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Disease spectrum of PICU admissions in a Tertiary Care Center in Hyderabad, Telangana

Paediatrics

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ABSTRACT

Title: Disease spectrum of PICU admissions in a Tertiary Care Center in Hyderabad, Telangana
Objective The objective of the study was to examine the disease spectrum of patients admitted to the PICU in a tertiary care hospital.
Material and Methods This is a retrospective, descriptive study of hospitalized children in PICU at Gandhi Medical College and Hospital Secunderabad from January 2016 to December 2016. The data was analyzed using MS Excel software and $\chi 2$ test at $P < 0.05$ was conducted for male and female comparison.
Results The number of admitted children below one year group was 935; 1-5 years was 1327; and above 5yrs was 1211. The most common diagnosis overall was seizures (21%), pneumonia (18%), fever (12%) and Acute Gastro-Enteritis (AGE) (9%). The pattern of disease varied in different age groups. The overall mortality rate was around 8%.

KEYWORDS

Disease spectrum, PICU admissions, morbidity, children, pneumonia, seizures, AGE, fever

INTRODUCTION

Critically ill or injured children require prompt identification, rapid referral and quality emergency management. This is one of the most challenging and demanding areas for pediatricians. It is reported that critically ill children admitted to hospitals often die within 24 hours of admission[1]. Child mortality is a sensitive indicator of a country's development and evidence of the nation's priorities and values. It is also reported that "advanced technologies, effective monitoring, and high-intensity staffing and specialized training" in critical care have greatly improved the outcomes of critically ill children and infants who are admitted to the PICU[2, 3]. The PICU has got a very important role in management of critically ill children and has contributed to the improved survival of critically ill children[4, 5]. A well-functioning Pediatric Intensive Care Unit (PICU) contributes significantly in improving survival of critically sick children[6].

Research and studies in developed and developing countries has shown that critically ill children who come to the PICU have some common disease and diagnosis spectrum. These appear to be fever, pneumonia/respiratory tract infections, acute gastroenteritis(diarrhea, dysentery with or without vomiting), and seizures. Mick[7] (2009) writes that fever is one of the most common complaints of children coming to the emergency department; accounting for 20% of all pediatric ED visits.

According to a WHO Fact Sheet[8], pneumonia is the single largest infectious cause of death in children worldwide, accounting for 16% of all deaths of children under five years old especially in South Asia and sub-Saharan Africa. ARI is responsible for about 30-50 % visits to health facilities and for about 20- 40 % admissions to hospital (Kiranmai[9] et al, 2016). The results of a 2010 study by Farooqui[10] et al suggest that 3.6 million (3.3–3.9 million) episodes of severe pneumonia and 0.35 million (0.31–0.40 million) all-cause pneumonia deaths occurred in children younger than 5 years in India. One of the major contributors to the pneumonia burden is Streptococcus pneumonia; others include Hemophilus influenzae, Respiratory syncitical virus and Influenza. However, the estimation of etiological agent among clinical pneumonia episodes has remained a challenge in developing nations due to lack of laboratory diagnostic support and surveillance systems[8]. The incidence of pneumonia has decreased in developed countries after universal immunization of their children with HIB and Pneumococcal vaccine. The use of these conjugate vaccines are definitely indicated for the prevention pneumonia morbidity and mortality in children younger than 5 years.

WHO[11] has also reported that diarrheal disease is the second leading cause of death in children under five years old globally, killing around 525 000 children under five. Globally, there are nearly 1.7 billion cases of childhood diarrheal disease every year and it is the leading cause of malnutrition in children under five years old. In India, studies have shown that diarrhea is the third leading cause of childhood mortality in India, and is responsible for 13% of all deaths/year in children under 5 years of age (Laxminarayana,[12] 2015). Management of acute dehydration in the PICU is a challenging task for physicians in the PICU (Sutariya[13], 2011).

The WHO and UNICEF integrated Global action plan for pneumonia and diarrhoea (GAPPD)[14] aims to accelerate pneumonia control with a combination of interventions to protect, prevent, and treat pneumonia/diarrhea in children with actions to:

- **Protect** children by including promoting exclusive breastfeeding and adequate complementary feeding;
- **Prevent** pneumonia with vaccinations, hand washing with soap, reducing household air pollution, HIV prevention and cotrim oxazole prophylaxis for HIV-infected and exposed children; preventive interventions for diarrhea include sanitation, source water improvements, and household water treatment and safe storage;
- **Treat** focusing on making sure that every sick child has access to the right kind of care -- either from a community-based health worker, or in a health facility if the disease is severe -- and can get the antibiotics and oxygen they need to get well;

Pediatric seizures and epilepsy among Indian children is a common reason for periodic visits to the emergency rooms of hospitals (Saravanan[15], 2013). Studies have shown that about 5% of all children will have at least one seizure by the time they're 16 years old (Udani[16], 2005). Most seizures in children are provoked by somatic disorders originating outside the brain, such as high grade fever, infection, syncope, head trauma, hypoxia, toxins, or cardiac arrhythmias. . Less than one third of seizures in children are caused by epilepsy. For

children with epilepsy, the prognosis is generally good, but 10- 20% have persistent seizures refractory to drugs, and those cases pose a diagnostic and management challenge in PICU.

Children are the most vulnerable and valuable demographic group for any community and country. They need special care and protection, especially when admitted to intensive care units. Thus a general understanding in the management of these patients is crucial for all emergency medicine clinicians. The analysis of the disease spectrum of children admitted to the PICU provides overall information of the predominant morbidity pattern of children in the community. This information is valuable in preparing public health action plans and strategies both at the macro state and country level, as well as micro planning at the hospital level.

OBJECTIVE

The objective of this study was to examine the Disease spectrum of PICU admissions in a tertiary care center in Hyderabad, Telangana. Based on statistical analysis, we identified the major diagnosis of admissions in three age groups, as well as analysis based on male and female children to study differences between the sexes, if any.

MATERIAL & METHODS

This is a retrospective study of children admitted to the Pediatric ICU at Gandhi Medical College and Hospital from 1st January 2016 to 31st December 2016. The Hospital has a 12 bedded pediatric ICU (4 ventilator beds) and is staffed by pediatricians, pediatric postgraduates and nurses. All cases are triaged by the duty physician and moderately sick and severely ill patients are directly admitted to the PICU. Once stabilized, they are shifted to a step-down unit. Data on age, sex and diagnosis spectrum details were retrieved from the medical records and admission registers and tabulated into an Excel sheet. No indicators or ID numbers were collected which could lead to the disclosure of the identity of the patient and there was no link to any PHI of individual patients.

Patient data was collected from the admission register and medical records (n =3,473, 1 month old to 14 years). The age, sex, clinical diagnosis and mortality parameters were analyzed to study the pattern of diseases among admitted children and their outcome. The results were analyzed using MS Excel software Data was then stratified into male and female in three age groups—less than one year, one to five years and above five years. The data was analyzed using MS Excel software. Data between male and female was compared using the $\chi 2$ tests at $P < 0.05$ level of significance.

RESULTS

The total admissions during the year were 3,533 children out of which complete data was available only for 3,473 cases. These 3473 cases were used for the analysis. The age of the children was from one month to 14 years old. Males accounted for 1,993 or 57.4 % of the sample and females were 1,480 or 42.6%.

It was found that the most common age group of admitted children is 1-5 years, (1,327 or 38.2%), followed by above 5years age group (1,211 or 34.9%) and children below one year constituted 26.9 % (935) of the sample.

The most common diagnosis at the time of admission overall was Seizures, Pneumonia (with Bronchiolitis), Fever and AGE, comprising 65% of the admitted diagnosis spectrum. There was no statistical significance between the difference in percentages between males and females. This is shown in Table 1.

Diagnosis	Total Male	% of Male	Total Female	% of Female	Total	% to total
AGE	170	8.53%	143	9.66%	313	9.01%
Bronchiolitis	123	6.17%	55	3.72%	178	5.13%
Fever	225	11.29%	190	12.84%	415	11.95%
Pneumonia	324	16.26%	308	20.81%	632	18.20%
Seizures	418	20.97%	313	21.15%	731	21.05%
Total Sample	1993		1480		3473	65.34%

Table 1—Diagnosis Spectrum of Total Sample

The pattern of disease varied in different age groups. In the below 1 year age group, respiratory disease dominated—pneumonia and bronchiolitis accounting for 45%, followed by seizures and diarrhea. This is consistent with expected diagnosis for this age group. There was no statistical significance between the difference in percentages between males and females. The details are shown in Table 2.

Diagnosis	Below 1 year Male	% to Sample Size	Below 1 year Female	% to Sample Size	Below 1 year All	% to sample size
AGE	43	7.85%	45	11.63%	88	9.41%
Bronchiolitis	94	17.15%	45	11.63%	139	14.87%
Fever	38	6.93%	17	4.39%	55	5.88%
Pneumonia	180	32.85%	114	29.46%	294	31.44%
Seizures	55	10.04%	70	18.09%	125	13.37%
Total Sample	548		387		935	

Table 2—Diagnosis Spectrum—Less than One Year

In the 1 to 5 years age group, "seizures" was the majority diagnosis, followed by pneumonia, fever and diarrhea. As expected, in the higher age group, bronchiolitis was almost non-existent. Cases of poisoning were also reported. There was no statistical significance between the difference in percentages between males and females, except in the case of pneumonia where the incidence among females almost twice that of males. However, we may not be able to draw any clinical conclusions based on this. This is shown in Table 3.

Diagnosis	1 to 5 Male	% to Sample Size	1 to 5 Female	% to Sample Size	1 to 5 years all	% to Sample Size
AGE	90	11.38%	56	10.45%	146	11.00%
Bronchiolitis	23	2.91%	7	1.31%	30	2.26%
Fever	95	12.01%	73	13.62%	168	12.66%
Pneumonia	125	15.80%	170	31.72%	295	22.23%
Seizures	216	27.31%	142	26.49%	358	26.98%
Total Sample	791		536		1327	

Table 3—Diagnosis Spectrum—One to Five Years

In the above 5 years age group, seizures was the majority diagnosis, followed by fever, dengue and diarrhea. In this age group, snake and scorpion bites were also reported, possibly because of older children venturing outside. There was no statistical significance between the difference in percentages between males and females for these diagnoses. However, of the admissions into PICU due to anemia, the percentage of females was 2.25 times that of males. Though the size of the anemia sample was too small to conduct a $\chi 2$ test, this data seems to support the conventional wisdom theory that Indian mothers feed their sons better than their daughters. A substantial number of hemophilia cases were also reported. The details are shown in Table 4.

Diagnosis	5+ Male	% to Sample Size	5+ Female	% to Sample Size	5+ years All	% to Sample Size
AGE	37	5.66%	42	7.54%	79	6.52%
Anemia	14	2.14%	27	4.85%	41	3.39%
Bites	25	3.82%	16	2.87%	41	3.39%
Dengue	59	9.02%	41	7.36%	100	8.26%
Fever	92	14.07%	100	17.95%	192	15.85%
Hemophilia	27	4.13%				
Seizures	147	22.48%	101	18.13%	248	20.48%
Total Sample	654		557		1211	

Table 4—Diagnosis Spectrum—Age 5+

Across age groups, the main diagnoses of the total sample were seizures, pneumonia (with bronchiolitis), fever and AGE. However, the incidence varied according to age groups and this is shown in Figure 1.

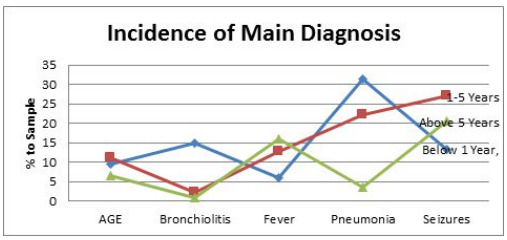

Figure 1—Incidence of Main Diagnosis Across Age Groups

The total mortality rate was about 8% with no statistically significant

association with sex.

CONCLUSION

The most common diagnosis at the time of admission overall was seizures (21%), pneumonia (18%), fever (12%) and AGE (9%). There was no association with sex in the main diagnosis. This result is consistent with the results of other studies in Indian and is shown in Table 5 below.

Main Diagnosis	Khilnani[17] et al (2004)	Earan[18] et al 2016	Nirmala[19] et al 2016	Our Study 2017
Respiratory	19.7%	40.2%	23.4%	18%
AGE		10%	11.9%	9%
Fever/Infections	12.5%	19.5%	33.7%	12%
Seizures/CNS	17.9%	16%	12.9%	21%

Table 5—Comparison with other Studies

In 2011, the Government of India[21] introduced the Hib-containing pentavalent vaccine in a phased manner and also started rotavirus vaccinations in a few States. The Government is also planning to introduce pneumococcal vaccinations this year. These interventions will definitely decrease the preventable disease morbidity and mortality. GAPPD[14] aims to accelerate pneumonia control with a combination of interventions to protect, prevent, and treat pneumonia/ diarrhea in children.

Implementing these measures will prevent children from coming to the PICU and reduce the overall morbidity and mortality associated with these diseases.

Our study was for a 12-bedded PICU in a large capital city of a medium sized state. About 3500 cases were admitted in one year, an average of about 10 cases per day. In this hospital, there is no pediatric emergency care unit and all cases are directly admitted to the PICU, causing a severe strain on the medical and human resources of the unit. It is suggested that a pediatric ER department be opened so that only the serious cases are admitted to PICU and others be sent to the step down ward after triage.

Research on Intensive Care Unit (ICU) outcomes is a valuable tool for policy makers and hospital administrators. Data across studies can provide strategies for better resource use and for developing models for patient-centered outcomes[20]. As stated by Earan[18] et al, "Observational data guide the design of new protocols and clinical trials, which in turn helps in disease management and reduction of mortality". We agree with Khilnani[17] et al when they suggest that more studies are required to assess the overall outcome of critically ill children in India and the strategies for managing PICU admissions.

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