



PRESCRIBING PATTERN OF ANTIMICROBIAL AGENTS IN THE PEDIATRIC INTENSIVE CARE UNIT OF A TERTIARY CARE TEACHING HOSPITAL IN PUDUCHERRY UNION TERRITORY.

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ABSTRACT

This study was done to evaluate the prescribing pattern of antimicrobial agents (AMA) in the NICU of a tertiary care teaching hospital. A prospective, hospital-based, cross-sectional prescription audit was conducted with 100 case records of children admitted in the PICU of a tertiary care teaching hospital located in Puducherry Union Territory. Cefixime (25.2%) and Ampicillin (23.8%) were found to be the most frequently prescribed antimicrobial agents. Penicillins (41.72%) and Cephalosporins (34.43%) were the most frequently prescribed groups of AMAs in the studied PICU. Majority (66.66%) of antimicrobial prescriptions were made for non-bacteriologically proven infections. CSF specimens were taken for culture in 4 cases out of 100 patients to identify pathogenic organisms and no specimen showed positive culture. Our data shows more frequent use of betalactam antibiotics in the PICU and most AMA prescriptions were made without supporting bacteriological evidence in the PICU.

KEYWORDS: Antimicrobial agents; Prescribing pattern; PICU; Beta lactam antibiotics; antibiogram.



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INTRODUCTION

Pediatric intensive care unit (PICU), is a setting of the hospital in which critically ill children are treated by Pediatric specialists. Children admitted to the Pediatric Intensive Care Unit (PICU) have life threatening illnesses. They either already have an infection when admitted or are at high-risk of acquiring infections because of different procedures, use of invasive devices, and extended length of stay in the PICU.¹ Antimicrobial agents are the most commonly used medicines in the Intensive Care Units (ICUs).² Excessive antibiotic use promotes the emergence and spread of antibiotic-resistant bacterial pathogens frequently isolated from patients in ICUs.³ There are limited data from Indian PICUs on antibiotic prescription pattern. It is extremely imperative to evaluate and monitor the prescribing pattern of antimicrobials from time to time for enabling suitable modifications in prescribing patterns; to increase the therapeutic benefits and also to decrease the adverse effects for optimizing the health care services.⁴ So, this study was done to evaluate the prescribing pattern of antimicrobial agents in the NICU of a tertiary care teaching hospital.

METHODOLOGY

A prospective, hospital-based, cross-sectional study (prescription audit) was conducted in the PICU of a tertiary care teaching hospital located in Puducherry – Cuddalore main road, Puducherry, Puducherry Union Territory. This study was carried out in 2013 with the case records of patients admitted to the PICU during September to December 2012. Considering the total number of admitted patients in the PICU during the previous 3 years under the department of Pediatrics, 125 neonatal case records were recruited and reviewed for the present study (expecting 20% non-response and calculated sample size of 100). The study was carried out in the Department of Pharmacology in-collaboration with the Department of Pediatrics.

Ethical clearance

Institutional Human Ethics Committee approval was obtained before the commencement of the study. Waiver for written informed consent was obtained from the institutional ethics committee, since the study did not involve any active intervention or participation of subjects. Subject confidentiality was maintained during and after data collection.

Exclusion criteria

1. Incomplete case records.
2. Discharged from PICU within 24 hrs of admission.
3. Transferred to other specialty Intensive Care Units.

Data collection and procedure

Data were collected through review of case records of children admitted and treated in the PICU. Consecutive 125 case records of children admitted and treated in the PICU between September and December 2012 were obtained from the Medical Records Department of the hospital. To evaluate the drug prescribing pattern, a data collection pro forma sheet was prepared. The pro

forma contained space for recording the following data which included.

- Demographic data: Age, sex and address.
- Diagnoses.
- Duration of stays in the PICU.
- Group and type of antimicrobials prescribed: Different types of AMAs and the group they belonged-to were noted down in detail.
- Dosage, durations, and frequency: Dose of all AMAs, their duration of prescription and frequency of administration.
- Routes of administration: Details regarding the route and formulation of administration of the AMAs.
- Brand or generic drugs: Whether AMAs were prescribed in their generic or brand names.
- Any adverse reaction to the antimicrobials as recorded by the physicians in the case records.
- Investigation results: Details of culture and sensitivity, commonly isolated organisms and their resistance pattern as mentioned in the investigation reports attached to the case records.
- Details of other markers of infection (C-reactive protein, organisms/pus cells in urine, detection of vegetation in Echocardiogram, relevant radiological findings (Ultrasonography, X-ray, CT).
Fluids and electrolyte solutions, drugs other than AMAs, amino acids, glucose, oxygen, phototherapy and prophylactic ophthalmic treatment were not included in data for analysis.

Categorization of AMA usage based on their indications

Antimicrobial therapy was categorized according to the indication for antimicrobial use. According to the indication, four antimicrobial usage groups of subjects were essentially defined.

- Usage Group 1: Bacteriologically proven infection was considered as the indication for antimicrobial prescription if Antibiogram (culture and sensitivity testing) report suggested organism growth and their drug sensitivity.
- Usage Group 2: Non-bacteriologically proven infection/empirical was considered as the indication for antimicrobial prescriptions if investigation data such as urine microscopy, total WBC count, Differential count or radiological findings were suggestive of local or systemic infection but the causative organism and its sensitivity pattern were unknown.
- Usage Group 3: The antimicrobial therapy was considered as prophylactic if there was no evidence of infections and the AMA was employed to prevent infection (e.g., in catheterized patients).
- Usage Group 4: Indication was considered as symptomatic if the records suggested that AMAs were prescribed based on the clinical symptoms and signs (e.g., treatment of fever in the absence of specifically suspected infection).

STATISTICAL ANALYSIS

Collected data were entered in Microsoft_Office_Excel 2010 and analyzed using SPSS Inc. Statistical Software Version 17.0. Descriptive statistical analysis was done using proportion, percentages, and mean \pm standard deviation.

RESULTS

During the study period, 100 consecutive patient case records which satisfied the eligibility criteria were analysed. Out of the hundred, 61 (61%) were male children and 39 (39%) were female children. Age of the patients were ranging between 1 month to 144 months (12 years) and the mean age of patients admitted to the PICU was found to be 18.93 (\pm SD 34.54) months. The most frequent diagnoses which warranted admission in the PICU were predominantly respiratory illnesses which constituted 73% of admissions including wheeze associated Lower Respiratory tract infection (25%); bronchopneumonia (23%); bronchiolitis (17%); severe bronchial asthma (6%); and

laryngotracheobronchitis(2%). Simple Febrile seizures(5%), Diarrhoea/Dysentry (4%), clinical malaria (3%), Typhoid fever(2%) and Secondary Seizure (1%) constituted 15% of admissions and other diseases like cardiac illness (Ventricular Septal Defect – 1%; Arrhythmia – 1%), Pyrexia of Unknown origin (5%), Suspected Dengue fever (1%) and suspected meningitis (4%) constituted the rest (12%). Minimum duration of stay in the PICU in the study sample was 2 days and the maximum duration of stay was 11 days and the mean duration of stay was found to be 6.4 (\pm SD 2.08) days. Out of the hundred patient records studied, 10(10%) were not prescribed any AMAs during their course of treatment. Rest 90(90%) were prescribed one or more AMAs as shown in fig 1.

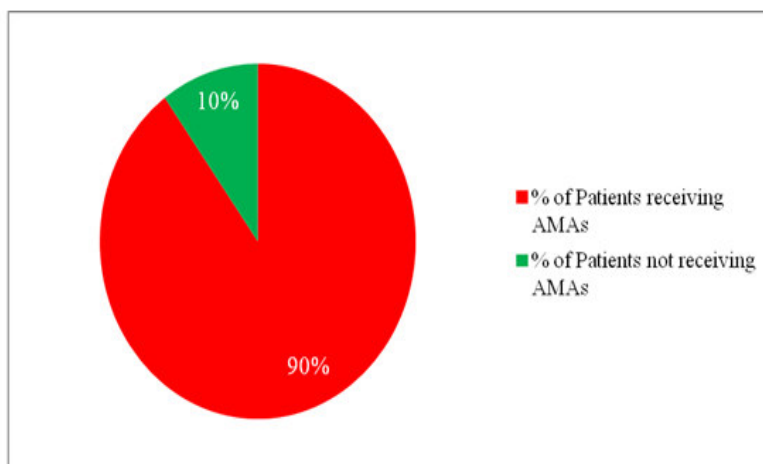


Figure 1
Percentage of Patients receiving AMAs in the PICU (n-100)

151 antibiotic prescriptions were made for the 90 patients who received antibiotics. Totally 16 types of AMAs were prescribed as shown in table 1. Fixed drug combinations such as Amoxicillin + Clavulanic acid, and Ampicillin + Cloxacillin prescriptions were considered as a single type of AMA prescribed. Penicillins (41.72%) and Cephalosporins(34.43%) were the frequently

prescribed groups of Antimicrobial agents as shown in the table 2. Based on the number of antimicrobial agents prescribed for a patient during their stay in the PICU, it was observed that majority of them received One to two Antimicrobial agents (55.6% and 30% respectively) as depicted in the table 3 and figure 2.

Table 1
Prescribing frequency of antimicrobial agents in the PICU

Sl.No	Drug	Frequency	Percentage
1	Cefixime	38	25.2
2	Ampicillin	36	23.8
3	Amoxicillin	13	8.6
4	Amikacin	11	7.28
5	Ceftriaxone	10	6.62
6	Gentamicin	9	5.96
7	Ampicillin+Cloxacillin	9	5.96
8	Artesunate	5	3.3
9	Metronidazole	4	2.64
10	Azithromycin	4	2.64
11	Amoxicillin+Clavulanic acid	3	1.98
12	Cefotaxime	2	1.32
13	Cefpodoxime	2	1.32
14	Cloxacillin	2	1.32
15	Clotrimazole	2	1.32
16	Chloroquine	1	0.66
Total		151	100.0

n-151

Table 2
Utilization of various groups of AMAs in the PICU

Group of AMAs	No. of prescriptions	% of prescriptions
Penicillins	63	41.72 %
Cephalosporins	52	34.43%
Aminoglycosides	20	13.24%
Metronidazole	4	2.64%
Macrolides	4	2.64%
Others	8	5.29%
Total	151	100%

n-151

Table 3
Distribution of patients according to the number of AMAs prescribed

Number of AMAs	Number of Patients	% of Pts receiving AMAs
1	50	55.60%
2	27	30%
3	8	8.90%
4	3	3.30%
5	1	1.10%
6	1	1.10%
Total	90	100%

n-90

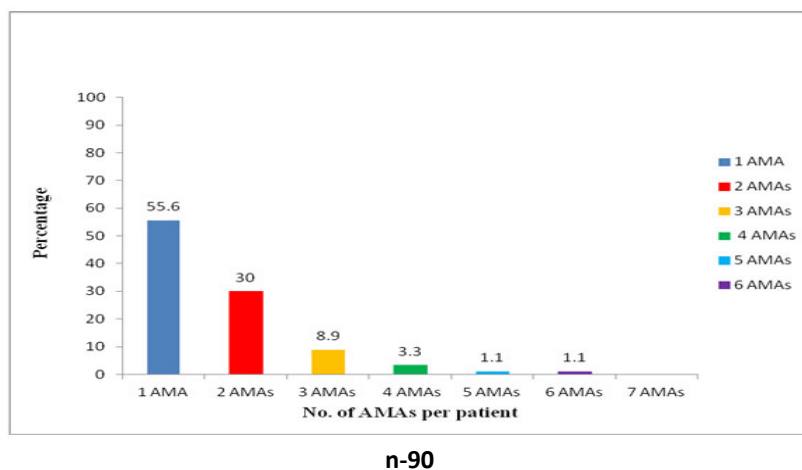


Figure 2
Distribution of patients according to the number of AMAs prescribed in the PICU

Indications for AMA utilization in the PICU

151 prescriptions made for the 90 patients were categorised into four basis based upon the reason for utilization of AMA and the percentage of each basis for prescribing AMAs was found to be as shown in table-4,

Table 4
Indications for AMAs

Non Bacteriologically proven infection	-	66.66%
Prophylaxis	-	.88%
Symptomatic	-	24.44%
Bacteriologically proven infection	-	Nil

n-151

Routes of administration of the AMAs

Among the 151 AMA prescriptions in PICU 104(68.87%) were administered in injection form parenterally (intravenously) and remaining 47(31.13%) prescriptions were given orally in either tablet or capsule form.

Antibiogram reports

CSF sample was sent for culture and sensitivity testing and biochemical analysis from four patients who were suspected of having meningitis. No organism growth was detected in any of the culture but biochemical

reports suggested meningitis in two patients out of the four.

Percentage of AMA prescribed in generic name

Among the 151 AMA prescribed, 39(25.87%) were prescribed in generic names and the remaining 112(74.17%) were prescribed in brand names.

Adverse effect to AMAs

No adverse reaction to any AMA prescribed was recorded in the studied case records.

DISCUSSION

This study found that 90% of the Pediatric patients admitted to PICU received at least one AMA. A similar study done in PICU of a tertiary care hospital in Karachi, Pakistan found that all the admitted patients received at least one AMA.⁵ A study of antibiotic use in PICU of Canada⁶ showed 27–40% usage of empiric antibiotic treatment while another study by Ding *et al.* from China showed that 71% of their patients in PICU received empiric antibiotic treatment.¹ Our study found that 50% of pediatric patients received 2 or more AMAs which is lesser than the findings of the studies done in PICUs of Pakistan and Canada which reported use of 2 or more AMAs in 76% and 55–69% respectively.^{5,6} The finding of our study is more than that reported in China of two or more antibiotics use in PICU in 47% patients. Cefixime (25.2%) and Ampicillin (23.8%) were found to be the most frequently prescribed antimicrobial agents in our study. But Cefazolin and Ceftriaxone were the most frequently prescribed AMAs in similar studies done in other parts of the world.^{5,7,8} Vancomycin and Meropenem which were found to be prescribed frequently in Pakistan and USA were not prescribed in the studied PICU in South India.^{5,8} Penicillins (41.72%) and Cephalosporins (34.43%) were the most frequently prescribed groups of AMAs in the studied PICU. Similar studies done in Pakistan, USA and Nepal found that Cephalosporins were the most frequently prescribed group of AMA.^{5,8,9} Cephalosporins (35.6%) & Penicillins (21.3%) in MICU and Aminoglycosides (43.7%) & Penicillins (28.7%) in NICU were the most frequently

prescribed groups of AMAs in other ICUs of the same tertiary care teaching hospital.^{10,11} These findings suggest that the Cephalosporins and Penicillins which are beta-lactam antibiotics are the frequently prescribed groups of AMAs in the ICUs. It was observed in this study that most of the antimicrobial prescriptions were made for non bacteriologically proven infections (66.66%). CSF specimens were taken for culture in 4 cases out of 100 patients to identify pathogenic organisms and no specimen showed positive culture. This is lesser than the finding from Nepal wherein specimens were taken for culture in 24 cases out of 121 patients and 13 specimens showed positive culture results.⁹ This shows even though 90% of admitted cases received at least one AMA in our study, very less frequent attempts were made by the Physicians to detect the exact causative organisms.

CONCLUSION

This study provides valuable insight to AMA usage in PICU of South India. Our data shows more frequent use of betalactam antibiotics in the PICU and most AMA prescriptions were made without supporting bacteriological evidence in the PICU. It is recommended to guide AMA utilization with more microbiological antibiogram evidences.

CONFLICT OF INTEREST

Conflict of interest declared none.

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