Pediatrics

A RETROSPECTIVE EVALUATION OF THE MORBIDITY PATTERN AND OUTCOME OF PATIENTS ADMITTED IN A PEDIATRIC INTENSIVE CARE UNIT IN INDIA

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ABSTRACT **Background:** Pediatric intensive care unit is the main stay in the management of critically ill children requiring advanced airway, respiratory, and hemodynamic supports. These children are admitted to the pediatric intensive care unit (PICU) for offering an advanced life support system and to achieve better outcome.
Objective: To evaluate the morbidity and mortality pattern and outcome of admissions into the PICU of a tertiary care center in India.
Methods: This study was carried out with the objectives to study the clinical profile and to find the outcome of children admitted to Pediatric Intensive Care Unit (PICU) of Heritage institute of medical sciences and Hospital, Varanasi Uttar Pradesh. This retrospective study was done in children aged more than 28 days to 18 years admitted in PICU from 1st May 2016 to 30th Apr 2019.This was a retrospective study in which records of admissions (01May 2016 to30 th Apr 2019) were obtained from the PICU records which included age, sex, weight, diagnosis, duration of stay in the unit, and outcome.
Results: There were total of 890 patients were admitted. Out of these, 529 (59.43%) cases were males and 361 (40.56 %) cases were females .The Total deaths in this study were 91 and the mortality rate was 10.22%. Out of 91 patients who died, 51 (64.55%) were male as compared to 28 (35.44 %) females (M: F; 1.6:1). Median age was 4.3 years. Out of the 890 patients admitted to PICU, 91 (10.22%) died. Out of remaining 799 patients 176 (19.77 %) were taken away against medical advice and 54 (6.06%) patients were referred to higher centers .A total of 569 (63.93%) cases improved and were shifted to general ward and later discharged. 165 (20.89%) cases constituted of those who were shifted.
Conclusion: Mortality was high in our PICU. We conclude that a well-equipped intensive care unit with modern and innovative intensive care greatly facilitates the care of critically ill patients giving desirable outcome if there is early referral.

KEYWORDS : PICU admission, morbidity pattern, outcome of patients, India.

INTRODUCTION

Eastern UP and Bihar are facing a very peculiar and major crisis in the health care management. This part of country has a very high density of population with high illiteracy, and ignorance with many social taboos. Safe drinking water is still not available to most of them. Most of these children are malnourished, underweight and stunted. Most of the time the patients from rural areas & also from urban areas land up in the hands of malafide health agents(touts) who take them to the places which gives them maximum cuts or percentage per patients. There is an uncontrolled mushrooming of clinics, nursing homes and hospitals in most of the cities & townships in this part of country. Most of them are being run by untrained professionals with good clout in the society. Deliveries are being conducted by totally unskilled people who are not familiar with basics of neonatal and infant care , and at places without any infrastructure for newborn resuscitation. This is leading to very high neonatal morbidity and mortality in this part of India in spite of tremendous efforts by government PNMR, NMR, IMR and Under-5 mortality is not improving or improving at a very slow pace. It is a well known fact that an educated population takes more precautions against diseases which in turn reduce their morbidities.

The neonatal morbidity and mortality, infant morbidity and mortality and under - 5 morbidity and mortality along with life expectancy at birth are very important indicators of health status of a population. Pediatric and neonatal intensive care are emerging specialties in India .Intensive care units are very important in the management of critically ill children. The profile of neonates admitted in PICU is different as compared to neonatal ICU (NICU) .The pediatric intensive care unit (PICU) is a part of the hospital where critically ill pediatric patients requiring advanced airway, respiratory, and hemodynamic supports are treated with the aim of achieving an outcome better than if the patients were admitted into other parts of the hospital.(1,2) The care of these critically ill children is very challenging. The main purpose of the PICU is to prevent mortality by intensively monitoring and treating critically ill children who are at very high risk of mortality. This comes at a huge cost both to the hospital, the patient, and the care givers.(1,3) ICU care is offered to patients whose condition is potentially reversible and who have a good chance of surviving with intensive care support. Many hospitals in India treat newborns in pediatric ICUs (PICU).Neonates admitted to PICU are usually out born babies with severe illnesses. But the concept of NICU or SNCU and PICU is fast catching up at grass root levels i.e. in almost all the district hospital and most of the Community health centers of India.

The mortality in a Pediatric intensive care unit (PICU) can reflect a hospital's health care quality and efficiency on handling with critical ill patients, and reduce the mortality in PICU will be the key to reduce the overall mortality in a children.

The care of critically ill children remains one of the most demanding and challenging aspects in the field of pediatrics. Pediatric intensive care unit (PICU) aims at promoting early intervention and quality care with an objective of achieving good results and better prognosis. This can be achieved by well-equipped and well-trained & staffed intensive care units.(2). Despite all measures, ICU is one of the sites where medical errors are most likely to occur because of the complexity of the diseases, and multiple interventions.(3,4) . With the advancement in intensive care facilities, there is a dramatic increase in survival of critically ill children.(1,5) In critical care medicine, intensive care unit (ICU) results can be assessed on the basis of outcome such as mortality rate or the survival. Evaluation of the outcome of medical interventions can assess the efficacy of treatment. This helps in better decision making, improving quality of care and modifying the future management if required. Evaluation of the outcomes of medical interventions can assess the efficacy of treatment, making it possible to take better decisions, to further improve quality of care, to standardize conduct, and to ensure effective management of the high-level resources needed to deliver intensive care services thereby optimizing resource utilization.(4).Although mortality in patients depends on many factors such as demographic and clinical characteristic of population, infrastructure and non-medical factors (management and organization), case mix, and admission practice, it is also affected by ICU performance.(4,5)

The principle objective of pediatric clinical care is not only to decrease the mortality but also to restore the child who is suffering from a life threatening condition to health with a minimum pain , anxiety and complications. This will provide comfort and guidance to the affected family in addition. (6).The infant mortality rate in our country stands to 34,highest IMR i.e.56 being in the state of Odisha and the lowest i.e.11 being in the state of Kerala. Under five mortality according to data provided by UNICEF is 39 deaths per 1000 live births in 2016. (7,21). Children dying before the age of is huge i.e. 5-6 million in

20016.Approximately 15000 under five children die every day. (8).

MATERIAL AND METHODS

This study was a retrospective record based analysis which reviewed the admissions to the PICU of a tertiary care centre in Varanasi, for a period of three years from 01 May 2016 to 30 th Apr 2019. The hospital has a well-equipped five bedded PICU with latest facilities including ventilator and dialysis, and a team of well trained staff .We admitpediatric patient's less than 18 years of age. PICU records of all admissions, transfers out, discharges, and deaths were analyzed. Data collected on patients included age, gender, diagnosis, weight, duration of stay in the unit and outcome.

The outcome was classified as transfers to the main pediatric wards, discharges, discharges against medical advice (DAMA), left against medical advice (LAMA) along with referral discharge and death. All patients in the unit were treated according to the written standard protocol.

Relevant investigations including hemoglobin, total and differential blood counts, electrolytes, urea, creatinine, blood glucose, blood culture and arterial blood gas were done at admission. Blood tests were repeated subsequently whenever required. Cerebrospinal fluid analysis was done for suspected central nervous system infections. Treatment was started as per the protocol. Antibiotic therapy was

modified whenever necessary depending upon the culture and sensitivity pattern. Vasopressors were used for patients in shock or poor perfusion. Suspected sepsis cases (with culture negative) and proven sepsis cases with culture positive body fluid were included in infectious disease. Suspected sepsis cases included those patients who had systemic inflammatory response syndrome. (Tachycardia, tachypnoea, temperature >38.5 ºC or < 36 ºC, abnormal leukocyte count or >10% band cells.) Patients with tropical diseases (malaria/typhoid/dengue/scrub typhus) and or positive viral marker were included in other than sepsis group.

Results

During three years of study period, there were total of 890 patients were admitted. Out of these, 529 (59.43%) cases were males and 361 (40.56%) cases were females .The Total no of deaths were 91 mortality rate being (10.22%).Out of 91 patients who died, 51 (64.55%) were male as compared to 28 (35.44 %) females (M: F; 1.6:1). Median age was 4.3 years.

Out of the 890 patients admitted to PICU, 91 (10.22%) died. Out of remaining 799 patients 176 (19.77 %) were taken away against medical advice and 54 (6.06%) patients were referred to higher centers . A total of 569 (63.93%) cases improved and were shifted to general ward and later discharged. 165 (20.89%) cases constituted of those who were shifted.

Table.1.Morbidity pattern of the patients admitted to PICU

Diagnosis	Age group								
	1-12 months			01 year to 05 year			05 years to 18 years		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Neurological 241	71	59	130	35	29	64	27	20	47
Respiratory123	27	23	60	19	16	35	12	16	28
Renal32	3	5	8	6	7	13	2	2	4
Hematological	5	6	11	7	7	14	3	4	7
Cardiology12	2	3	5	1	3	4	2	1	3
Gastrointestinal66	11	16	27	13	15	28	5	6	11
Infection other than sepsis 148	31	27	58	19	33	52	17	21	38
Immunological14	1	1	2	3	2	5	3	4	7
Endocrinologcal10	1	1	2	2	2	4	1	3	4
Developmental13	3	4	7	1	2	3	1	2	3
Anemia261	39	41	80	56	67	123	23	35	58
Sepsis332	55	68	123	65	71	136	31	42	73

Table two shows distribution of deaths in different age group.

Table-2: Age variability in deaths

Age	Number of death
01Month to 01 year	43 (47.25%)
01year to 05 years	27 (29.67%)
Above 05 years and under 18 years	21 (23.07%)

Out of 91 deaths, approximately one fourth of them (n = 30; 32.96%) died within 24 hours of admission in PICU. forty-four percent (n= 43) cases succumbed to death between 24-48 hours and remaining 21 deaths (23.07%) occurred after 48 hours (Table-2).

Table.3. Time interval from admission in PICU to death

Interval from admission to death	Number (%)
Less than 24 hrs	30 (32.96%)
24 hrs to 48 hrs	43 (44%)
More than 48 hrs	21 (23.07%)

Most common primary system involved leading to mortality was Central Nervous System (n =31; 35%) followed by Respiratory system (n =25; 28.73%) and Gastro-Intestinal system (n = 15; 17.1%) (Table-3).

Table.4. System wise distribution of mortality

Primary system involved	Frequency (%)
Central Nervous System	31(34.06%)
Respiratory system	27 (29.67%)
Gastrointestinal system	17 (18.68%)
Cardiovascular system	10 (10.98%)
Renal	3 (3.29%)
Poisoning	3 (3.29%)

Different causes of mortality and co-morbid conditions are tabulated in table 4. Common co-morbidities found were anemia in 35 (40.23%) and sepsis in 36 (41.38%) patients. Large number of critically sick

patients176 (19.77%) left the hospital against medical advice (LAMA).

Table.5. Causes of mortality and co–morbid conditions

Causes	Frequency (%)
Pyogenic meningitis	07 (7.69%)
Tuberculous Meningitis	14 (15.38%)
Acute Febrile Encephalopathy	16 (17.58%)
Cerebral malaria	05 (5.49%)
Dengue hemorrhagic fever	09 (9.8%)
Refractory status epilepticus	07 (7.69%)
Congenital Heart Disease	02 (2.19%)
Bacterial pneumonia	14 (15.38%)
Acute Diarrhea	11 (12.08%)
Renal diseases	03 (3.29%)
Poisoning	03 (3.29%)
Sepsis	21 (23.07%)
Anemia	16 (17.58%)

Discussion

There were a total of 890 children admitted to PICU with different ailments over a period of three years**.** The Total no of deaths were 91 , and the mortality rate was 10.22%.Out of 91 patients who died, 51 (56.04.55%) were male as compared to 40 (43.95. %) females (M: F; 1.9:1). Median age of these children was 4.3 years. Higher rates of mortality (16.7% - 23.5%) has been reported by other authors [12, 13, 14,20]. The most likely cause of low mortality observed by us in this study could be due to high LAMA (Left Against Medical Advice) rate of critically sick children from our PICU. Most of these patients left the hospital either due to financial constraints or parents' perception that the child won't survive from current illness. which is in accordance with various other published studies Much lower mortalities have been reported from various other studies from different parts of the world the range being 2.1% - 7.1%. (8-11).

In present study, we observed that 43 (47.25%) deaths belonged to patients 01 month to 05 years age group, which is lower than reported by other studies in which it varied from 72% - 80%. (10,11,20) There was a higher mortality in male patients (66.6%) in present study which is similar to the results of Siddiqui et al which was60.5%.(6,20). It was found that out of total 91 deaths, 32.96% cases died within 24 hours of admission in PICU which is in contrary with study done by Shashikala et al. They reported 16% deaths occurring within 24 hours of admission (15,20). This reflects either a poor health seeking behavior of parents or very late referral from peripheral health centers. It was found that n diseases of nervous system were the commonest cause of mortality (40.65%) followed by respiratory diseases (15.38%). This is inconsistence with the study by Volakli et al (17,20)but contrary to other studies which reported either sepsis or pneumonia as most common causes of death (12, 18,20). Singhal and colleagues in their study found respiratory condition (40%) as most common cause of death in their PICU followed by neurological diseases amounting to 27%. (19,20). .

A well functioning PICU reduces morbidity and mortality in critically sick children. Low mortality rate observed in present study shows quality management of our PICU patients; although high LAMA rate may be causing some bias in the result.(20)

A major limitation in this study was the small sample size when compared to the other studies from India and abroad. In addition all data used in this study is from single PICU.

This being a retrospective study permission from the ethical committee was not required.

REFERENCES

1. Singh O P. Kaul K K; Morbidity and Mortality profile of NICU in a zonal hospital of armed forces in central India, a retrospective study; IJAR;Volume-8 | Issue-2 | February-2018 | ISSN - 2249-555X | IF : 5.397 | IC Value : 86.18.
2. Young MP, Birkmeyer JD. Potential reduction in mortality rates using an intensivist model to manage intensive careunits. Eff Clin Pract. 2000;3:284-9.
3. Earle M, Natera OM, Zaslavsky A Outcome of pediatric intensive care at six centers in Mexico and Ecuador. Crit Care Med. 1997;25:1462-7.
4. Cullen DJ, Sweitzer BJ, Bates DW,Burdick E, Edmondson A, Leape LL.Preventable adverse drug events in hospitalized patients: A comparative study of intensive care and general care units.Crit Care Med. 1997;25:1289-97.
5. Pronovost P, Wu AW, Dorman T, Morlock L. Building safety into ICU care. J Crit Care. 2002;17:78-85.
6. Siddiqui Nu, Ashraf Z, Jurair H, Haque A. Mortality patterns among critically ill children in a Pediatric Intensive Care Unit of a developing country. Indian J Crit Care Med. 2015;19:147-50. Available at: http:// www.ijccm.org/ text.asp?2015/19/3/147/152756.
7. Ministry of health and family welfare-National family health survey-(4), 2015-16. Available at: www.mohfw.nic.in
8. Blessing I. Lyoha A, Pooboni S K, Vuppali NKK. Morbidity Pattern and outcome of Patients admitted into a Pediatric Intensive Care unit in India. Indian Journal of Clinical Medicine. 2014; (5):1–5. DOI: 10.4137/IJCM.S13902.
9. Eulmesekian PG, Pérez A, Minces PG, Ferrero H. Validation of pediatric index of mortality 2 (PIM2) in a single pediatric intensive care unit of Argentina. Pediatr Crit Care Med. 2007 Jan; 8(1): 54-7. DOI:10.1097/01.pcc.0000256619.78382.93. [PubMed]
10. Choi KMS, Ng DKK, Wong SF, Kwok KL, Chow PY, Chan CH et al. Assessment of the pediatric index of mortality (PIM) and the pediatric risk of mortality (PRISM) III score for prediction of mortality in a paediatric intensive care unit in Hong Kong. Hong Kong Med J. 2005; 11(2): 97–103. [PubMed]
11. Gemke RJ, Bonsel GJ.Comparative assessment of pediatric intensive care: a national multicenter study. Pediatric Intensive Care Assessment of Outcome (PICASSO) Study Group. Crit Care Med. 1995 ;23(2):238-45. [PubMed]
12. Kapil D, Bagga A. The profile and outcome of patients admitted to a pediatric intensive care unit. Indian J Pediatr. 1993; 60(1):5-10. [PubMed]
13. Bellad R, Rao S, Patil VD, Mahantshetti NS. Outcome of intensive care unit patients using pediatric risk of mortality (PRISM) score. Indian Pediatr. 2009; 46(12):1091–92. [PubMed]
14.. Hoque M S, Masud M A H, Uddin A N . Admission pattern and outcome in a paediatric intensive care unit of a tertiary care paediatric hospital in Bangladesh. DS (Child) H J. 2012; 28(1):14-19.
15. Shashikala V, Begum A, Kumar C S .Analysis of Mortality in PICU of A TertiaryCare Teaching Hospital in Telanganal. Journal of Dental and Medical Sciences. 2016; 15(5):07-12. DOI: 10.9790/0853-1504081317.
16. George I O, Hart B A Alex, Briggs A I Frank- Mortality Pattern in Children. A Hospital Based Study in Nigeria: Int J Biomed Sci. 2009; 5(4):369-72. PMC3614794. [PubMed]
17. Volakli E, Sdougka M, Tamiolaki M, Tsonidis C, Reizoglo M, Giala M. Demographic profile and outcome analysis of pediatric intensive care patients. HIPPOKRATIA. 2011;15(4):316-22. [PubMed]
18. Shah G S, Shah B K, Thapa A, Shah L, Mishra O P. Admission Patterns and Outcome in a Pediatric Intensive Care Unit in Nepal. British Journal of Medicine and Medical Research. 2014; 4(30): 4939-45.
19. Singhal D, Kumar N, Puliyel J M, Singh S K, Srinivas V. Prediction of mortility by application of PRISM score in intensive care unit. indian pediatr. 2001; 38 (7):714-19. [PubMed]
20. Kalraiya A, Kapoor A, Singh R. Mortality pattern in pediatric intensive care unit patients of a tertiary care teaching hospital: a retrospective analysis. J Pediatr Res.2016;3(12): 898-901. doi: 10.17511/ijpr.2016.12.09.
21. SRS data; Office of Registrar General & Census Commissioner, India, Ministry of Home Affairs ,Government of India, updated on 01032019