Introduction: Antimicrobial drugs are substances or compounds which are used to treat infections which are caused by microorganisms including bacteria, fungi, protozoa and viruses. Antimicrobials are classified on the basis of their modes of action, spectrum of activity and chemical structure. The ultimate objective of antimicrobial chemotherapy is to cure the infections. With the establishment of the efficacy and safety of the antimicrobials, selection of empirical monotherapy or combination therapy is made. Another approach is to use definitive antimicrobial therapy once the sensitivity of the microorganism is known. The purpose of this study was to analyze the prescription pattern of antimicrobials in the department of internal medicine of tertiary care hospital.

Methods: Antimicrobials are among the most commonly prescribed drugs in hospital. Overuse and irrational use of antimicrobials is a key factor behind rapidly spreading antimicrobial resistance in microorganisms. Use of irrational and unnecessary antimicrobials remains common in the developing countries. This study was conducted to analyze the prescription pattern of antimicrobials in the department of internal medicine of tertiary care hospital.

Results: The mean duration of hospitalization among the study population was 5 days. Of the 460 medicines prescribed, mostly indicated for respiratory infections, and the most common antibiotic was from the group cephalosporin (69.7%). 55% of prescriptions include only one drug, 39% with two drugs and 6% with three or more than three drugs.

Conclusion: The mean duration of hospitalization among the study population was 5 days. Of the 460 medicines prescribed, mostly indicated for respiratory infections, and the most common antibiotic was from the group cephalosporin (69.7%). 55% of prescriptions include only one drug, 39% with two drugs and 6% with three or more than three drugs.

Keywords: antimicrobial drugs; culture sensitivity; prescription; resistance; rational therapy
treating infections is to prevent complications like sepsis and to improve patient survival. The selection of the antimicrobials should be based on their sensitivity pattern, toxicity profile and their resistance status. The use of antimicrobials have significantly brought down mortality and morbidity from infectious diseases. At the same time inappropriate use of antimicrobials is widespread all over the world even for trivial infection of viral etiology. Antimicrobial agents are the most commonly used and misused of all the drugs and they had been used in excess for decades. Antimicrobials if not used prudently, will lead to toxicity and resistance among microorganism.

The problems raised with irrational antimicrobial chemotherapy include systemic toxicity, drug resistance, super-infection and economic burden to the patient. There is increasing trend in the use of combinations of broad spectrum as well as newer generation antimicrobials which poses serious concern on antimicrobial resistance. Antimicrobial resistance elicits negative impact in health as well as economic burden in low economic countries where infectious diseases behold a major health challenge.

The study of a prescription pattern includes drug audit involving monitoring and evaluation of various prescriptions of medical practitioners to ensure rationality in medical care. The indiscriminate and injudicious use of antimicrobials has led to ineffective treatment or treatment failure with prolongation or exacerbation of illness, toxicity, drug resistance, psychological impact and additional cost to the patient. The issue of antimicrobial resistance and treatment failure in hospitals cannot be addressed without the knowledge of the pattern of antimicrobial prescription in hospitals. In the view of this, the study was planned and conducted to analyse the prescription pattern of antimicrobial drugs in hospitalized patient in tertiary care hospital.

METHODS

The hospital based cross-sectional study involving prescriptions of 300 patient was conducted in the Department of Internal Medicine of tertiary care hospital from May 2015 to December 2015 after obtaining ethical approval from institutional ethics committee. The study was carried out among patients admitted in the department of internal medicine at tertiary care hospital who were prescribed antimicrobials during their hospital stay. Data has been recorded in customized proforma from the daily case sheets and reports. Records were analyzed for various characteristics of patients and prescriptions such as age, gender, types of antimicrobials used based on generic or trade names, number of antimicrobials for each patient and duration of hospital stay and course of each antimicrobials. The informations regarding the indication and objectives of antimicrobial chemotherapy were also collected from the records. SPSS package version 20 was used for analysis.

RESULTS

During the study period, total of 300 prescriptions of patients for infectious diseases were assessed. More numbers of elderly patients were prescribed antimicrobials. The demographic variables of patients are expressed in table 1.

Out of 300 prescriptions, it was found that 270 (90 %) got cured or improved during the period of treatment, 8 (2.6 %) didn’t complete the
course of treatment, 10 (3.4 %) shifted to ICU for further treatment, and 12 (4 %) died during the treatment. 71% and 15.5 % of the drugs were prescribed for the therapeutic purposes and prophylactic purposes respectively as a treatment and prevention strategy for infectious diseases. 14.5 % drugs were found to be prescribed inappropriately. The infectious or associated comorbid conditions for which antimicrobials used were found to be acute exacerbation of chronic obstructive pulmonary disease, urinary tract infections, enteric fever, sepsis, post tuberculosis, etc (Table 2). 55 % of prescriptions include only one drug, 39 % with two drugs and 6 % with three or more than three drugs. Among all 300 prescriptions, only 59 (19.7 %) were prescribed with culture and sensitivity test and remaining 241 (80.3%) were prescribed without culture and sensitivity test as empirical therapy. Only 27 of 59 prescriptions had positive report on culture and sensitivity test which advocates for definitive antimicrobial therapy for infectious diseases.

Among the total prescribed antimicrobials, cephalosporin (209) are the most commonly prescribed drugs followed by fluoroquinolones (91), both with median duration of 7 days. The commonly prescribed drugs and their duration are shown in table 2. Aminoglycosides (5), vancomycin (4) and carbapenems (2) are least prescribed drugs and those prescribed were all in generic name.

Among the total number of 466 antimicrobial drugs prescribed, 117 (25.1 %) were prescribed on the basis of generic name and 349 (74.8 %) were prescribed on the basis of trade name (Figure 1).

**DISCUSSION**

The prescription-based study provides information to the prescribers, researchers, policy makers and the drug and therapeutics committee members to determine the drug use
In our study, antimicrobials prescriptions was prescribed more to the patients aging 60 years and above. The trends on antimicrobial prescription increases with increasing age of the patient which might be due to the high prevalence of infectious diseases in elderly due to low immunity towards microorganisms. The gender analysis showed that male patients are more than female patient. The majority of the patient suffered from respiratory diseases followed by 20 % with sepsis and enteric fever as in the similar types of previous study. The comorbidities were found to be hypertension with diabetes, post tubercular fibrosis, alcoholic liver diseases, cerebrovascular accident, etc. which are common problems in elderly population. The average number of drugs per prescription in the present study was found 1.53 which is comparable with the results of Jordan (2.3), Brazil (2.4), and India (2.7). The variation in results may be due to difference in health care delivery system, socioeconomic profile, and morbidity and mortality characteristics in the population. The larger number of drugs were prescribed by trade name. The generic name prescription in our study (25.1 %) is less than that reported in

<table>
<thead>
<tr>
<th>Drug Group</th>
<th>No. (%)</th>
<th>Duration in days</th>
</tr>
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<tbody>
<tr>
<td>Penicillins (Amoxicillin, Amoxicillin + Clavulanic acid, Amoxicillin + Cloxacillin)</td>
<td>46 (9.8 %)</td>
<td>Median 7, Range 3-21, SD 3.17</td>
</tr>
<tr>
<td>Aminoglycoside (Amikacin)</td>
<td>5 (1.1 %)</td>
<td>Median 7, Range 3-10, SD 2.49</td>
</tr>
<tr>
<td>Fluoroquinolones (Ciprofloxacin, Levofloxacin, Ofloxacin)</td>
<td>91 (19.5 %)</td>
<td>Median 7, Range 3-21, SD 3.87</td>
</tr>
<tr>
<td>Cephalosporins (Cefadroxil, Cefepime, Cefixime, Cefpodoxime, Ceftriaxone)</td>
<td>209 (44.8 %)</td>
<td>Median 5, Range 1-21, SD 2.97</td>
</tr>
<tr>
<td>Macrolides (Azithromycin, Clarithromycin)</td>
<td>76 (16.3 %)</td>
<td>Median 5, Range 3-14, SD 2.52</td>
</tr>
<tr>
<td>Nitroimidazole (Metronidazole)</td>
<td>25 (5.4 %)</td>
<td>Median 5, Range 3-7, SD 1.08</td>
</tr>
<tr>
<td>Tetracycline</td>
<td>8 (1.7 %)</td>
<td>Median 2, Range 5-30, SD 7.86</td>
</tr>
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**Table 3:** Types of antimicrobials prescribed with the duration in days.

**Figure 1:** Pattern of individual group of antimicrobials prescribed under generic and trade name.
studies conducted in Cambodia (99.8 %), India (73.4 %) and Brazil (30.6 %) 20, 21. In similar type of studies conducted in Nepal, generic name prescription rate were 63.5 % and 59 % 22, 23. The factor contributing to lesser prescription of generic drug might be the low production and lack of adequate promotion of generic drugs in Nepal. The use of generic names is recommended by WHO as a part of rational use of medicines. The use of generic name contributes to cost reduction and provides more alternatives for drug purchases 24.

In our study, more than half of the prescriptions include single drug prescription which include broad spectrum antibiotics with low toxicity profile like cephalosporins, fluoroquinolones and macrolides. The maximum number of drugs prescribed were ceftriaxone from the group cephalosporin which support the previously published literature 25. The beta-lactam antibiotics (cephalosporins) were found to be commonly used as there is strong evidence of their effectiveness in the respiratory infections 26. Poly pharmacy was not the issue among all prescriptions as two antimicrobial drugs combination were higher than three or more than three drugs combination. Combinations of cephalosporins with aminoglycosides, and penicillins with beta-lactamase inhibitors were commonly prescribed and it might be due to their proven synergistic activity, broader coverage of organisms for several serious gram negative infections and low risk of developing resistance 27.

Most of the drugs were prescribed for the therapeutic purpose. Antimicrobials were also prescribed for prophylactic purpose in few patients who are at high risk of developing infections due to exposure to infectious conditions, low immunity and lack of proper care. Among all 300 prescriptions, only few prescriptions were based on reports of culture and sensitivity test. Few drugs were found to be prescribed inappropriately which might be due to the lack of proper guidelines or the confusion in choosing the antimicrobial drugs as empiric therapy 28. Majority of the antimicrobials were prescribed on grounds of presumption and clinical experience of the physicians 29. The study conducted in Saudi Arabia observed that a high proportion of patients received antimicrobial agents prior to the availability of the results of blood culture tests 30. This may lead to the risk of toxicity and possibility of emergence of drug resistance. However, in India, it was observed that empirical use of antimicrobial agents in primary care centre was 100% and 78% in tertiary care centre although culture and sensitivity was done after initiation of therapy in 80% cases of the tertiary care centre 24. Above studies indicates that empirical use of antimicrobial agents are common in developing countries. Though culture and sensitivity testing is easy and cost effective to perform, it is not always feasible in developing countries due to lack of trained personnel, facilities and high chance of contamination. Sometimes, this pattern may also be due to lack of interest and unwillingness of physician or patients 31. In some instance sufficient time is not available for culture and sensitivity and empirical antimicrobials are prescribed to avoid complications of severe bacterial infections. These variations in the prescribing patterns show that although the principles of rational antimicrobial usage have been well defined and recommended for many years,
inappropriate and injudicious use of AMAs remains widespread as a global problem. The number of drugs is important indicator for assessing rationality of prescription. It is preferable to keep the mean number of drugs per prescription as low as possible since higher number always lead to increased risk of drug interactions and increased cost which will result in poor patient compliance. In similar type of study, it was found that 14%-43% of antimicrobial chemotherapy were unnecessary because of no evidence of infection. The studies done in Nigeria and Israel demonstrated that the antimicrobial prescription habits of doctors become prime concern. Low economic burden for antimicrobial therapy can be achieved without compromising the quality of treatment. Focus should be on promoting expenses and infectious control with the rational prescription of antimicrobials and utilization being aimed at reducing the future emergence of resistance against bacteria. There is dire need of antibiotics guideline and stewardship based on local epidemiological data of potential pathogens and their pattern of antibiotics susceptibility. Our study being single centered study, there is possibility of selection bias and referral bias. Similarly, the present study on prescription patterns on antimicrobials may not completely reflect the general population of Nepal.

CONCLUSION

The number of drug prescribed per patient is quite low compare to other studies. Poly pharmacy is not the problem in our settings but antimicrobials prescribed on trade name and without culture sensitivity report is the prime problem. Prescriptions on antimicrobial drugs does not follow the protocol of rational drug therapy. However, there is further need of multicentre analytical studies to link the prescription pattern analysis to figures on morbidity, outcome of treatment, quality of care, and ultimately assess the rationality of drug therapy.

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