Original Article

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Disease Pattern and Clinical Profile of Admitted Patients in Pediatric Intensive Care Unit of a Tertiary Care Hospital in Chattogram

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ABSTRACT

Background: *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 for achieving good results and better prognosis. With the advancement in intensive care facilities, there is a dramatic increase in survival of critically ill children. It is usually 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 intervention is sometimes difficult to predict. This study is aimed to assess the clinical profile of critically ill children presenting to the pediatric emergency room and then their admission pattern to the pediatric intensive care unit. This may help to assist intensivist and planners to pay due attention for better utilization of healthcare facilities.Better understanding leads to better management.*

Materials and methods: *This is a cross sectional study, conducted at the Pediatric Intensive Care Unit of Chattagram Maa Shishu-O-General Hospital from January to June of 2019. A total of 100 admitted cases were recruited and their symptoms and signs, clinical findings and diagnosis were recorded accordingly. All the patients were aged within 28 days to below 14 years.*

Results: *Among the 100 study subjects, 66 were male and 34 were female. The mean age was 1.73 ± 2.6 years. Most children were admitted with respiratory distress though there were other accompanying signs and symptoms.The symptoms subjects commonly presented with were respiratory distress(76%), tachycardia(70%), lung crepitations (69%), tachypnea (68%), fever (67%), lethargy (59%), feeding difficulty (59%), convulsions (48%), low blood pressure (24%), hepatomegaly (19%), cyanosis (14%), edema (6%), congenital anomalies (4%). The clinical findings that led them to PICU admissions were bronchiolitis (4%), bronchopneumonia (42%), respiratory failure of any cause (4%), heart failure (7%), cyanotic congenital heart disease (8%), acyanoticcongenital heart disease (7%), meningitis (13%), encephalitis (12%), cerebral palsy with seizure disorder (21%), status epilepticus (2%), Gullein Barre Syndrome (3%), hyponatremic dehydration (6%), acute kidney injury (2%), acute leukemia (2%).In this study, neurological disorders such as cerebral palsy with seizure disorder and encephalitis and meningitis were among the top five in the diagnosis list. Septicemia with shock was also a very common finding promoting admission to PICU. GCS was found to be significantly lower in the above-mentioned disease conditions making admission to the ICU quite plausible.*

Conclusion: *Children admitted to PICU may have multiple clinical findings and disease patterns. However, some diseases predominate the patient population admitted to PICU.The knowledge of clinical spectrum and epidemiological profile of critically ill children plays a significant role in the planning of health policies that would mitigate various factors related to the evolution of diseases prevalent in these sectors. Descriptive epidemiology focuses on identifying and reporting the pattern and frequency of events related to the health of a population.*

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Introduction

The pediatric critical and emergency medicine has been evolved as a subspecialty in pediatrics over the years and the care and researches in this field dramatically reduced the mortality in so many diseases, like dengue. Admission criteria for PICU admissions are institution dependent, based on the available facilities and bed strength. The trend is continuously changing from period to period.[1]

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Intensive care has become very important in the management of critically ill children who require advanced airway, respiratory and hemodynamic support and are usually admitted into the pediatric intensive care unit with the aim of achieving an outcome better than if the patients were admitted to other parts of the hospital.[2]

The care of critically ill children remains the most demanding and significant aspect in the field of pediatrics. Optimum care in the pediatric critical care unit depends on the level of training and expertise of the healthcare personnel, the availability of the resources and evidence-based management protocols. The principle objective of pediatric critical care is not only to decrease the mortality but also restore the child who is suffering from a life-threatening condition to health with a minimum of pain, anxiety and complications and to provide comfort and guidance to the child's family.[3]

By providing basic pediatric intensive care services, such as intravenous access and fluid resuscitation, basic antibiotic support, oxygen and non-invasive ventilator support (Continuous positive airway pressure) one can save the lives of million children every year in rural areas of developing countries. The main goal of Pediatric Intensive Care Unit (PICU) is to significantly decrease the mortality. These interventions are low cost and easy to implement in developing countries on a large scale to decrease mortality. The acquisition of technologies, training of human resources, and re-evaluation of care processes should be employed according to the demographic characteristics and morbidity of the population.[4]

Over the last three decades, mortality rates of children admitted to PICUs in North America have declined significantly.[5] By this measure alone, PICUs have been successful in offering children the best possibility for survival and recovery after life-threatening trauma and illness. Yet as mortality rates have declined, the PICU patient population has become steadily more complex. A recent analysis of admissions across 54 PICUs in United States (n= 52791) revealed that 53% of critically ill children had underlying chronic, complex illness.[6] The population has been defined as children with severe antecedent disorders; children with medical complexity, such as neuromuscular conditions and neurologic impairment; children with special healthcare needs; and children with a chronic co morbid illness, such as cardiovascular disease. What they have in common is a greater risk of PICU admission if they become acutely ill along with extensive medical needs that continue long after the illness that brings them to the PICU.[7]

The knowledge of clinical spectrum and epidemiological profile of critically ill children plays a significant role in the planning of health policies that would mitigate various factors related to the evolution of diseases prevalent in these sectors. Descriptive epidemiology focuses on identifying and reporting the pattern and frequency of events related to the health of a population.[8]

Advance in knowledge and technology of medical science have dramatically improved the prognosis for the critically ill children. The knowledge of clinical spectrum and epidemiological profile of critically ill children plays a significant role in the planning of health policies that would mitigate various factors related to the evolution of diseases prevalent in these sectors. Descriptive epidemiology focuses on identifying and reporting the pattern and frequency of events related to the health of a population.[9] This study is aimed to assess the clinical profile of critically ill children presenting to the pediatric emergency room and then their admission pattern to the pediatric intensive care unit.

Materials and methods

This cross sectional study carried on 100 cases of admitted patients in pediatric intensive care unit performed by pediatrician. All the patients aged more than 28 days to below 14 years of age admitted to the pediatric intensive care unit during a period of six months from January to June 2019 were included. Proportion of patients regarding clinical profile and disease pattern admitted in pediatric intensive care unit among pediatric group is unknown in settings. Due to time and resource constrain 100 cases of admitted patients in pediatric intensive care unit were taken. Initially patients were selected from the pediatric intensive care unit and after obtaining proper written consent from their respective guardians. Then data were collected from the patient's records at the intensive care unit as well as from their attendants and treating physicians. All these were recorded on a structured pre tested questionnaire containing all the variables of interest. Keeping compliance with Helsinki Declaration for Medical Research Involving Human Subjects, 1964, the parents of the study subjects were informed verbally about the study design, the purpose of the study and their right to withdraw from the project anytime. Only parents who had given their consent were included in the study.The data were processed and analyzed using Statistical Package for the Social Sciences (SPSS) method version 22.0. Tables of frequencies were drawn and proportions were calculated for relevant variables. Comparisons were made between variables. Means and standard deviations were measured and proportions were expressed in percentage. The Chi-square test was used to compare nominal variables and Student t-test

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was used to determine continuous variables. p-value <0.05 was considered significant. p- value <0.01 was considered highly significant. On admission, a detailed history of the patient's traditional and emergent disorders was taken from the patient's guardian. Then thorough general and systemic examinations of the patient as well as results of performed investigations recorded in the patients file were used for this study. Further queries if any were directed to the attending physician and solved instantly.

Results

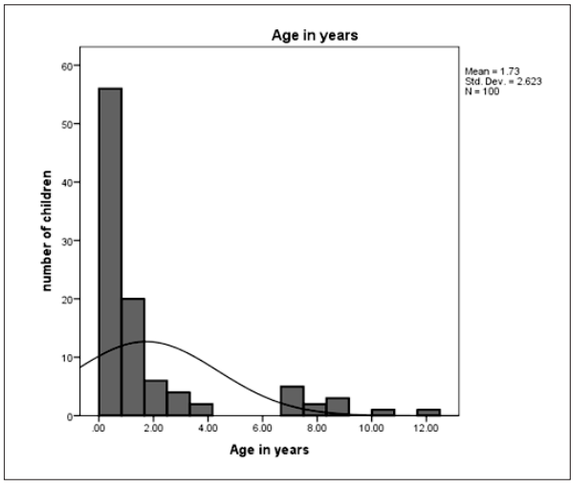

Figure 1 Age distribution of study subjects (n = 100)

The histogram above shows the distribution of study subjects according to age. Majority of the children were less than 2 years of age making up 80% of the study population, with the mean age of 1.7 years. The minimum age was 1 month and the maximum age was 12 years. 66% of the study subjects were male and 34% were female.

Table I Clinical profile of study subjects (n= 100)

Sl no.	Symptoms and signs	Percentage (%)
1.	Lethargy	59.0
2.	Respiratory distress	76.0
3.	Feeding difficulty	59.0
4.	Fever	67.0
5.	Convulsion	48.0
6.	Cyanosis	14.0
7.	Tachypnea	68.0
8.	Tachycardia	70.0
9.	Edema	6.0
10.	Low BP (according to age)	24.0
11.	Hepatomegaly	19.0
12.	Crepitation	69.0
13.	Congenital anomalies	4.0

As illustrated in the table above, 76% of the patients had respiratory distress only 4% had congenital anomalies.

Table II Diagnosis of study subjects (n=100)

	Diagnosis	Number of cases
1.	Bronchopneumonia	5
2.	Respiratory failure of any cause	2
3.	Heart failure	7
4.	Cyanotic congenital heart disease	6
5.	Acyanotic congenital heart disease	7
6.	Meningities	9
7.	Encephalitis	12
8.	Cerebral palsy with seizure Disorder	19
9.	Status epilepticus	2
10.	Gullein Barre syndrome	3
11.	Hypernatremic Dehydration	6
12.	Acute kidney injury	2
14.	Acute leukemia	2
15.	Hepatic encephalopathy	1
16.	Septicemia with Shock	11
17.	Submersion Injury	2
18.	Kerosene Poisoning	4
	Total	**100**

The Table above depicts the diagnosis of each study subject admitted to the pediatric ICU during the study period. It was revealed that 19% had cerebral palsy with seizure disorder. In second place was encephalitis followed by septicemia with shock in third place and only 1% had hepatic encephalopathy.

Table III Glasgow coma scale scoring of patients with clinical diagnosis (n=100)

Sl. no	Clinical findings	GCS scale			p value
		3 to 7	8 to 13	14 to 15	
1.	Bronchiolitis	0	2	2	0.53
2.	Bronchopneumonia	1	10	31	0.21
3.	Respiratory failure of any cause	0	0	4	0.342
4.	Heart failure	0	2	5	0.753
5.	Cyanotic congenital heart disease	0	0	8	0.106
6.	Acyanotic congenital heart disease	0	0	7	0.144
7.	Meningitis	4	2	7	0.001
8.	Encephalitis	2	6	4	0.026
9.	Cerebral palsy with seizure disorder	1	8	12	0.424
10	Status epilepticus	0	0	2	0.591
11	Gullein Barre Syndrome	0	0	3	0.451
12	Hyponatremic dehydration	0	0	6	0.193
13	Acute kidney injury	0	2	0	0.063
14	Acute leukemia	0	0	2	0.591
15	Hepatic encephalopathy	0	1	0	0.255
16	Septicemia with Shock	4	4	3	<0.001
17	Submersion injury	0	2	0	0.063
18	Kerosene poisoning	0	0	4	0.342

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It is observed from the above table about the clinical findings and compared it to the Glasgow coma scale of the respective patients, a significant variation in the GCS score in some diagnosis. GCS was significantly low in cases of meningitis, encephalitis and septicemia with shock. Some patients had more than one clinical finding and hence there is overlapping of a few cases. A chi square test was used to find the significance level.

Table IV Severity of GCS scale among different diagnosis

A Mann- Whitney U test was conducted to observe the difference in severity ranking according to GCS scale of study subjects based on the symptoms observed. The results are as seen below.

	Clinical findings	Significance level
1.	Bronchiolitis	0.597
2.	Bronchopneumonia	0.12
3.	Respiratory failure of any cause	0.151
4.	Heart failure	0.673
5.	Cyanotic congenital heart disease	0.038
6.	Acyanotic congenital heart disease	0.053
7.	Meningitis	0.121
8.	Encephalitis	0.007
9.	Cerebral palsy with seizure disorder	0.425
10.	Status epilepticus	0.314
11.	Gullein Barre Syndrome	0.216
12.	Hyponatremic dehydration	0.075
13.	Acute kidney injury	0.081
14.	Acute leukemia	0.314
15.	Hepatic encephalopathy	0.219
16.	Septicemia with Shock	0.001
17.	Submersion injury	0.081
18.	Kerosene poisoning	0.151

From the above table, it is revealed that that there is a significant difference between mean ranking of cases with and without the following clinical findings: Cyanotic congenital heart disease (sl: 0.038), encephalitis (sl: 0.007) and septicemia with shock (0.001). While cases with cyanotic congenital heart disease had a significantly better mean GCS score, cases with the remaining two clinical findings showed a significantly lower mean GCS ranking, suggesting that presence of the symptom somehow showed a worse GCS score.

Table V Relationship between convulsions and cerebral palsy with seizure disorder for study subjects (n=100)

Cerebral palsy with seizure disorder	Convulsion		Total
	No	Yes	
No	50 (63.29%) (96.15%)	29 (36.71%) (60.42%)	79 (79%)
Yes	2 (9.52%) (3.84%)	19 (90.48%) (39.58%)	21(21%)
Total	52(52%)	48(48%)	100

As it is depicted from the table above, children with a history of seizure disorder were more likely to be admitted to the PICU with presentation of an ongoing convulsion. The difference was highly significant ($p< 0.001$). Out of 100 patients, 79 patients had no cerebral palsy with seizure disorder, 21 patients had cerebral palsy with seizure disorder and Pearson chi square test value was 19.215

Table VI Relationship between convulsions and fever for study subjects (n=100)

Fever	Convulsion		Total	Chi square value
	No	Yes		
No	15 (45.45%) (28.85%)	18 (55.55%) (37.5%)	33	
Yes	37 (55.22%) (71.15%)	30 (44.78%) (62.5%)	67	.845
Total	52	48	100	

The Table above illustrates the relationship between fever and convulsions of the study subjects. Among the 100 patients 67 had fever, 33 had no fever, out of 67 patients with fever, 30 had convulsions and out of 33 patients without fever, 18 had convulsion. A significant difference was not observed between number of subjects admitted with fever and convulsions and those admitted without fever but with convulsions.($p=0.4$).

When a chi-squared test was conducted to compare the GCS scale of study subjects based on clinical findings, a significantly low GCS score was found in children presenting with meningitis ($p= 0.001$) encephalitis ($p= 0.026$) and septicemia with shock ($p<0.001$).

When a Mann Whitney U test was conducted to compare the mean rankings of GCS score based on clinical findings, cyanotic congenital heart disease showed a significantly high GCS mean rank($p=0.038$). On the contrary, subjects with encephalitis ($p=0.007$) and subjects having septicemia with shock (0.001) showed a significantly low GCS mean ranking.

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On comparing convulsions with fever no significant increase in cases were found. in other words, patients who presented with convulsions did not significantly have an increased chance of fever or vice versa (p=0.4). However, when we looked at cases of cerebral palsy with seizure disorders and compared them to the presenting symptom of convulsions, as expected there was a significant rise in incidences of convulsions among these children (p<0.001).

Discussion

Admissions to pediatric intensive care unit (PICU) becomes necessary when critically ill children need a generous amount of time, up to date medical equipment and a tremendous amount of effort from the medical staff team to help them recover and improve their chances of survival. The histogram (Figure 1) above shows the distribution of study subjects according to age. Majority of the children were less than 2 years of age making up 80% of the study population; with the mean age of 1.7 years. The minimum age was 1 month and the maximum age was 12 years. 66% of the study subjects were male and 34% were female. The most common symptom for which admission was required at the pediatric ICU was respiratory distress, followed by tachycardia, lung crepitations, tachypnea and fever and so on. The most common diagnosis was cerebral palsy with seizure disorder. In second place was encephalitis followed by septicemia with shock in third place. When we looked at the clinical findings and compared it to the Glasgow coma scale of the respective patients, was observed a significant variation in the GCS score of some diagnosis. GCS was significantly low in cases of meningitis, encephalitis and septicemia with shock. Some patients had more than one clinical findings and hence there is overlapping of a few cases. A chi squared test was used to find the significance level. There is a significant difference between mean ranking of cases with and without the following clinical findings: Cyanotic congenital heart disease, encephalitis, and septicemia with shock. While cases with cyanotic congenital heart disease had a significantly better mean GCS score, cases with the remaining two clinical findings showed a significantly lower mean GCS ranking, suggesting that presence of the symptom somehow showed a worse GCS score. Unlike the previous table (Table III), where meningitis also showed a p value less than 0.001, here the mean ranking between cases with and without meningitis did not show a significant difference. This could be due to the fact that children with meningitis had either a very severe GCS scale or a very mild GCS score thus off-setting the mean score.Children with a history of seizure disorder were more likely to be admitted to the PICU with presentation of an ongoing convulsion. The difference was highly significant (p< 0.001) the relationship between fever and convulsions of the study subjects. A significant difference was not observed between number of subjects admitted with fever and convulsions and those admitted without fever but with convulsions. (p=0.4). A retrospective study conducted at the PICU of Gauhati Medical College & Hospital, Guwahati Assam by Indira Das et al. showed that most of the cases admitted in PICU belonged to central nervous system disorders which constituted 241 (30.51%) cases, followed by respiratory system in 153 (19.37%) cases, infections in 132 (16.71%) and cardiovascular system in 83 (10.51%) cases.[9] This was comparable to a study carried out by Anwarul Haque et al. which showed that the most common cause was neurological (28%) followed by respiratory in 24.4%, sepsis in 13.7% and cardiovascular in 10.9% cases.[10] This was in contrast to a study published in British Journal of Medical research by Gauri S. Shah et al. which found that respiratory diseases contributed to the maximum number of cases i.e. 33%, followed by central nervous system diseases (18.6%), infectious diseases (11.3%), surgical causes (7.8%), gastrointestinal diseases (7.4%), cardiovascular diseases (6.5%) and poisoning (4.8%).[11] This variation might be due to the differences in the sample size and study period of the studies.

Limitations

- Sample size was small. Hence, inferences for some of the clinical findings could not be made confidently.
- The study was a single center study. Only patients that were admitted to one pediatric ICU were recruited for the study. Hence, the results may not reflect the overall image of the country.
- Since the sampling method was purposive convenient sampling, there is a chance of observer bias that could have occurred.
- Due to time, budget and resource limitations, long term follow-up of the patients was not possible. Patient outcome was also not recorded.

Conclusions

The study revealed that, Children admitted to PICU may have multiple clinical findings and disease patterns, However, some diseases predominate the patient population admitted to PICU. Among them neurological disorders such as cerebral palsy with seizure disorder and encephalitis and meningitis were among the top five in the diagnosis list. Septicemia with shock was also a very common finding prompting

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admission to PICU. GCS was found to be significantly lower in the above-mentioned disease conditions thus making admission to the ICU quite plausible.

Recommendations

Further study to assess the overall clinical profile and disease pattern of admission in PICU is highly recommended that will enrich the knowledge of stake holder and planners to pay due attention for better utilization of healthcare facilities.

Disclosure

All the authors declared no competing interest.

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