

# Drug use evaluation of antibiotics prescribed in a Jordanian hospital outpatient and emergency clinics using WHO prescribing indicators

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## ABSTRACT

**الأهداف:** تقييم وصف المضادات الحيوية المصروفة لمرضى العيادات الخارجية والطوارئ في مدينة الحسين الطبية باستخدام معايير منظمة الصحة العالمية WHO لوصف هذه العلاجات من أجل ترشيد استعمالها في الخدمات الطبية الملكية.

**الطريقة:** في هذه الدراسة الاستعدادية قمنا بإحصاء عينة حجمها (187822) وصفة تحتوي على مضاد حيوي جمعت من خمس صيدليات في مدينة الحسين الطبية والتي تم كتابتها على مدار ثلاثة أشهر متتالية في الفترة مابين مايو وحتى يوليو 2007م. تم احتساب النسبة المئوية للوصفات المحتوية على المضادات الحيوية حسب الطريقة المقترحة من قبل منظمة الصحة العالمية WHO. كما تم إضافة معيار آخر وهو حساب النسبة المئوية لكل مضاد حيوي وذلك بهدف معرفة مدى تكرار وصف هذه المضادات الحيوية.

**النتائج:** كان معدل النسبة المئوية للوصفات المحتوية على المضادات الحيوية هو (35.6%) للعينة الكلية البالغة عددها (187822) وصفة والتي احتوت على (65500) مضاد حيوي. البنسلينات (وأكثرها الأموكسيسيلين)، والكويونولونز (وأكثرها السيبروفلوكساسين والنورفلوكساسين) كانوا أكثر المضادات الحيوية التي تم وصفها بمعدل (31.8%) و(27.5%) على التوالي. معدل وصف المجموعات الأخرى كان كالتالي: الماكروليدز (5.2%) السيفالوسبورين (16%) و الأموكسيسيلين/ كلافيولانيك أسيد (5.4%).

**خاتمة:** النسبة المئوية العالية لوصفات المضادات الحيوية التي تم ملاحظتها في صيدليات مدينة الحسين الطبية تتطلب الاستعمال المرشد والوصف الحكيم من قبل الأشخاص الذين يصفونها. وهذا يتم بالنظر بتمعن في العوامل التي تؤثر على طريقة وصف هذه الأدوية من قبل الأطباء العسكريين و التأكد من مدى التزامهم بتعليمات وصفها.

**Objective:** To evaluate the use of antibiotics prescribed in hospital outpatient and emergency clinics in King Hussein Medical Centre (KHMC) using WHO prescribing indicators in an attempt to rationalize the use of antibiotics in the Royal Medical Services.

**Methods:** We retrospectively surveyed a sample of 187,822 antibiotic prescriptions obtained from 5 outpatient pharmacies in KHMC written over the period of 3 consecutive months (May 2007 - July 2007). The percentage of encounters of an antibiotic prescribed was calculated using the methodology recommended by the WHO. An additional indicator, the percentage share of different antibiotics was also included to identify the frequency prescribed from those antibiotics.

**Results:** The average percentage of prescriptions involving antibiotics was 35.6% out of 187,822 prescriptions surveyed. From these, 65,500 antibiotic prescriptions were observed. Penicillins (most frequently amoxicillins) and Quinolones (most frequently ciprofloxacin and norfloxacin) were the most commonly prescribed antibiotics with an average percentage of 31.8% and 27.5%. The average prescribing rate for the other antibiotic categories was as follows: macrolides (5.2%), cephalosporins (16%), and amoxicillins/clavulanate (5.4%).

**Conclusion:** The high percentage of prescriptions involving antibiotics observed in KHMC pharmacies requires rational use of antibiotics and judicious prescribing by Military prescribers. An insight into factors influencing antibiotic prescribing patterns and adherence to antibiotic prescribing guidelines by the Military prescribers is warranted.

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Antibiotics are frequently used in the ambulatory care environment in either clinics or hospital outpatient department.<sup>1</sup> This excessive and inappropriate use lead to suboptimal clinical and economic outcomes and are believed to be a major contributing factor to the emergence and spread of antibiotic resistant bacteria in the community.<sup>1,2</sup> Studies have documented high levels of antibiotics misuse among health workers such as antibiotics to treat viral diseases or using incorrect dosage.<sup>3</sup> In addition, it has been reported that drug use evaluation (DUE) in the outpatient environment is not well established as in the inpatient setting.<sup>1</sup> In order to advise effective strategies for more rational prescribing of antibiotics in those outpatient settings, a better understanding of factors influencing prescribing decisions is essential and development of intervention programs aimed at optimizing the use of antibiotics in those settings is warranted. It is clear that the cost of medicine is a matter of great concern in both developed and developing countries. Antibiotics receive special attention of the various classes of drugs as more money is spent on them than many other drugs.<sup>4</sup> From this perspective, it is crucial to carry on drug use research on antibiotics, though the drug use research in Jordan is very limited and very few studies on antibiotics use could be found.<sup>5</sup> Drug utilization reviews (DURs) are important for clinical, educational and economic reasons as they are useful for obtaining information on drug usage patterns and for identifying high cost drugs (for example antibiotics), which are of economic interest.<sup>6</sup> The current situation in the Royal Medical Services/The Jordan Armed Forces (RMS/JAF) regarding prescribing, dispensing, and use of antibiotics is not well documented. To our knowledge, no such study has been carried out selectively in ambulatory care settings in the RMS. Therefore, the aim of this preliminary study is to evaluate the use of antibiotics prescribed in hospital out patient and emergency clinics in King Hussein Medical Centre (KHMC) using WHO prescribing indicators. We selected to measure the prescribing prevalence of antibiotics and the percentage share of some antibiotic categories in our facility with its 5 out patients' pharmacies. The data collected will provide baseline information to determine future priorities and encourages conduction of more studies investigating antibiotic use in the RMS in an attempt to rationalize their use and enhance the awareness of the issue of antibiotic resistance (Ab-R) between healthcare providers in the Kingdom, particularly between military prescribers in the RMS.

**Methods. Drug use indicators.** There are several well-established methods to measure the type and degree of irrational use of medicines.<sup>7</sup> To assess the

scope of improvement in a rational drug use in outpatient practice, WHO has developed and validated a set of core drug use indicators. These indicators are used to measure performance in 3 areas related to the rational use of drugs in health care facilities: prescribing indicators measures the performance of prescribers, the patient care indicators measure what patients experience at health facilities and the facility indicators measure whether the health personnel can function effectively.<sup>8,9</sup> In our study, we selected to measure the antibiotic prescribing indicator (percentage encounters with an antibiotic prescribed) to obtain preliminary data for promoting rational use of antibiotics in the RMS.

**Sampling and data collection.** To perform this study we obtained the ethical approval from the Ethical Committee in the Royal Medical Services. We conducted the study in 5 hospital centers in KHMC, which are shown in **Table 1**. We retrospectively surveyed a sample of 187,822 antibiotic prescriptions written over the period of 3 consecutive months (May 2007-July 2007). The prescriptions were collected from the 5 out patients' pharmacies in KHMC. Through out the study we followed the methodology recommended by the WHO (1993)<sup>8</sup> and the antibiotic prescribing indicators were calculated as follows: a) Percentage of encounters with an antibiotic prescribed = (number of patients encounters with an antibiotic prescribed/total number of encounters surveyed) x 100%. b) The percentage share of an individual antibiotic = (Number of patients encounters with an individual antibiotic/total number of encounters with an antibiotic prescription) x 100%. We used Statistical Package for Social Sciences Version 13.

**Results.** The average percentage of prescriptions involving antibiotics was 35.6% ranging from 7.2-73.4% at different outpatient pharmacies in KHMC as shown in **Table 1**. The highest percentage of prescriptions was observed in the emergency clinic (73.4%), followed by QRC for Urology (44%) and the specialized outpatient clinics in King Hussein Hospital (29.7%), which are considered high values compared to appropriate. **Table 2** shows the average prescribing rate for individual antibiotic category. Penicillins (most frequently amoxicillins) and Quinolones (most frequently ciprofloxacin and norfloxacin) were the most commonly prescribed antibiotic categories with an average percentage of 31.8% and 27.5%. The highest frequency rate of amoxicillins prescriptions was obtained in the emergency clinic (49%). Concerning Quinolones the highest percentage share was obtained in (QRC) (78%).

**Discussion.** Essential drugs offer a cost-effective solution to many health problems in a developing country. Prescribers can only treat patients in a rational way if they have access to an Essential Drug List (EDL) and essential drugs are available in a regular basis.<sup>8,9</sup> As mentioned previously, WHO has selected a core of drug use indicators to assess the scope of improvement in rational drug use in out patient practice. Regarding the use of antibiotics, relatively high levels of availability and consumption of antibiotics in developing countries have led to higher incidence of inappropriate use and greater level of resistance than in developed countries. Surveys of antibiotic use in those settings show antibiotics prescribed in 35-60% of clinical encounters, although appropriate is <20%. In addition, a recent comparative

analysis of inappropriate prescribing by physicians and other professional personnel in 12 developing countries highlighted an unnecessary high proportion (25-75%) of patients receiving antibiotics during clinical visits.<sup>10</sup> It is documented that antibiotics are the most commonly prescribed class of drugs and have been reported to account for almost 50% of the pharmacy budget in hospitals.<sup>4</sup> In addition, it is estimated that a very high percentage is inappropriately prescribed in many centers.<sup>4</sup> Aside from the money wasted on unnecessary prescribed antibiotics, more money is spent on the consequences of indiscriminate antibiotic use. These indirect costs include hospitalizations due to infections with multi-drug-resistant organisms, morbidity associated with avoidable adverse drug

**Table 1** - Antibiotics prescribed as a percentage of the total drugs prescribed (percentage of encounters with an antibiotic prescribed) per day.

KHMC facilities	No. of patients encountered with an Ab. prescription (average)	No. of encounters surveyed/day (average)	Percentage of encounters with an Ab. prescribed/day (average)
<i>King Hussein Hospital</i>			
Emergency Clinic	257	350	73.4
Specialized out patients clinics	202	680	29.7
Royal Jordanian Rehabilitation Centre	53	225	23.6
Queen Alia Heart Institute	22	305	7.2
Queen Rania Centre for Urology and Organ Transplant	51	116	44.0
Ab - antibiotic, KHMC - King Hussein Medical Centre			

**Table 2** - Antibiotics prescribed as a percentage share (proportionate distribution) of total antibiotics prescribed per day.

Antibiotic categories	Percentage share of Ab. in emergency clinic (average)	Percentage share of Ab. in specialized out patients clinics (average)	Percentage share of Ab. in RRC (average)	Percentage share of Ab. in QAI (average)	Percentage Share of Ab. in QRC (average)	Percentage share of antibiotics (average)
<i>Penicillins</i>	49.0	31.5	35.5	34.0	9.0	31.8
Amoxicillins						
Ampicillins						
<i>Macrolides</i>	6.6	11.2	1.0	7.0	-	5.2
Erythromycin						
Klarithromycin						
Azithromycin						
Roxithromycin						
<i>Quinolones</i>	11.0	18.1	10.5	20.0	78.0	27.5
Ciprofloxacin						
Norfloxacin						
Nalidixic acid						
Cephalosporins	15.3	13.3	29.5	16.3	6.0	16.0
Amoxicillin/clavulanate	1.0	7.9	2.5	15.7	-	5.4
Ab - antibiotic, RRC - Royal Rehabilitation Centre, QAI - Queen Alia Heart Institute, QRC - Queen Rania Centre						

reactions and the need to use newer and more expensive agents.<sup>11</sup> In Jordan, antimicrobials accounts for the largest market share of the drug consumption (23% by Jordanian Dinar, 15% by unit) and few antibiotics utilization research could be found in the Kingdom.<sup>5,12</sup> From this perspective, it is crucial to perform studies on the current use of antibiotics in Jordan as data from these studies would be expected to provide useful information in a field for which such data are missing in Jordan, particularly in our model example; the RMS resembled by KHMC.

King Hussein Medical Centre with its 5 outpatient's pharmacies could reflect the general population because all pediatrics, geriatrics, and adults prescriptions are included in the sample. Therefore, data reported in this DUE from those settings may be easy to compare to other settings in Jordan particularly to other military hospitals in RMS. However, some limitations of the study should be noted. Because of the study's retrospective nature, we cannot determine the number of antibiotic prescriptions provided to both patients who had an antibiotic and non-antibiotic responsive diagnoses. Therefore, we cannot assume that every antibiotic prescription included in the surveyed sample was unnecessary. In addition, the study was conducted in the summer season (May-July) and since in the winter season, more antibiotics might be prescribed and a larger sample is included, therefore, we might obtain a higher percentage of antibiotic prescriptions than that observed in this study. However, these limitations do not detract from the study's strengths in documenting an unacceptable high rate of antibiotic prescriptions particularly in the emergency department (ED). In our study, the average percentage of encounters where antibiotics were prescribed was 35.6%. Our figure is high compared to the appropriate percentage (<20%)<sup>10</sup> and lower than that reported in other developing countries as India (43%), Nigeria (48%), and Yemen (46%), but almost higher than that observed in Lebanon (17.5%), Zimbabwe (29%).<sup>8,13</sup> However, our figure is less than that obtained by Ootom et al<sup>14</sup> (60.9%), in their study on drug use evaluation in Jordan. **Table 1** shows that the higher percentage of antibiotics encountered was observed in the emergency clinic (73.4%) with amoxicillins constituting (49%) share of total antibiotics prescriptions indicating that antibiotics over prescribing and misuse are more prevalent than in the other speciality clinics. This could be attributed to the differences between EDs patients and those attending other traditional clinics. Patients presenting to an emergency clinic may have different concerns, different expectations, and more satisfied to obtain an antibiotic prescription than those seeking treatment in other clinics. Moreover, emergency physicians might

alter their prescribing habits to accommodate patients with whom they have short standing relationship, may be sicker than those who go to the office or have less ability to follow up with a primary care physician.<sup>11</sup> This suggests that the ED should be appropriately targeted for programs that minimize inappropriate antibiotics prescriptions. The specialized out patient pharmacy serves patients attending different speciality clinics including Dentistry, Ophthalmology, Pediatric, Gynecology, Surgery, Dermatology, ENT, and so forth. The percentage of antibiotics encountered observed in these clinics (29.7%) is lower than that observed in the emergency clinic. It might be that senior physicians in the specialized clinics use better judgment in prescribing antibiotics to their patients and are more adherent to prescribing guidelines than those emergency resident physicians. However, this percentage considered to be higher than appropriate suggesting that auditing physicians antibiotics prescribing practices in the specialized clinics might effectively reduce the over prescription of antibiotics in those settings. Our study shows a high percentage of antibiotics per encounter in QRC for Urology (44%). Quinolones mainly ciprofloxacin and norfloxacin are the most commonly prescribed antibiotics in this center (78%) of total antibiotic prescriptions as shown in **Table 2**. Quinolones have always been a reliable therapeutic intervention in UTI because of their broad-spectrum activity as well as strong action on gram-negatives. However, it is advocated that they should be used as a last line (not a first line antibiotic) due to their serious side effects profile especially younger patients and their cost. In addition, due to incessant abuse and misuse of these antibiotics, extensive resistance of microorganisms to these antibiotics has developed.<sup>15</sup> In Jordan, high levels of antimicrobial resistance in urinary tract were reported to antibiotics commonly used in both outpatients and inpatients.<sup>5</sup> In view of the above, the high prescribing rate of quinolones obtained in our study could be attributed to the fact that more expensive and broad-spectrum antibiotics, which generally constitute second line agents are used. Urinary catheterization procedures applied to in-patients could be responsible for cross infection of multi resistant organisms to antibiotics thus increasing number of out patient with recurrent UTI, accordingly increasing prescribing rate of these second line antibiotics, and therefore increasing health care cost in the RMS.

In the Royal Rehabilitation Centre (RRC), the average percentage of antibiotics encountered (23.6%) is less than that obtained above, but almost close to appropriate. Amoxicillins and cephalosporins were the most frequently prescribed antibiotics in this setting with an average percentage of 35.5% and 29.5%.

These antibiotics are mainly prescribed in this center for outpatients as postoperative therapy after attending orthopedic surgery. In Queen Alia Heart Institute, we obtained the lowest percentage of antibiotics prescription per encounter (7.2%) compared to the other values. This could be attributed to the fact that this center is mainly serving patients with heart diseases and cardiologists mainly recommend IV antibiotic therapy for patients who require longer hospitalization after open-heart surgery procedures, thus few out patients require oral antibiotics prescriptions. However, as shown in **Table 2**, the percentage share of some antibiotics appears to be almost higher than the other values as in Quinolones (20%), and amoxicillin/clavulanate (15.7%) suggesting that those expensive second line antibiotics should be prescribed in this center more wisely and cost effectively. The lower percentage observed in RRC and QAI might be attributed to the fact that physicians in those settings are having inpatient facilities and relatively better exposure to specific guidelines and protocols for antibiotic prescriptions, thus having both inpatient and outpatient practices than those physicians in the emergency clinic who are having only outpatient practices and more likely to prescribe antibiotics.

**Future recommendations.** Military prescribers and healthcare providers in the RMS should be aware of the problem associated with over prescribing and over consumption of antibiotics. This could be achieved by targeting these groups through educational, financial, and regulatory interventions. Educational interventions could be in the form of Continuing Medical Education (CME) programs, which are desirable because in their absence medical practitioners invariably rely on the information from pharmaceutical companies, which are not always consistent with rational drug use.<sup>16</sup> Continuing Medical Education could be in the form of Interactive CME sessions, sessions that consist of a series, small groups involving peers, delivery or endorsement of a message by a local opinion leader and a message of local relevance is all effective in antibiotic prescribing.<sup>17</sup> In addition, provision of Standard Treatment Guidelines, for example, the judicious use of antimicrobials in common respiratory tract infections accompanied with onsite training and supervision may be helpful in guiding prescribers in the appropriate use of antimicrobials.<sup>18,19</sup> Establishment of Drug and Therapeutics Committees based on restrictive measures is essential. Drug and Therapeutics Committees in hospitals must regularly review antibiotic use, conduct audits, carry out monitoring and supervision and give doctors feedback to influence prescribing habits; these committees should also approve the use of newer agents, which should be restricted to agreed clinical conditions. Drug and Therapeutics Committees have

been successful in industrialized countries in promoting more rational, cost-effective use of medicines and antimicrobials in hospitals.<sup>20</sup> Laboratory support and establishment of a surveillance system are important to prevent the irrational empirical antimicrobial prescription and monitoring trends in resistance. The WHO supported the development and release of World Health Organization net shareware for routine management of data and analysis of susceptibility testing results. This software is designed to present data in a uniform manner to aid reporting and keeping track of local and global resistance trends.<sup>16</sup> The low fee paid by the patient per drug in a prescription encourages the demand of medications even when they are not needed as in the case of antibiotics in common colds. Changing the rules and establishing a higher fee system for expensive items, as antibiotics will be a cost-effective economic strategy to contain the over prescriptions of antibiotics in the RMS' out patient settings.

Finally, recognition of the problem of antibiotics abuse and antibiotic resistance in the RMS and in our community is the first step to rationalize the use of antibiotics. Our great success will probably come from efforts to enhance physicians' awareness of the consequences of the indiscriminate prescribing habits of antibiotics. Future studies should address methods to reduce unnecessary antibiotics prescriptions mainly in the EDs in the RMS. Moreover, this study needs to be extended and repeated over time to maintain good quality healthcare in RMS. And last, but not least, as individuals we cannot change the world, however serving as an example we can try to have some influence on the numerous wrong attitudes of our societies with regard to antibiotic usage.

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