



Antimicrobial drug use in primary healthcare clinics: a retrospective evaluation



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SUMMARY

Objectives: To examine the appropriateness of antibiotics prescribed for acute infection based on the Malaysian national antibiotic guidelines and the defined daily dose (DDD) system of the World Health Organization (WHO). This study also aimed to describe the factors influencing the drug use pattern and to investigate the procurement patterns of antibiotics in the primary healthcare setting.

Methods: A retrospective cohort follow-up study of randomly selected patients from all patients who received any antibiotic between January and December 2013 was conducted at three primary healthcare clinics in Selangor State of Malaysia. For each patient, the following information was recorded: name of the antibiotic, frequency and dose, and Anatomical Therapeutic Chemical (ATC) group. The defined daily dose per 1000 inhabitants per day was calculated for each antibiotic. The national antibiotic guidelines were used to assess the appropriateness of each antibiotic prescription.

Results: A total of 735 patients were included in the study. The five most used antibiotics were amoxicillin (1.36 g, 35.2%), cloxacillin (0.68 g, 26.3%), erythromycin (0.32 g, 22.3%), bacampicillin (0.13 g, 7.2%), and cephalexin (0.11 g, 6.9%). Respiratory tract infections were the most commonly treated infections, and the doctors' preferred antibiotic for the treatment of these infections was amoxicillin. More than 18% of all amoxicillin prescriptions were deemed inappropriate according to the national antibiotic guidelines. In terms of procurement costs, USD 88 885 was spent in 2011, USD 219 402 in 2012, and USD 233 034 in 2013 at the three primary healthcare clinics, an average of USD 180 440 per year for the three clinics.

Conclusions: This study reports the antibiotic usage at three primary healthcare clinics in Klang Province. The most prescribed antibiotic was amoxicillin in capsules (250 mg), which was mainly prescribed for respiratory infections. Although the national antibiotic guidelines state that amoxicillin is a preferred drug for acute bacterial rhinosinusitis, this drug is also being prescribed for other disease conditions, such as acute pharyngitis and acute tonsillitis. This result shows that current practice is not following the current antibiotic guidelines, which state that phenoxypenicillin should be the preferred drug.

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1. Introduction

In 2011, about 10.1% of annual drug expenditure for primary care clinics was used for antibiotics. Approximately 164.97 million Malaysian ringgit (MYR) (equivalent to USD 43.5 million) was

spent for the purchase of antibiotics for all Ministry of Health hospitals and primary care clinics.¹ In the primary care setting, oral antimicrobial drugs feature consistently in the top therapeutic classes of drugs in terms of frequency of use and cost. Thus, the antibiotic usage pattern should be monitored to determine the appropriateness of use and the cost burden of antibiotics in primary care.

Inappropriate prescribing will eventually cause treatment failure and poses a threat to patient safety, which may lead to other issues, such as non-adherence and wastage of resources.²

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Many factors are associated with inappropriate prescribing of antibiotics. These factors may include the limited knowledge and experience of the medical practitioner, personal preference, and parental or patient pressure.^{3,4} Physicians and patients both play an important role in monitoring drug use patterns. Prescription decisions and patterns are influenced by the patient's expectations and the doctor's perception of the patient's expectations.⁵

Although the guidelines provided by the Malaysian Ministry of Health can be considered the basis for the rational use of antibiotics in the healthcare setting, it is difficult to ensure that these guidelines are diligently followed. One method to ensure correct prescribing and use is through the undertaking of a drug utilization study (DUS). The DUS evaluates the marketing, distribution, prescription, and use of drugs in society, with specific emphasis on the resulting medical, social, and economic consequences. Healthcare providers should focus on certain components of drug use with regard to DUS criteria; these components include the use, selection, dosage, interactions, and preparation. The DUS plays a key role in understanding, interpreting, evaluating, and improving the prescription, administration, and use of medications. Policymakers and procurement management personnel find DUS valuable because the results may be used to promote the efficient use of scarce healthcare resources.⁶ In addition, DUS can be a tool to detect abuse and inappropriate drug usage, which are possible in certain healthcare settings. The DUS can be performed as a prospective, current, or retrospective study. The retrospective DUS involves a review of drug therapy after the patient has completed the course of therapy. This review poses less risk of bias because the prescriber is not aware of the data collection.⁷

The prescription of antibiotics is mainly indicated for the empirical therapy of upper respiratory tract infections (URTIs), urinary tract infection (UTIs), and mild community-acquired pneumonia.^{1,8} A surveillance study conducted among Malaysian Ministry of Health hospitals found that antibiotics are often used for therapeutic uses and are commonly given to patients with lower respiratory tract infections.⁴ Another study showed that antibiotics are more often prescribed for patients with URTIs than for those without an URTI.⁹ Nevertheless, the national antimicrobial resistance surveillance data in 2007 showed high resistance of Gram-negative bacteria, such as *Klebsiella spp* (99%), *Enterobacter spp* (93%), *Escherichia coli* (69%), *Proteus spp* (48%), and *Haemophilus influenzae* (20%), to ampicillin. Hence, the use of these antibiotics as empirical therapy in the primary healthcare setting should be reviewed and changed.¹⁰

Information on the utilization and appropriateness of antibiotic use among adults in the primary healthcare setting is important, especially when the antibiotics are prescribed for acute diseases. The effectiveness of the antibiotics and occurrence of adverse drug reactions might be related to usage patterns. Thus, a DUS on antibiotic usage should be performed to ensure the implementation of the current drug policies and drug formulary at the health clinic level. Additionally, there is a paucity of pertinent data from cross-sectional and retrospective studies on the comparative prescribing of medical specialist versus medical doctor.

The aim of the present study was to examine the appropriateness of antibiotics prescribed for acute infections based on the Malaysian national antibiotic guidelines of 2014 and the defined daily dose (DDD) system of the World Health Organization (WHO). Furthermore, this study also aimed to describe the factors influencing the drug use pattern and to investigate the procurement patterns of antibiotics in the primary care setting.

2. Materials and methods

This was a retrospective study examining the utilization of selected antibiotics in three government health clinics. The health

clinics selected are situated in Klang (Anika), Pandamaran, and Bukit Kuda, which are all within Klang Province. Klang Province has a total of 11 health clinics that offer primary health maintenance services. The clinics at Pandamaran, Anika, and Bukit Kuda are under the management of Klang Province Health Department. Klang Province had a population of 744 062 in 2010. These three large-scale health clinics are located in the centre of the Province of Klang and have the highest population densities. They provide general outpatient care, maternal and child care, dental care, and rehabilitation care. In addition, they also provide laboratory and radiological services. Patients attending these clinics are seen by non-specialist medical doctors or primary care specialists, who are known locally as family medicine specialists.

2.1. Data collection

Information was collected from the electronic clinic management system dispensing records and profile databases. For inclusion in the study, the patient had to be aged between 18 and 60 years and to have been prescribed oral antibiotics. Patients given topical antibiotics, dental treatment, or prophylaxis were excluded from this study. All records of patients attending the three clinics during the period January to December 2013, who fulfilled the necessary criteria, were screened. Out of these records, 245 records from each clinic were chosen at random based on numbering in an alphabetical list. Data gathered from all dispensing records of encoded antibiotics were collected. The prescribed medicine, frequency, and dose were recorded for each patient to obtain the DDD per 1000 inhabitants per day. The national antibiotic guidelines 2014 were used to evaluate the quality of prescription. Comparisons of the DDD between drugs and clinics were assessed against the prescriber and patient characteristics.

2.2. Outcome parameter

The Anatomical Therapeutic Chemical (ATC) classification system is issued by the WHO as a tool for presenting drug utilization statistics in international comparisons. In this classification, each active ingredient of a drug is given a distinct code. Furthermore, the DDD is defined as "the average maintenance dose of the drug when used on its major indication in adults".¹¹ The DDD can be related to drugs with the ATC classification (Table 1). The DDD does not reflect the prescribed daily dose or recommended dose for the treatment of each patient. However, the DDD is the average maintenance dose taken by adult patients for certain indications. The DDD is also a unit of measurement that can be used as a tool for presenting drug utilization statistics for consideration by pharmacy and therapeutic committee members in drug utilization reviews and drug regimen review activities.¹² The DDD can be presented in many ways; for example, the DDD can be expressed as the DDD per 1000 inhabitants per day when describing chronic disease drug use, or as the DDD per 100 bed-days if inpatient drug use is described.¹³ In the present study, the DDD per 1000 patients per day (DID) was used. The DDD result was compared with the current WHO classification of ATC/DDD for the DDD analysis.¹² The antibiotics used in this study are listed in Table 1.

In this study, the data were recorded as the DDD per 1000 inhabitants per day. The quantity of drug use was calculated as follows: $DDD/1000 \text{ inhabitants/day} = T \times 1000 / (DDD \times P \times 365)$, where T is an estimate of the total quantity of the drug (mg) utilized in the year under consideration, DDD is the DDD assigned for the drug according to the ATC/DDD system, P is the population of health clinics studied, and 365 refers to the 365 days in a year.

The DDD was compared to the treatment agreed in the national antibiotic guidelines to assess the prescribing quality and appropriateness.

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