Brief communication (Original)

Prescribing pattern of higher generation antibiotics in the out-patient setting in Bhutan hospitals

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Background: The emergence of antibiotic resistance is a complex problem contributed by the interplay of various parties such as prescribers, patients or health settings. In particular, prescribers play a vital role in the use of antibiotics both in rational prescribing of drugs and influencing patients on the appropriate use.

Objectives: Determine the appropriateness of the higher generation antibiotics (cephalosporin and flouroquonolone groups) in the out-patient setting of Bhutan hospitals.

Materials and method: A cross-sectional study was conducted in three referral hospitals of Bhutan where the prescriptions were collected from the pharmacy. All prescriptions containing higher generation antibiotics were selected based on the appropriateness using a modified Medication Appropriateness Index. Three hundred thirty three prescriptions containing higher generation antibiotics were analyzed.

Results: The use of antibiotics was common with 37.1% of the prescriptions containing antibiotics out of which 14% were higher generation antibiotics. When assessed on the appropriateness of the prescription, 55.9% of the prescriptions containing higher generation antibiotics were prescribed inappropriately. In addition, only 47.1% of the prescriptions had appropriate indications for higher generation antibiotics.

Conclusion: There is a widespread inappropriate use of higher generation antibiotics in Bhutan.

Keywords: Antibiotics, Bhutan, medication appropriateness index, prescribing pattern, rational use

Infectious diseases are a major cause of deaths, and this is more prominent in the developing countries [1]. Antibiotics, combined with vaccinations, has produced a massive decline in mortality caused by bacterial infections [2]. The antibiotic resistance is a health problem leading to poor treatment outcome and increased cost [3].

Antibiotics resistance is contributed by the interplay of various parties such as prescribers, patients, health settings, medicines used, dispensers, private parties, and animal husbandry [4]. The inappropriate antibiotic use, including overuse, use in wrong indications, mode of use, under- or over-use, poor adherence, and poor quality of drugs, may also contribute to the antibiotic resistance [5-7].

Okeke et al. [8] described various problems in the use of antibiotics in developing countries leading to a rapid development of resistance to antibiotics. Although antimicrobial resistance is rampant, there are limited studies on determining the best model for improving the use of antibiotics [9-11].

The Bhutan Essential Drugs Program (EDP) was launched in 1986 with an objective to ensure the regular supply of safe, effective, and need-based drugs of acceptable quality at reasonable cost to the majority of the population and promote and monitor rational prescribing, good storage, and dispensing practices. According to the report by Ministry of Health, Bhutan, expenditure on antibiotics is about 17% of the total drug budget, which is about USD 1.4 million per year for a population of about 635,000. The higher generation antibiotic available on the Essential Drug List (EDL) is ciprofloxacin and norfloxacin among

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fluoroquonolones, and ceftraixone, cephalaxin, cefotaxime, and cephazolin among cephalosporins.

In this report, we investigated the appropriateness of prescriptions of higher generation antibiotics (cephalosporin and flouroquonolone groups) in the out-patient setting of three referral hospitals of Bhutan.

Materials and method

This cross-sectional study using out-patient prescriptions was carried out between July and August, 2007 in Eastern Regional Referral Hospital (ERRH) located at Monggar, Central Regional Referral Hospital located at Gelephu, and Jigme Dorji Wangchuk National Referral Hospital (JDW/NRH) located at Thimphu in Western Bhutan. These referral hospitals have specialists in different fields such as medicine, surgery, gynecology, pediatric.

The outpatient prescriptions included patient details, clinical signs and symptoms, laboratory results, medications prescribed, and directions provided to the patients. All prescriptions containing antibiotics were collected from the pharmacy units during the medication collection time over a period of one month.

The prescriptions were used to determine the appropriateness of the medication as per the following ten criteria:

1 Is there an indication for the drug?
2 Is the medication effective for the condition?
3 Is the dosage correct?
4 Are the directions correct?
5 Are there clinically significant drug-drug interactions?
6 Are there clinically significant drug-disease interactions?
7 Are the directions practical?
8 Is this drug the least expensive alternative compared to others of equal utility?
9 Is there unnecessary duplication with other drugs?
10 Is the duration of therapy acceptable?

Each criterion was scored as either: appropriate, marginally appropriate and inappropriate. The MAI (Medication Appropriateness Index) was modified and adapted after discussion with Hospital Antibiotic Advisory Committee (HAAC). This tool has been tested for validity and reliability [12-14]. The HAAC members were called for a one-day meeting. After a brief explanation about the MAI criteria and its guidelines, they were divided into groups. The group consisted of three to four members from various specialties among the HAAC members. The groups made their decision based on the above- mentioned 10 criteria. After sorting, 333 prescriptions were analyzed.

This study was approved by the health research working group, which was the ethical clearing body for the Ministry of Health of Bhutan.

Results

Characteristics of the prescriptions for patients are shown in **Table 1**. On an average, 37.1% of the prescription contained at least one antibiotic, out of which 13.8% prescriptions contained higher generation antibiotics. The prescriptions contained an average of 3.6 drugs per prescription. Only 14.7% of patients had co-morbidities. A total of 51.1% prescriptions were prescribed antibiotics on the first day of their visit, and only 2.7% of the prescriptions were prescribed after a culture sensitivity test.

Table 2 shows percentage score according to medication appropriateness index. For indication, 47.1% of the prescriptions had appropriate indication, 12.9% marginally appropriate, and 40.0% inappropriate. The finding for correctness of dosage, duration of therapy, interactions, and cost effectiveness were decided. The outcome assessed on the inappropriateness with weighted average of three and above considered as inappropriate, our study showed 55.9% of the prescriptions had inappropriate higher generation antibiotics prescribed.

Table 1. Characteristics of the prescriptions.

Variables	Frequency	Proportion
% prescriptions with antibiotics	3658	37.1
% prescriptions with higher generations antibiotics out of antibiotics prescribed	505	13.8
Mean age of patient	9847	34.6 (SD 15.7)
% females	189	56.8
% prescriptions with co morbidities	49	14.7
% discharge prescription	60	18
% prescriptions with culture sensitivity report	9	2.7
% prescription prescribed with higher generation antibiotics on first day	170	51.1
% prescriptions prescribed other antibiotics before higher generation antibiotics	74	22.2
% higher generation antibiotics prescription in generics	347	99.1
% higher generation antibiotics dispensed from hospital	313	94.0
Average number of drugs prescribed/prescription	9847	3.5 (SD 1.6)
% higher generation antibiotics prescribed by specialist	205	61.6
% higher generation antibiotics prescribed by medical officers	43	12.9
% higher generation antibiotics prescribed by Assistant Clinical Officers	57	17.1
% higher generation antibiotics prescribed by others including paramedics	28	8.4

Table 2. % score according to medication appropriateness index.

Criterion in the text	Inappropriate Number (%)	Marginally appropriate Number (%)	Appropriate Number (%)	Unknown Number (%)
1	133 (40.0)	43 (12.9)	157 (47.1)	0
2	133 (39.9)	42 (12.6)	157 (47.1)	1 (0.3)
3	136 (40.8)	2 (0.6)	194 (58.3)	1 (0.3)
4	137 (41.1)	18 (5.4)	51 (15.3)	127 (38.0)
5	137 (41.1)	2 (0.6)	68 (20.4)	126 (37.8)
6	143 (42.9)	3 (0.9)	185 (55.6)	2 (0.6)
7	133 (39.9)	1 (0.3)	199 (59.8)	0
8	136 (40.8)	0	197 (59.2)	0
9	141 (42.3)	1 (0.3)	188 (56.5)	3 (0.9)
10	246 (73.9)	50 (15.1)	36 (10.8)	1 (0.3)

Discussion

This study has shown a wide spread inappropriate use of higher generation antibiotics in Bhutan. The essential drug list of Bhutan specifically mentions that higher generation antibiotics should be prescribed only by the specialist after culture sensitivity result. However, our study revealed that on overall 55.6% of the prescriptions containing higher generation antibiotics are prescribed inappropriately. This indicates that the policies of the program are not followed by the prescriber.

Our study also revealed that 51.1% of the higher generation antibiotics were prescribed on the first day of the patient's visit and with only 2.7% of prescription having culture sensitive test done as mandated by the antibiotic policy. The EDP policy guideline states that all higher generation antibiotics must be prescribed only if there is evidence of resistance as indicated by culture sensitive test and only specialists are authorized to prescribe the higher generation antibiotics. However, 38% of the prescriptions with higher generation antibiotics were prescribed by other health workers including of 17.1% that were prescribed by Assistant Clinical Officers. This indicates that although the guidelines and policies provide stewardship and guide the prudent use of antibiotics, it is not always followed. Therefore, to obtain good adherence, education and monitoring of all relevant people are indispensable.

It is well known that there is a high mean decreases in susceptibility to fluoroquinlones by *P. aeruginosa* and *E.coli* [16]. Inappropriate use of antibiotics seems to be a universal problem. A study conducted in Turkey showed that only 45.7% of the prescriptions prescribed for in-patient were rational [17]. Sandiumenge et al. [15] studied in the impact of different antibiotic strategies on acquisition of resistance microorganisms, and found that cephalosporins and quinolones accounted for 11.3% and 8.4%, respectively, of all prescriptions for ventilator-associated pneumonia in Spain. Other similar studies indicated about 30-75% of prescriptions for higher generation antibiotics are inappropriate [18-20].

Our study has some limitations such as short duration of data collection, which could over represent few prescribers. In addition, some prescriptions did not contain all the required information especially on patient history to thoroughly determine the appropriateness. However, the present result showed that there is a huge inappropriate use of higher generation antibiotics in Bhutan. Therefore, urgent effective interventions are required to halt this rampant practice of inappropriate prescribing of higher generation antibiotics.

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