the present study, 71% of total deaths occurred in first 7 days which was also revealed in other studies,In the present study, 10% of patients had prolonged stay and a very similar figure (11%) was identified in a prospective study conducted on prolonged study by YaseenArabi et al.(14) Prolonged ICU stay can adversely affect the health status by increasing the risk of infection, complications and possibly, mortality.

7. Conclusion

People working in PICU in developing countries face many problems like lack of resources, knowledge and the support system. A trained paediatric intensivist may help by working closely with general paediatricians, training residents and nurses in advanced procedures, developing and updating unit protocols taking into consideration the existing human, logistic and financial resources. The intensivist may also be helpful for training peripheral units on stabilization and transportation of sick children..There is also a need for optimizing an efficient distribution and use of ICU beds.

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