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A study on Utilization of antibiotics in Paediatric In – patient department of SVRR Government general hospital, Tirupathi

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ABSTRACT

Antibiotics are the most commonly prescribed drugs in paediatrics and can be a biggest threat of growing resistance in children. It is always preferable to choose a single drug with a narrowest spectrum effective for pathogen. Combination antibiotic therapy may provide synergistic effect but there is a chance of getting drug resistance particularly in paediatrics. Paediatrics, a specialized population is at a significant risk for drug related problems in particular when they exposed to multiple drug therapy and complex illness. Monitoring and control of antibiotic usage and detailed knowledge of antibiotic prescribing practice is important now-a-days. The aim of our study was to analyse the Utilization of antibiotics in paediatric department of Sri Venkata Ramnaraine Ruia Government General Hospital (SVRRGGH), Tirupathi. A Prospective observational study was carried out for 3 months using patient data collection proforma and clinical significance of 120 individual cases were recorded. The data were analysed by descriptive statistics. The utilization of antibiotics in emergency ward, general ward and ICU were observed. More number of prescriptions was observed in the emergency ward (53.33 %). Most of the paediatric patients receiving parenteral preparations (81.8 %) and 55.62 % of prescriptions were based on empirical therapy. In our study 66.66 % of paediatric patients were on single antibiotic. Cephalosporins (42.2 %) were the most commonly prescribed antibiotics in three departments followed by Pencillins (22.7 %) and least prescribed group was Fluroquinolones (2.13 %). This information was helpful to analyse the clinical judgment on selection of antibiotics in paediatrics of SVRRGGH.

Keywords: Paediatrics, antibiotics, resistance, emergency ward, general ward, ICU.

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INTRODUCTION

Infants and children present a higher proportion of the population worldwide. Out of the world's total population 28 % of population was accounted by Children younger than 15 years of age who are most susceptible to diseases due to under development of immune system. Across the globe this category was higher than average risk of developing infectious disease. Globally nearly 9 million children under 5 years of age die every year, with pneumonia, diarrhea, and neonatal causes being the major killers[1]. The use of antibiotics has become a routine practice for the treatment of pediatric illnesses[2, 3, 4, 5]. In addition Paediatric groups are among the most vulnerable population groups to contact illnesses[6] and cause harmful effects of drugs due to differences in pharmacodynamic and pharmacokinetics[7,8,9]. The key role of antibiotics for the treatment of infectious diseases that are prevalent everywhere in developing countries including India may not be denied. However there are also reports of an irrational use of antibiotics[(9,10, 11)] which may even lead to infections that are worse than the originally diagnosed ones. The pediatricians and other medical personnel who provide health care for infants and children in developing countries facing a number of challenges during the day-to-day practice of medicine due to the shortage of appropriate drugs and other facilities. Appropriate drug utilization studies have been found to be crucial to evaluate whether drugs are properly used and utilized in terms of medical, social and economic aspects. Several professional societies have issued guidelines designed to reduce the use of antibiotics world- wide by means of various control strategies[12, 13]. These guidelines help the physician to prescribe the antibiotics rationally to paediatric patients when definitely indicated[14]. In spite of these children are at high risk for opportunistic or nosocomial infections due to intensive antibiotic therapy or prolonged hospitalization and immunosuppressed condition[15]. An overall rise in health care costs, lack of uniformity in drug prescribing and the emergence of antibiotic resistance, monitoring and control of antibiotic use is of growing concern[16, 17, 18]. Thus, judicious use of antibiotic is therefore an important way to reduce the problem of antimicrobial resistance. So, detailed rationale knowledge of antibiotic prescribing pattern must be implemented in the clinical practice. Detailed knowledge of antibiotic prescription pattern is important before the policies and measures can be implemented in the clinical practice. The study of prescribing pattern infers to monitor, evaluate, and suggest modifications in the practitioner's prescription habits, so as to make patient care reasonable and effective[(19)]. Sri Venkata Ramnaraine Ruia Government General Hospital (SVRRGGH) is the largest bed capacity tertiary care teaching hospital in the Tirupathi. More over antibiotics are

the class of drugs commonly prescribed in the paediatric department. Thus the aim of our study was to observe study and analyse the prescription pattern of antibiotics in paediatric inpatient department of SVRRGGH Tirupathi.

MATERIALS AND METHOD

A Prospective observational study was carried out in Paediatric inpatient department of SVRR government general hospital. The study was conducted with the approval of the human ethical committee, Sri Padmavathi School of Pharmacy, Tiruchanoor **(IHEC SPSP/M. PHARM (PP)/2012/01).** The study was done for a period of 3 months (August 2012 to October 2012). The patient below 16 years who received antibiotics were included in the study. Patients were enrolled after receiving verbal informed consent from the parents. In the study period all hospitalized patients who were receiving antibiotics were analysed for antibiotic use. Children with congenital anomalies were excluded from the study. Based on the study objectives patient data collection form was prepared. The data were collected by patient proforma specially designed in Department of Pharmacy Practice, Sripadmavathi school of Pharmacy. Clinicians and nursing staff were also consulted for further details. Data were analysed by medical records/case sheets. The patient characteristics such as age, gender and number of hospital days, and the number of antibiotics for each patient and the generic class, dose and duration of each antibiotic were documented. Data were also recorded on whether the antimicrobial drugs were prescribed on the basis of clinical signs suggestive of infection, but without microbiological confirmation (i.e. On an empirical basis), or administered for infections that were laboratory confirmed (i.e. based on microbiological findings), or related to prophylaxis. The different formulations of antibiotics were also being considered in this study. The rates of antibiotic prescription were calculated for the individual unit, i.e. intensive care units (ICUs), general wards and emergency wards. Patient characteristics and other relevant data were computed using MS Excel and SPSS statistical package. The results were presented as percentage and mean ± Standard deviation (SD).

RESULTS AND DISCUSSION

During the study in Paediatric inpatient department of SVRRGGH a total of 120 hospitalized children were evaluated. Their median age was 42.3 months (range 0-806 months). The male patients were 69 (57.5 %) whereas the female patients were 51 (42.5 %). The mean length of hospital stay was 6.41 ± 5.26 (Table-1).

Table 1: Paediatric inpatient Characteristics

Variables	Number of patients (%)
Total Patients	120
Male	69(57.5%)
Female	51(42.5%)
Median age	42.3 months
Length of hospital stay (mean± SD)	6.41± 5.26

Out of the total 120 paediatrics admitted 64 (53.33 %) were hospitalized in emergency wards, 41 (34.16%) were hospitalized in general medical wards and 15 (12.5%) in ICUs. The median age of patients differed significantly being lowest in emergency (36.8 months) and highest in ICU (68.7 months). The highest number of prescriptions were found in the youngest age group of the study population of which a high proportion was admitted to the emergency units . Out of the total 120 paediatrics 171 antibiotics were used. The prevalence of antibiotic use was highest 100 (58.47%) in emergency department wards followed by 48 (28.07 %) in medical wards and (23)13.4 % in ICUs (Table 2).

Table 2: Prevalence of antibiotic use by basis for prescription and by type of ward.

Variables	Emergency ward	ICU	General ward	Total
Number of patients	64(53.33)	15(12.5)	41(34.16)	120
Patients median age (months)	36.8	68.7	40.8	-
Number of antibiotics used per department	100(58.47)	23(13.4)	48(28.07)	171

The dosage forms used in the study were depicted in the Table 3. Antibiotics had been prescribed by using various dosage forms but most commonly used dosage form were intravenous formulations (IV) 140 (81.8 %) followed by oral formulations 31(18.2 %). In that more IV formulations were observed in emergency ward 80 (46.78 %) followed by general ward 40 (23.39 %) and ICU 20 (11.69 %). Likewise oral formulations were more in emergency ward 20 (11.69 %) followed by general ward 8 (4.67 %) and ICU 3 (1.75 %).

Table 3: Percentage of total Antibiotic formulations prescribed in different wards of paediatrics based on route of administrations.

Route of administration	Emergency ward (%)	ICU (%)	General ward (%)	Total (%)
Oral	20 (11.69)	3 (1.75)	8 (4.67)	31 (18.2)
Intravenous	80 (46.78)	20 (11.69)	20 (23.39)	140 (81.8)
Total	100 (58.47)	23 (13.45)	48 (28.07)	171 (100)

Out of the total 171 antibiotics 95 (55.62 %) were started empirically and 76 (44.38 %) were prescribed on prophylaxis basis. In that particularly empirical treatment was followed more in

emergency ward 67 (39.18 %) followed by general ward 25 (14.61 %) and ICU 3 (1.75 %). Prophylaxis basis were followed more in emergency ward 33 (19.4 %), general ward 23(13.8 %) and less in ICU 20 (11.8 %).

Table 4: Prevalence of antibiotic use by basis for prescription (empirical data or prophylaxis).

Variables	Emergency ward (%)	ICU (%)	General ward (%)	Total (%)
Empirical basis	67 (39.18)	3 (1.75)	25 (14.61)	95 (55.62)
Prophylaxis	33 (19.4)	20 (11.8)	23 (13.18)	76 (44.38)
Total	100 (58.47)	23 (13.4)	48 (28.07)	171 (100)

In our study more than 40 % of the patients were exposed to atleast 2 antibiotics. Only 1 antibiotic was prescribed in 80 (66.66 %) paediatric patients, 2 antibiotics in 24 (20 %) paediatrics, 3 antibiotics in 9 (7. 5 %) cases, 4 antibiotics in 6 (5 %) cases and finally 5 or more than 5 antibiotics were prescribed in about 1 (0.83 %) case of all cases that was only in emergency department .

Table 5: Prevalence of number of antibiotics present in each prescription.

Number of antibiotics per prescription	Number of prescriptions per ward			
	Emergency ward (%)	ICU (%)	General ward (%)	Total (%)
1	38(31.6)	8 (6.6)	34 (28.3)	80 (66.66)
2	15(12.5)	4(3.33)	5(4.16)	24 (20)
3	7(5.8)	1(0.83)	1(0.83)	9 (7.5)
4	3(2.5)	2(1.66)	1(0.83)	6 (5)
≥5	1(0.83)	-	-	1(0.83)

In the present study all antibiotics were prescribed in generic name. Cephalosporin 72 (42.2 %) were commonly prescribed antibiotics in paediatrics followed by Pencillin group 38 (22.7 %), aminoglycosides 37 (21.9 %), Glycopeptides 14 (8.24 %), Lincosamide 6 (2.77 %) and Fluroquinolones were prescribed very rare 5 (2.13 %).

Out of the 42.2 % of Cephalosporins 24.8 % were from emergency ward followed by 9.8 % in ICU and 7.6 % in general ward. In 22.7 % of Pencillin groups 13.6 % were prescribed in emergency ward, 7.4 % in general ward and 1.7 % in ICU. In the category of Aminoglycosides out of the 21.9 % of antibiotics 15.4% were prescribed in emergency ward followed by 5.3 % in general ward and 1.2 % in ICU.

Among the Glycopeptides (8.24 %) category highest prescriptions were observed in general ward 4.9 %, Emergency ward 2.8 % and lowest perceptions were observed in ICU (0.54 %).

In Lincosamides category (2.77 %) more prescriptions were observed in general ward 1.57 % and next most commonly prescribed in emergency ward 1.2 %. In the present study Fluroquinolones were utilized highest in general ward 1.30 %, 0.67 % in emergency ward and less prescriptions were observed in ICU 0.16 %.

Table 6: Percentage of total Generic classes of antibiotics prescribed in paediatric wards.

General classes of prescribed antibiotics	Percentage of antibiotics in percentage of all prescriptions			
	Emergency ward (%)	ICU (%)	General ward (%)	Total (%)
Cephalosporins	42(24.8)	17(9.8)	13(7.6)	72(42.2)
Pencillins	23(13.6)	3(1.7)	12(7.4)	38(22.7)
Aminoglycosides	26(15.4)	2(1.2)	9(5.3)	37(21.9)
Glycopeptide	5(2.8)	1(0.54)	8(4.9)	14(8.24)
Lincosamide	2 (1.2)	-	4(1.57)	6(2.77)
Fluroquinolones	2(0.67)	1(0.16)	2(1.30)	5(2.13)

DISCUSSION

As like other developing countries Paediatric antibiotic usage in India is not well controlled. People can obtain antibiotics easily even without a prescription. The over-the-counter sale of antibiotics is a major problem especially in an era of rapidly increasing antibiotic resistance. Previous studies showed that non-prescription antimicrobial agents are often sold for inappropriate indications and in quantities too small to be effective for the treatment of infections and this may partially explain why antibiotic-resistance rates are so high in developing countries[1].

In our study, we observed that 120 paediatric patient prescriptions, in that the total percentage of male paediatric patients were 57.5 % comparatively more than that of female paediatric patients 42.5 %. Similar findings were found in studies conducted by *Palikhe et al.* , which shows male child 61.9 % were more than female 38.1 %[9].

In our study the average length of hospital stay was 6.41 ± 5.26 which was less than study done at Kathmandu hospital which shows 7.29 ± 4.26[9]. In our study we have observed that paediatric patients having less age group were admitted more in emergency ward had received more number of antibiotics 58.47 % when compared to other departments like general ward 28.07 % and ICU 13.4 %. This pattern of distribution was not observed in any earlier studies.

In many developing countries including India the excessive use of injectables is common. In our study most of the paediatric patients received antibiotics through parenteral route 81.8 %.

Similarly several studies have shown varying percentages of antibiotics were prescribed parenterally [9, 20, 21]. It seems necessary for the paediatric patient to be treated by parenteral route of administration but consideration should be taken care for the syringes used to administer different antibiotics. The reason for the higher percentage of patients receiving injectable antimicrobials could be attributed to the physicians concern about the drugs including bioavailability, food –drug interactions, tissue distribution, non-adherence[22].

The present study found that empirically started antimicrobials accounted for 55.62 % of the total number of antimicrobials prescribed. This is in accordance with an earlier study that showed empirically started antimicrobials contributing towards 79 % of therapeutic antimicrobial use[23]. Changing empirical therapy to definitive treatment based on culture reports have shown to improve health and economic outcomes[24].

In our study overall 66.66 % patients were on monotherapy and 33.34 % of patients were on multitherapy. In that 20 % of patients were prescribed with 2 antibiotics, while 3 and 4 antibiotics were prescribed to 7.5 % and 5 % of patients respectively. 5 or more than 5 antibiotics were found to be prescribed in 0.83 % of patients, whereas in the study by Bosu et al [25] showed the variation in average percentage of patients receiving antibiotics one in 41 % of cases. It is not possible to draw any conclusion since the patients are not matched socioeconomically, the morbidity pattern also not be equal. In our study in the emergency department 5 antibiotics were prescribed, this is due to requirement of more time to diagnose the patient and select the appropriate treatment.

During the study period among the various groups of antibiotics Cephalosporin 42.2 % were commonly prescribed antibiotics in paediatrics followed by Pencillin group 22.7 %, aminoglycosides 21.9 %, Glycopeptides 18.24 %, Lincosamide 2.77 % and Fluroquinolones were prescribed very rare 2.13 %. Whereas, the study of Sriram *et al.* have shown 68.2 % of Cephalosporins and 31.3 % of Penicillins prescriptions. However, Sandra R Arnold in 1999 revealed that antibiotics from the penicillin class were the most frequently prescribed antibiotics and other categories of antibiotics prescribed include Aminoglycosides 8.9 %, Macrolides 6.1 % Fluoroquinolones 4.7 % [26].

Out of the 42.2 % of Cephalosporins 24.8 % were from emergency ward followed by 9.8 % in ICU and 7.6 % in general ward. In 22.7 % of Penicillin groups 13.6 % were prescribed in emergency ward, 7.4 % in general ward and 1.7 % in ICU. In the category of Aminoglycosides out of the 21.9 % of antibiotics 15.4 % were prescribed in emergency ward followed by 5.3 % in general ward and 1.2 % in ICU. Among the Glycopeptides 8.24 % category highest

prescriptions were observed in general ward 4.9 %, Emergency ward 2.8 % and lowest perceptions were observed in ICU 0.54 %. In Lincosamides category 2.77 % more prescriptions were observed in general ward 1.57 % and next most commonly prescribed in emergency ward 1.2 %. In the present study Fluroquinolones were utilized highest in general ward 1.30 %, 0.67 % in emergency ward and less prescriptions were observed in ICU 0.16 %. Utilizations of antibiotics in paediatrics according to their prevalence of departments were not observed in earlier studies.

Limitations of the study:

Our study has some limitations. Firstly, it was conducted in single hospital only, and its results cannot be considered representative of the whole country. Secondly, it was conducted in June, when the number of children admitted with respiratory infections could have been lower in other periods of the year. Since respiratory tract infections are 1 of the leading causes of antimicrobial use in children, we could have underestimated the prevalence. Thirdly, information on the start of antibiotic therapy was not collected, so we cannot exclude the possibility that some children had already been on therapy at admission. Lastly, we did not evaluate the appropriateness of antibiotic prescriptions and we did not investigate if prescriptions were due to nosocomial infections.

CONCLUSION

Antimicrobials can be a biggest threat of growing resistance in children. It is always preferable to choose a single drug with a narrowest spectrum effective for pathogen. The fact that children admitted to intensive care units and patients of younger age groups are at special risk of receiving multiple courses of antibiotics, together with the knowledge that antibiotic resistance develops in this setting suggest that strategies to control antibiotic use should focus on these patient populations. Our study suggests that strategies to control irrational use of antibiotics should be implemented and the guidelines used for treatment of treatment of paediatric patients should be upgraded regularly.

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