PRESCRIBING PATTERN OF ANTIBIOTICS IN PEDIATRIC HOSPITAL IN CHITWAN DISTRICT IN NEPAL

Kailash Thapaliya1*, Shakti Shrestha1, Sheela Bhattarai2, Damodar Basnet2, Ram Kishor Chaudhary2

1Lecturers, Department of Pharmacy, Shree Medical and Technical College, Bharatpur-12, Chitwan, Nepal.
2B. Pharm-Final Year, Shree Medical and Technical College, Bharatpur-12, Chitwan, Nepal.

ABSTRACT
Antibiotics are one of the most widely prescribed drugs among pediatric patients. To prevent antimicrobial resistance, antibiotics must be prescribed rationally. The main objective of our study is to determine trend or prescribing pattern of antibiotics in hospitalized pediatric patients in Niko Children Hospital and Research Center, Bharatpur, Chitwan, Nepal. A retrospective study of 6 months duration was undertaken from February to July 2015. A total number of 160 patients case sheets were utilized for our study. Patients with history of various infections and undergone antibiotic therapy were included in our study. The data were analysed by using IBM SPSS version 20. The mean age of pediatric patient was 2.83 years. The average number of antibiotic per patient was 1.86. The most prevalent disease was pneumonia, followed by gastroenteritis. Cephalosporins group of drugs like ceftriaxone and cefotaxime were the most frequently prescribed antibiotics. Combination of Ceftriaxone and tazobactum were widely prescribed combinations, however, ceftriaxone and amikacin were most commonly used combination of antibiotics from different categories.

KEYWORDS: Pediatric, antibiotics, rational, prescription pattern, inpatient.

INTRODUCTION
Medicine use is rational (appropriate, proper, correct) when patients receive the appropriate medicines, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost both to them and the community.[1] Irrational (inappropriate,
improper, incorrect) use of medicines is when one or more of these conditions are not met. Worldwide, it is estimated that over half of all medicines are prescribed, dispensed or sold inappropriately.\cite{2} Prescribing practices are a reflection of health professional’s abilities to determinate among the various choices of drugs and determine the ones that will most benefit the patients.\cite{3} The study of prescribing pattern is a part of the medical audit and seeks to monitor, evaluate and if necessary, suggest modification in prescribing practices to make medical care rational and cost effective.\cite{4} Appropriate drug utilization it terms of efficacy, safety, convenience and economic aspects at all levels in the chain of drug use.\cite{3} Epidemiological evaluation of medicine use in the elderly is now a highly visible topic, but drug utilization studies in pediatric population have been limited. The assessment of medicine utilization is important for clinical, educational and economic purpose.\cite{5} Infants and children represent a large part of the population in developing countries.\cite{6} Pediatric population is prone to suffer from recurrent infections of the respiratory tract and gastrointestinal system. Lower respiratory tract infections are the leading cause of death in children below 5 five years of age.\cite{7} Acute respiratory infection, acute watery diarrhoea and viral fever are the common childhood illnesses accounting for the major proportion of pediatric visits.\cite{8}

Aims and Objectives
To assess the prescription pattern of antibiotics in pediatric hospital of Chitwan district in Nepal.

MATERIALS AND METHODS
Source of data
Patient Profile sheets were used as data collection tool in this research in which demographic records, lab reports, disease diagnostic report, duration of hospital stay, name and category of antibiotic and other drug use were recorded.

Setting
Niko Children Hospital and Research Centre is located at Bharatpur, Chitwan, established in 2013 A.D. It is the first children hospital in Chitwan District of Nepal.

Study Type
Hospital based retrospective study.
Study Duration
The study was conducted from February to July 2015.

Study Population
Total 160 patient profile sheets were enrolled for the study.

Inclusion Criteria
• Patient admitted in hospital with infective disease.
• Patients under antibiotic therapy.

Exclusion Criteria
• Patients with non-infective disease.
• Patients with co-morbidities or critically ill.
• Patients using antibiotic for prophylaxis purpose.

Pilot study
A pilot study was carried out for reliability of the tools used. The pilot study was conducted prior to data collection in November 12 to 25, 2014. The study included 18 pediatric patients profile sheets. The data obtained were recorded and evaluated. These data were not included in the main study. This pilot study gave us an idea about the patient flow in the hospital, data collection and analysis procedure. This is how the study was designed.

ANALYSIS OF DATA
Statistical analysis
The data were analyzed by using suitable statistical method. Necessary statistical figures were shown using Bar Diagram, Chart and other necessary tools. The data was entered and analyzed using IBM SPSS version. 20.

Results analysis
All the information recorded in the patient profile form were analyzed for various parameters like age, gender, weight, antibiotics and other drugs used, combination therapy, diseases diagnosed etc.
RESULT AND DISCUSSION

Demography

Age Distribution

Among 160 patients, the highest number of patients were in age group less than a year i.e. 38.1% and lowest number were in age group 9-11 i.e. 0.6%. The mean age of pediatric patient was 2.83 years.

Table 1. Age distribution.

<table>
<thead>
<tr>
<th>Age (Years)</th>
<th>No. of patients</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1</td>
<td>61</td>
<td>38.1</td>
</tr>
<tr>
<td>&gt;1-3</td>
<td>57</td>
<td>35.6</td>
</tr>
<tr>
<td>&gt;3-5</td>
<td>22</td>
<td>13.7</td>
</tr>
<tr>
<td>&gt;5-7</td>
<td>15</td>
<td>9.37</td>
</tr>
<tr>
<td>&gt;7-9</td>
<td>2</td>
<td>1.25</td>
</tr>
<tr>
<td>&gt;9-11</td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td>&gt;11-13</td>
<td>2</td>
<td>1.25</td>
</tr>
<tr>
<td>Total</td>
<td>160</td>
<td>100</td>
</tr>
</tbody>
</table>

Most of the hospitalized pediatric patients belonged to age group of less than a year. This is indicative of susceptibility of infant below one year towards various infective diseases. In a research done by Palikhe N in 2004, in Kathmandu, Nepal, revealed that infant less than one year received antibiotics more frequently than older children. The author also stated that this could be due to a higher susceptibility of infections at a younger age and needs a greater concern for infant’s health relatively.[9] In a research done by Choudhury DK in 2013, however, shows more patients being hospitalized belong to age group 5-12 years.[10]
Gender distribution

Out of 160 sample size, 113 patients were male and 47 were female. The percentage of male and female patients was 70.6% and 29.4% respectively. Similar findings were seen in other studies done by Choudhury DK in 2013.[10] In an article by Maximilian and Philip, in 2014, mentioned that sex has a major impact on outcome from a range of infectious diseases starting from the beginning of life. They also quoted that morbidity and mortality rates are higher in males than in females throughout life which could be attributed to stronger humoral and cellular immune response to infection or antigenic stimulation in females than in males.[11]

![Figure 2. Gender distribution.](image)

Diseases diagnosed

![Figure 3. Disease diagnosed.](image)
The most prevalent disease among studied patients was pneumonia (22.5%) followed by acute gastroenteritis (16.3%), and lower respiratory tract infection (LRTI) (9.4%) being in third position. In a report prepared by International Vaccine Access Center (IVAC) in 2014 revealed that pneumonia and diarrhoea in developing countries remain fairly stagnant despite of major reductions in these diseases globally. In an article by Ghimire et al., in 2014, the authors stated that pneumonia is still a leading killer of young children though there are simple, safe, effective, and inexpensive interventions to minimize the risk. They also emphasized that the reason could be poverty and lack of access to healthcare in developing countries.[12]

Antibiotics prescribed

Table 4. Antibiotics Prescribed.

<table>
<thead>
<tr>
<th>Antibiotics</th>
<th>No. of patients</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceftriaxone</td>
<td>79</td>
<td>49.3</td>
</tr>
<tr>
<td>Cefotaxime</td>
<td>42</td>
<td>26.2</td>
</tr>
<tr>
<td>Cefixime</td>
<td>39</td>
<td>24.3</td>
</tr>
<tr>
<td>Azithromycin</td>
<td>32</td>
<td>20.0</td>
</tr>
<tr>
<td>Cefpodoxime</td>
<td>23</td>
<td>14.3</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>10</td>
<td>6.2</td>
</tr>
<tr>
<td>Cefuroxime</td>
<td>10</td>
<td>6.2</td>
</tr>
<tr>
<td>Meropenem</td>
<td>3</td>
<td>1.8</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>2</td>
<td>1.2</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td>Ofloxacin</td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td>Ceftazidine</td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>1</td>
<td>0.6</td>
</tr>
</tbody>
</table>

The average number of antibiotics per prescription in our study was 1.86. Average number of drug is an important indicator for assessing rationality of prescription. It is preferable to keep the mean number of drugs per prescription as low. The WHO recommends that the average number of drugs per prescription should be less than 2. The average number of drugs per prescription value should be as low as possible to prevent the unfavourable outcomes of polypharmacy such as increased risk of drug interactions, increased cost of therapy, non-compliance and emergence of resistance in case of use of antimicrobials.[13]

In our study, cephalosporin was found to be widely prescribed antibiotic. Third generation, ceftriaxone (49.3%) was the leading antibiotic prescribed followed by cefotaxime (26.2%), cefixime (24.3%) and other antibiotics. The least prescribed antibiotics were ofloxacin, ampicillin, ceftazidime and chloramphenicol i.e. 0.6%.
Higher prescription rate of cephalosporin could be attributed to its broad spectrum of activity and tolerance across all age group. Fluoroquinolones were used least because of their toxic effects in children below 14 years old.\(^{[14]}\)

Recently published WHO guideline, in Geneva in 2014, regarding treatment of childhood pneumonia at healthcare centres revealed that a three-day-course of antibiotics is as effective as a five day course in treating children with fast breathing Pneumonia. Children with fast breathing Pneumonia who fail on first-line treatment with amoxicillin should have the option of referral to a facility where there is appropriate second line treatment. Oral amoxicillin is as effective as injectable ceftriaxone and should be used as a second line treatment in children with severe pneumonia having failed on the first line treatment.\(^{[15]}\)

Cefixime was well tolerated and there was no need of therapy discontinuation which was studied by Dreshaj Sh et al., in 2011, in Kosovo, concluded that cefixime proves good efficiency in patient with community-acquired infections, however, in case of acute infections where staphylococcus aureus is a suspected pathogen, cefixime is not recommended as a therapy and needs to be replaced with another antibiotic, according to susceptibility at the antibiogram.\(^{[16]}\)

Gastroenteritis can be managed based on degree of dehydration, in two different phases, i.e. rehydration and maintenance. Mostly viruses like rotavirus, astrovirus, enteric adenovirus, norovirus etc are responsible for causing diarrhoea and gastroenteritis, the use of antibiotics for treatment wastes resources and also could lead to increased antimicrobial resistance.\(^{[17]}\)

On the other hand, the use of antibiotics is mandatory in severe cases of cholera, shigellosis, and typhoid fever, as antimicrobial treatment tends to quicken the clinical resolution of diarrhoea, prevent the progression of disease and reduces the severity of associated symptoms, such as abdominal pain, vomiting, and fever.\(^{[18]}\)

**Combinations of antibiotics**

Among 160 patients, 96 patients received combination antibiotic i.e. 60%. The most frequently used antibiotics from same group was ceftriaxone and tazobactum, however, from two different groups were cefotaxime and amikacin.
Table 5. Combinations of Antibiotics.

<table>
<thead>
<tr>
<th>Combination of Antibiotics</th>
<th>No. of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceftriaxone &amp; Tazobactum</td>
<td>25</td>
</tr>
<tr>
<td>Cefotaxime &amp; Amikacin</td>
<td>22</td>
</tr>
<tr>
<td>Ceftriaxone &amp; Azithromycin</td>
<td>17</td>
</tr>
<tr>
<td>Cefpodoxime &amp; Azithromycin</td>
<td>6</td>
</tr>
<tr>
<td>Ceftriaxone &amp; Amikacin</td>
<td>3</td>
</tr>
<tr>
<td>Cefotaxime &amp; Erythromycin</td>
<td>3</td>
</tr>
</tbody>
</table>

In a study done by Choudhury DK showed the usage of combination of antibiotics in his study was found to be 29% which is quite lower than that of our study. This could be indicative of severity of disease or failure of treatment with monotherapy.[19] In study done by Palikhe, N in 2004 in Nepal showed that 79% of patients received multiple antibiotics and 21% of patients received a single antibiotic.[9] A study conducted by Shamshy et al., 2013 in another tertiary care hospital in Tamil Nadu have shown that the common combination of antibiotics prescribed were Amoxicillin with clavulanate, followed by piperacillin with tazobactum, and cefotaxim with sulbactum.[20]

A study done by Prakash et al., showed that tazobactam is more effective beta-lactam inhibitor than salbactam. Their study revealed that when organisms produce multiple beta-lactamases, therapeutic options becomes few, where combination of ceftriaxone and tazobactam could act as excellent therapeutic alternative.[12]

A study showed that i.v. beta-lactam or a combination of beta-lactam and beta-lactamase inhibitor plus a macrolide may be prescribed for children with severe pneumonia. Young infants should receive a beta-lactam and an aminoglycoside because of their tendency to get gram negative infection.[21] A study done in 2013, by Mohammad et al., in Tehran University of Medical science, Iran, conclude that consumption of combination of probiotic and antibiotics in children with urinary tract infections is safe and more effective in comparison to prophylactic antibiotics alone.[22]

According to study conducted in All India Institute of Medical Science (AIIMS), in 2008, there cannot be a single recommendation for the antibiotics regimen of neonatal sepsis for all setting. The authors also mentioned that the choice of antibiotics depends on the prevailing flora in the given unit and their antimicrobial sensitivity. They also concluded that third generation cephalosporins have good CSF penetration and are traditionally thought to have excellent antimicrobial activity against gram negative organisms.[23] Research done by Abdul...
Thapaliya et al., in 2012, in Chennai, India, revealed that Cephalosporin is a safe and effective agent to treat patient with non-life threatening sepsis due to gram negative bacteria, however the authors quoted a serious drawback of the study could be its retrospective observational design, with possible selection bias.\[24\]

In study done in Spain by Caballero & Rello, in 2011, found that combination of antibiotic therapy achieves better outcomes compared to monotherapy. Combination therapy has a better coverage for typical micro-organisms in polymicrobial community acquired pneumonia including both Chlamydia Pneumonia and Mycoplasma Pneumonia. Mostly Chlamydia Pneumonia penetrate intracellular that increases severity in infection. Combination therapy superiority is the fact that combination therapy acts at two different sites in the bacteria cell wall by beta-lactams and the inhibition of protein synthesis by macrolides.\[25\]

CONCLUSION
This study gives an overview of the pattern of antibiotic use in the study, single as well as combined drugs prescriptions. Beta-Lactam antibiotics were the highly prescribed antibiotics as well as the most preferred for combination therapy among pediatric patients. Pneumonia was the most prevalent disease and was found to be primary cause for hospitalization among pediatric patients. Despite of limited sample size, our study could contribute towards improvement in prescription pattern and implement institutional guidelines. In addition, collaborative researches (Pharmacist, Physician, and Microbiologist) can be performed with a clear understanding of need for microbiological diagnosis, pharmacists’ interventions, and physician’s good judgment in clinical situation.

ACKNOWLEDGEMENT
We, authors, would like to express our sincere gratitude to Dr. Yougraj Sharma (Medical Director, Niko Children’s Hospital & Research Center), Mr. Nanda Kishor Bhatta, Ms. Poonam Shah and Mrs. Bijayalaxmi Giri (Faculties, Department of Pharmacy, Shree Medical & Technical College) for their constructive comments and support for completion of this research work.

REFERENCES


