Analysis of Prescribing Pattern of Antibiotics in Paediatric Urinary Tract Infection at A Teaching Hospital

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ABSTRACT

Introduction: Drug utilization studies are always necessary for evaluation of judiciousness of prescription. This study was conducted to analyse and asses the rationality of prescribed antimicrobials in paediatric urinary tract infection.

Material and methods: This prospective observational study was done in the department of Paediatrics in a teaching hospital in Nepal for 6 months duration in patients under 16 years of age diagnosed as UTI without any other co-morbidity. Data was collected by using a self-designed data collection form.

Results: In this study, out of 71 patients the percentage of male and female patients were 42.25% and 57.74% respectively. *Escherichia coli* was the most common organism responsible for paediatric urinary tract infection (59.15%). Most commonly used antibiotics as a single drug was ceftriaxone (23.94%). Amikacin with ceftriaxone was most commonly prescribed antimicrobial combination (25.35%). Number of drugs per prescription and number of antibiotics per prescription was 2.42 ± 0.64 and 1.30 ± 0.46 respectively ; percentage of drugs prescribed by generic name was 83.7%.

Conclusion: In our study average number of drugs per prescription was found to be optimal as according to world health organization / *International* Network for Rational Use of Drugs (WHO/ INRUD) prescribing indicators. Drugs were prescribed for proper indications, in proper dosage and for appropriate durations. We can expect that the results from this study would help to formulate or amend antimicrobial policy.

Keywords: Antimicrobials, Paediatrics, Prescription, Rationale therapy, Urinary Tract Infection.

INTRODUCTION

Urinary tract infection (UTI) is defined as the occurrence of micro-organisms in the urine that cannot be explained by contamination. These organisms have the potentiality to invade into the tissues of the urinary tract and neighbouring structures.[1] Gram negative aerobic bacilli like *E. coli, Klebsiella, Enterobecter, Citrobector* and *Proteus* are the most common causative organism for UTI. Above these, other common pathogens include *staphylococcus epidermidis, staphylococcus saprophyticus* and *enterococcus* species.[2] The two main important factors that govern risk of urinary tract infection (UTI) are : 1. bacterial virulence factors and 2. Impaired host immunity.

Urinary tract infection (UTI) is a common bacterial infection in infants and children.[3] Hence, approximately 1/10 girls and 1/30 boys suffer from UTI by the age of 16 years.[4] As urinary symptoms are mild and non-specific, the diagnosis of UTI is often missed in infants and young children. Prompt evaluation and treatment of UTI is vital to avoid renal parenchymal damage and renal scarring.[5]

Before the result of urine culture and sensitivity reports are available, a clinician commonly recommends antimicrobial agents (AMAs) empirically for UTIs. Various factors like age, drug allergy, cost, compliance, dosing frequency and local resistance patterns are involved in antibiotic selection.[6] Rational usage of drugs is one of the major components for successful therapy. In order to be rational, the drug must be effective, safe, easily available and of a reasonable cost; drug should be prescribed for the proper therapeutic indication in correct dosage and in an appropriate formulation.[7]

Drug utilization studies are always needed for better assessment of rationality of prescription. So this study was undertaken with an objective of evaluation of the prescribing pattern and assessment the rationality of prescribed antibiotics in paediatric patients suffering from UTI. Outcome of this study is anticipated to offer relevant information to the physicians and other health care personal to formulate the proper guidelines regarding prescribing antibiotics in UTI.

MATERIAL AND METHODS

This prospective observational study was conducted in the department of Paediatrics in College of Medical Sciences, Bharatpur, Nepal for a period of 6 months from July 2016 to December 2016. Ethics committee approval was obtained before initiating the study.

The inclusion criteria for our study was patients under 16 years of age, diagnosed as UTI admitted in the department of Paediatrics of our hospital. Exclusion criteria was patients aged less than 16 years who did not want to participate in the study and who had other co-morbid conditions like respiratory tract infections etc. Informed consent was obtained from each patient's guardians before participation in this study.

Data was collected by using a self-designed data collection form, which consists of details like patient demographics, history of patient, general physical examination, laboratory data, drug therapy, duration of the treatment and other relevant information. Sources of data considered for this study were patient's case sheet, lab reports etc.

The prescriptions were analysed as per WHO/INRUD indicators of prescribing for: number of drugs per prescription, number of antibiotics per prescription, percentage of drugs prescribed by generic name, percentage of drugs prescribed from the WHO Model List of Essential Medicines (EML), number of injections per prescription.

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261

STATISTICAL ANALYSIS

The collected data was analysed by using descriptive statistics like mean and percentages. Microsoft Excel 2007 was used for calculation and making tables.

RESULTS

In present study, out of 71 patients, 42.25% patients were male and 57.74% patients were female of which 11.26% were below 1 year old, 25.35% were 1 -5 years old, 36.61% were 6-10 years old and 26.76% were 11-15 years old as shown in table 1.

In this study, most commonly found pathogen responsible for causing paediatric urinary tract infection was *E.coli* (59.15%), followed by *Klebsiella* (16.9%), *staphylococci* (9.8%), *enterococcus* (7.04%), *proteus* (4.22%), *citobacter* (1.4%) and *pseudomonas* (1.4%).

Urine culture and sensitivity was done in 53 cases and the antibiotics which were found to be most commonly sensitive against *E.coli* were in the following sequence : amikacin - 42 (79.24%), gentamycin - 39 (73.58%), piperacillin and tazobactum -38 (71.69%), ceftriaxone -37 (69.81%), cefotaxime 36- (67.92%), cefixime - 34 (64.15%), ciprofloxacin -21 (39.62%), amoxicillin - 9 (16.98%).

In our study, most commonly used antibiotics as a single drug category was ceftriaxone (23.94%), followed by cefixime (21.12%), whereas most commonly used antimicrobial drug in combination category was amikacin with ceftriaxone (25.35%) as shown in table 2.

Duration of antimicrobial therapy was between 1 to 5 days for 12.6% of the patients, 6-10 days for 67.6%, 11-15 days for 19.7% of the patients. Drugs were prescribed for proper indications, in appropriate dosage and for proper durations.

The prescriptions were analysed according to the WHO/INRUD prescribing indicators as follows:

1. Number of drugs per prescription: 2.42± 0.64
2. Number of antibiotics per prescription: 1.3 ± 0.46
3. Percentage of drugs prescribed by generic name: 83.7%
4. Percentage of drugs prescribed from the WHO Model List of Essential Medicines (EML): 92.4%
5. Number of injections per prescription: 1.11 ± 0.45

Paracetamol was the most commonly prescribed drug other than antibiotics, followed by Vitamin supplements.

DISCUSSION

It is observed that there is a necessity of improvement in the areas of choosing the proper antibiotic for an infection and educating the patients about the significance of taking therapy precisely.[8] Decrease in efficiency of antimicrobials because of increased resistant species of pathogenic micro-organisms is considered as major cause of enormous costs in health care delivery systems.[9]

Rational usage of antibiotics minimizes the incidence of antimicrobial resistance and decreases the cost of therapy. Hence, constant vigilance and evaluation of rationality of prescribed antimicrobials is one of the pillars of the health care system.

Now a days, drug utilization studies are established to be advantageous study method to facilitate rational use of drugs. International Network for the Rational Use of Drugs (INRUD) in collaboration with WHO formulated various indicators and

Age in years	Male n (%)	Female n (%)	Total N (%)
<1	6	2	8 (11. 26%)
1--5	8	10	18 (25.35%)
6--10	11	15	36 (36.61%)
11--15	5	14	19 (26.76%)
Total	30(42.25 %)	41(57.74%)	71 (100 %)

Table-1: Patient's demography

Single Antibiotic Used In This Study		
Drug name	**Number**	**Percentage**
Amikacin	9	12. 6%
Ceftriaxone	17	23.9%
Cefixime	15	21.12%
Amoxicillin	4	5.6%
Vancomycin	1	1.4%
Cefotaxime	2	2.8%
Total	48	
Combination of antibiotics used in this study		
Drug name	**Number**	**Percentage**
Amikacin + Ceftriaxone	18	25.35%
Amikacin + Cefotaxime	6	8.4%
Total	23	32.39%

Table-2: Number and percentage of antibiotics used as single drug or as combination

guidelines that helps to conduct and assess the rationality of the of prescribing medications.[10]

Till date, different studies have been conducted to evaluate the prescribing pattern of antimicrobials in UTI in different parts of the world. This study was also initiated in view of finding the rationality of antimicrobials prescribed for UTI in paediatric patients and to provide the information gathered through this study to the health care professionals for better management of UTI and to formulate or to amend the antibiotic policy of the institute.

In our investigation, most of the patients were between 6-10 years old (36.61%) of which majority of the patient were female (57.74%) compared to male patients (42.25%). This finding is in the contrary to the study conducted by Sushma M et al.[11], who found that most of the patients were male. This finding closely similar to the findings of A. Hellstrom et al.[12] demonstrating that incidence of UTI in boys is higher than in girls under the age of 1 year; however, after 1 year, girls are much more likely to develop a UTI than boys.

In this study, most commonly found pathogen responsible for causing paediatric urinary tract infection was *E.coli* (59.15%), followed by *Klebsiella* (16.9%) which is also in conformity with the findings of many earlier studies.[11,13-15] As per our findings, the antibioctics which were found to be most commonly sensitive against *E.Coli* were amikacin (79.24%), gentamycin (73.58%), piperacillin and tazobactum (71.69%), ceftriaxone (69.81%), cefotaxime (67.92%), cefixime (64.15%), ciprofloxacin (39.62%), amoxicillin (16.98%).This finding is closely similar to a study conducted by Mohan J et al.[16]; as in that study they found that E.coli was sensitive to amikacin, follwed by cephalosporins.

In single drug category, we found that most commonly used antibiotic was ceftriaxone (23.94%), after that cefixime

262

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(21.12%) took 2nd place. In drug combination category, frequently prescribed antimicrobial was amikacin plus ceftriaxone combination (25.35%) as shown in table-2. A study conducted by Harish N et al.[17] also concluded that ceftriaxone was the most commonly used antibiotic for UTI followed by cefotaxime. Conventionally amoxicillin was the first-line therapy for outpatient treatment of UTI in children in earlier days. But nowadays because of occurrence of amoxicillin resistant *Escherichia coli* species, it has become less acceptable choice. Different studies have demonstrated that higher cure rates in UTI with the use of trimethoprim-sulfamethoxazole drug combination.[18] Other alternatives include amoxicillin-clavulanate or cephalosporins such as cefixime, cephalexin, cefprozil, or cefpodixime. The potential adverse effects of fluoroquinolones on musculoskeletal joint development based on animal data have restricted their use in young children.

In our study duration of antimicrobial therapy was found to be optimal ; as according to different standard guidelines[18,19] duration of therapy for should be 7-10 days for uncomplicated UTI and 10-14 days for complicated UTI in infants and children. According to WHO/INRUD prescribing indicators average number of drugs prescribed per encounter should be ≤ 3. So in this present study, average number of drugs per prescription was 2.42 ± 0.54, which is optimal according to WHO/INRUD prescribing indicators. But in another study conducted by Sushma M et al.[11] demonstrated that average number of drugs per prescription was 5.2 ± 2.4, which was more than the optimal recommendation. Average number of antibiotics per prescription and number of injections per prescription was found to be 1.3 ± 0.46 and 1.11 ± 0.45 respectively. But Sushma M et al.[11] found higher number of usage of antibiotics and injections. Percentage of drugs prescribed by generic name was 83.7, but according to WHO, it should be 100%.

Antibiotics are the most commonly prescribed drugs in patients, thus special measures should be taken to prevent emergence of antimicrobial resistance. In spite of limited sample size, this study provides a summary of usage of antimicrobials in paediatric urinary tract infection which can contribute towards improvement in prescription pattern.

CONCLUSION

There are limited numbers of Drug utilization studies on prescribing pattern of antimicrobials in paediatric urinary tract infection. The strength of any drug utilization study like this present one can be increased by formulating a multicentre study with larger sample size and for long duration. In future, we can expect that the results from this study would help to design multicentre interventional studies to frame standard treatment guideline in the treatment of UTI and to promote rational usage of drugs.

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263