ORIGINAL ARTICLE

Antibiotics Utilization Pattern in Pediatrics in a Tertiary Care Teaching Hospital

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Abstract

Introduction: Children have high rates of minor infection, and because of their increased susceptibility to serious bacterial infection, they are frequently prescribed with antibiotics. The main aim of the study was to evaluate the antibiotics utilization pattern and check the adherence to the antibiotic policy in pediatric patients of a tertiary care teaching hospital. **Materials and Methods:** This prospective observational study was conducted for a period of 6 months in the inpatient Department of Pediatrics of a tertiary care teaching hospital after getting approval from the Research and Ethics Committee. 90 children from 1 month to 18 years age of either sex admitted to pediatric ward prescribed with antibiotics were included for the study, after getting informed consent from their parents. The lab data were noted down on follow-up. The patient charts were followed up throughout the period of hospitalization for drug interactions. The antibiotic utilization pattern was studied from the revised antibiotic prescribing policy of the Department of Pediatrics. The drug interactions were found using drugs.com. **Results:** Cephalosporins was the common class of antibiotics prescribed and majority of antibiotics were prescribed for a period of 1-5 days. There was 83.33% complete adherence to the prescribed medication, no significant drug interactions were found in this study. **Discussion and Conclusion:** Pharmacist plays a major role in monitoring, adherence of drug according to the guidelines, and drug interactions. This study helps to promote appropriate antibiotic usage and serve as a check mark to the health-care professionals.

Key words: Antibiotics, interaction, pediatrics, utilization

INTRODUCTION

The most commonly prescribed drugs among pediatrics are antibiotics.[1] The resistance developed due to the irrational use of antibiotics is a global public health problem.[2] Children have high rates of minor infection, and because of their increased susceptibility to serious bacterial infection, they are frequently prescribed with antibiotics. There is a concern that there may be an increasing bacterial resistance in childhood and that changes in childcare practices, particularly the marked increase of day care in pre-school groups, may lead to increasing transfer of antibiotic-resistant organisms within these environments.[3] Infections caused by resistant pathogens have a significant impact on patient morbidity and mortality.[4]

Majority of the hospitalized patients are prescribed with antibiotics. Several studies focusing on prescribing practices of antibiotics among the hospitalized children indicate that approximately 35% of infants and children who are admitted to hospitals receive antibiotics.[5]

Data collected from a database on the pediatric antibiotic prescribing reveals that 50% of children consulting a physician for viral respiratory tract infections receive antibiotics.[6] Other reasons for antibiotic resistance are self-medication, especially in low-income countries with over-the-counter antibiotics sale, due to the high cost of medical consultations and dissatisfaction with medical practitioners.[2]

Nearly, half of the pediatricians report parental pressure to prescribe antibiotics even though it is not

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necessary.[7] Antibiotics account for a substantial proportion of the expenditures in pharmacies and hospitals. Increasing costs of health care, lack of uniformity in prescribing attitudes and the emergence of antibiotic resistance lead to difficulty in monitoring and controlling antibiotic use.[8]

The most vulnerable groups to contract illnesses are mainly infants and children. The use of antibiotics has become a regular practice for the treating of pediatric illnesses.[9,10] However, the major role of antibiotics in treating infectious diseases cannot be neglected. However, there are also reports of irrational use of antibiotics,[11,12] which may lead to infections that are even worse than the original diagnosis. The pediatricians and other medical professionals who provide health care for infants and children face a number of challenges in their daily practice of medicine due to a shortage of the most appropriate drugs and other facilities.[1]

The rising incidence of bacterial resistance to most commonly used antibiotics, especially multi-drug resistant pneumococci, has mandated the judicious use of antibiotics in pediatric practice.[13] Most of the antibiotics are prescribed unnecessarily for viral infections like common cold. Appropriate drug utilization studies have been found to be effective in evaluating whether the drugs are utilized properly in medical, social, and economic aspects.[1]

Several professional agencies and societies have issued guidelines designed to reduce the use of antibiotics by following various control strategies. Before such policies are implemented, detailed knowledge of antibiotic prescription patterns is mandatory.

Several drug utilization studies have been conducted before. But in this study, the antibiotic utilization pattern was studied compared with the revised antibiotic prescribing policy of the Department of Pediatrics.

In India, approximately 35% of the population comprises children below 12 years which are a very large number. Hence, provision of good health care to them indirectly reflects on the health-care set-up of the country. Moreover, the prescribing patterns reflect the ability of prescriber in terms of choosing such drugs which are accessible, affordable, safe, effective, and give maximum benefit to patients. Thus, to ensure the rationality of drug prescription time to time monitoring, evaluation is absolutely essential as changes in health-related behavior usually take longer to achieve. Hence, the main aim of the study was to evaluate the antibiotics utilization pattern and check the adherence to the antibiotic policy in pediatric patients of a tertiary care teaching hospital.

MATERIALS AND METHODS

This prospective observational study was conducted for a period of 6 months in the inpatient Department of Pediatrics of a tertiary care teaching hospital after getting approval from the Research and Ethics Committee (REF: CSP/13/AUG/30/137). 90 children from 1 month to 18 years age of either sex admitted to pediatric ward prescribed with antibiotics were included for the study, after getting informed consent from their parents. The patient demographic details, diagnosis, pharmacotherapy details were noted down in the predesigned pro forma on the day of admission. The lab data were noted down on follow-up. The patient charts were followed up throughout the period of hospitalization for drug interactions. The antibiotic utilization pattern was studied from the revised antibiotic prescribing policy of the Department of Pediatrics. The drug interactions were found using drugs.com.

RESULTS

Majority of children were in the age group of 1-5 years (n = 39; 43%), followed by children <1 year (n = 22; 24%). Male children constitute more (n = 55; 61%). The diagnosis of children was shown in Table 1. Majority of children were diagnosed with enteric fever and urinary tract infection (UTI) (n = 19; 21%), followed by upper respiratory tract infection (URTI) (n = 16; 18%).

The indication for starting antibiotics was clinical in 57 children (63%), definitive in 26 children (29%), and prophylactic in 7 children (8%).

The adherence of prescribed antibiotics was checked and it was found that complete adherence was seen in 75 children (83%).

Medication errors were found in 15 prescriptions (17%). The medication errors include wrong dose error, omission error, extra dose error, and wrong time error and were depicted in Table 2.

Among 90 prescriptions, moderate interactions were found in 10 prescriptions (11%), and minor interactions were seen in 13 prescriptions (14%).

Table 1: Diagnosis of children

Diagnosis	*N*=90 (%)
Enteric fever	19 (21)
UTI	19 (21)
URTI	16 (18)
Dengue	9 (10)
Sepsis	7 (8)
Pneumonia	6 (7)
Dysentery	5 (6)
Scrub typhus	5 (6)
Meningitis	4 (4)

URTI: Upper respiratory tract infection, UTI: Urinary tract infection

The culture tests were done in 53 children. Blood culture was done in 32 children and urine culture in 21 children. Positive culture tests were obtained – 24 in blood culture and 15 in urine culture. The causative organism along with the diagnosis was shown in Table 3.

Table 2: Type of medication errors

Type	*N*=15 (%)
Wrong dose error	4 (26.66)
Omission error	4 (26.66)
Extra dose error	4 (26.66)
Wrong time error	3 (20)

Table 3: Causative organism along with the diagnosis

Diagnosis	*N*	Causative organism
Blood culture (*N*=24)		
Enteric fever	16	*Salmonella typhi*
Sepsis	6	*Neisseria meningitidis*
Dysentery	2	*Shigella*
Urine culture (*N*=15)		
Enteric fever	3	*Salmonella typhi*
UTI	9	*Escherichia coli*
Dysentery	3	*Shigella*

UTI: Urinary tract infection

Table 4: Class of antibiotics prescribed

Class of antibiotics	*N*=90 (%)
Cephalosporins	63 (70)
Aminoglycosides	28 (31)
Penicillins	24 (27)
Tetracyclines	4 (4)
Metronidazole	2 (2)
Fluoroquinolones	2 (2)
Piperacillin	1 (1)

Majority of the children were prescribed with cephalosporins (n = 63; 70%), followed by aminoglycosides (n = 28; 31%). The class of antibiotics prescribed was shown in Table 4.

Antibiotics were prescribed for a duration of 1-5 days in 62 children (69%), 6-10 days in 17 children (19%), and more than 10 days in 11 children (12%).

Among the 90 prescriptions, 88 prescriptions contained intravenous therapy, and 2 prescriptions had an intravenous to oral conversion of antibiotics.

The antibiotics prescribed were compared with the hospital guidelines, and the same was given in Table 5.

DISCUSSION

The most commonly prescribed drugs in children are antibiotics. The inappropriate and excessive use of antibiotics is a major public health issue.[14] This study utilized the revised guidelines of antibiotic use in the Department of Pediatrics. This study analysis focused on antibiotic prescriptions for hospitalized child patients from the average time of hospitalization associated with antibiotic therapy, the range of antibiotics used and the appropriateness of the antibiotic utilization.

Nowadays, we are dealing with problems due to increasing health-care costs and the development of antibiotic resistance. Recent studies proved an association between antibiotics use and resistance development. Due to these emergent threats it is essential to be informed regularly about the antibiotics use in the hospital.[15]

Over 50% of 90 antibiotic prescriptions were started on a clinical basis, without confirmation of a bacterial infection. In this study, amoxicillin was prescribed for pneumonia. It is in contrast to the study conducted by Palikhe,[1] which reported that the benzyl penicillin and gentamicin/cefotaxime were used in case of pneumonia.

Table 5: Antibiotics prescribed with the guidelines

Diagnosis	Drugs to be prescribed as per guidelines	Drugs prescribed
Pneumonia	Amoxicillin	Amoxicillin
UTI	Ampicillin+aminoglycoside Or Cefotaxime/ceftriaxone	Ceftriaxone+amikacin
Enteric fever	Ceftriaxone/cefotaxime	Ceftriaxone
Sepsis	Cefotaxime/ceftriaxone+amikacin Cefotaxime/ceftriaxone	Cefotaxime+amikacin
Acute dysentery	Ciprofloxacin (first line) Cefixime, ceftriaxone, cefotaxime (alternative therapy)	Ceftriaxone, ciprofloxacin, Cefotaxime

UTI: Urinary tract infection

In this study, the mean value of hospitalization length in children with prescribed antibiotic therapy was 5 days. The longest hospitalization length was 14 days, and the shortest hospitalization length was 3 days. This finding is in contrast to the study conducted by Shlaes *et al.*,[16] which reported that the longest hospitalization length was 33 days. The shortest hospitalization length was 1 day.

Children <5 years received antibiotics more frequently were similar kind with that of the study conducted by van Houten *et al.*,[8] which showed children <2 years received antibiotics more frequently than the older children.

Most of the prescriptions in this study contained the antibiotics given on empirical basis, i.e. without the confirmation of the diagnosis. This finding is similar to the study conducted by Hekster *et al.*,[17] which reported that the antibiotic prescription is independent of the diagnosis in over 50% of the hospitalized children.

In the previous studies, URTIs and bronchitis were identified as the diagnoses most frequently associated with inappropriate antibiotic use. In this study, URTIs are much less common which shows a significant decline in the use of inappropriate antibiotics for these conditions. This finding is similar to the study of Stanulovic *et al.*,[18] which reported that in 1998 compared with 1995, patients with URTIs were 0.69 times less likely to be treated with antibiotics.

This study also identified a substantial increase in the use of third generation cephalosporins in case of UTIs which is similar to the study conducted by Copp *et al.*,[19] which reported the use of broad spectrum antibiotics in approximately one third of the UTI antibiotic visits which is an example of overprescribing broad spectrum antibiotics on the basis of empirical therapy.

In this study, we identified 67 (74.4%) nonsignificant drug interactions, 13 (14.4%) minor, 10 (11.1%) moderate, and nil major interactions.

We found that 83.33% of the patients had complete adherence to the prescribed medication. There were 26.66% wrong dose errors, 26.66% omission errors, 26.66% extra dose errors, and 20% other errors which do not fit into the above categories.

CONCLUSION

A high percentage of 90 hospitalized children received antibiotics on a clinical basis, without the proof of bacterial infection, nor before the start of therapy neither afterward. The antibiotic resistance develops in the same setting. The control on antibiotic use should focus on these patient populations.

There was 83.33% complete adherence to the prescribed medication, no significant drug interactions were found in this study.

Pharmacist plays a major role in monitoring, adherence of drug according to the guidelines, and drug interactions. This study helps to promote appropriate antibiotic usage and serve as a check mark to the health-care professionals.

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