Annals of
Medical & Surgical Case Reports

Research Article

Alawdi SH, et al. Ann Med & Surg Case Rep: AMSCR-1000013.

# Assessment of Drug Use Pattern Using WHO Prescribing Indicators at Outpatient Settings in Yemen

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**Citation:** Alawdi SH, Al-Mekhlafi AG and Alherwi MA (2019) Assessment of Drug Use Pattern Using WHO Prescribing Indicators at Outpatient Settings in Yemen. Ann Med & Surg Case Rep: AMSCR-1000013.

**Received date:** 06 August, 2019; **Accepted date:** 03 September, 2019; **Published date:** 16 September, 2019

## Abstract

**Background:** Rational prescribing is anessential step to ensure rational drug use. To promote rational drug use, especially in developing countries, assessment of drug use patterns according to WHO prescribing indicators is becoming increasingly necessary. The present study aimed to evaluate the prescribing patterns based on WHO indicators at the outpatient settings.

**Methods:** A prospective cross-sectional study was conducted between July 2018 and February 2019. A 386outpatient medication prescriptionsof patients from different diseases and ages were analyzed according to WHO guidelines and the standard prescription format. Also, prescriptions were analyzed to determine the most frequently prescribed antibiotics.

**Result:** Out of total drugs prescribed (1552), only 4.4% (62) drugs were prescribed by generic name. Mean number of drugs per prescriptions was 4 with a range between 1 and 13 drugs. Use of antibiotics was 96.1% (367), percentage of prescriptions with an injection was 65.8% (254), and the percentage of drugs prescribed from essential drug list was 4.8% (74). Adherence of prescribers to the standard prescription format is quite poor.

**Conclusion:** Brand name prescribing is dominant habit in Yemen. Adherence of the prescribers to the standard prescription format as well as their compliance with the WHO prescribing indicators is quite poor. Poly-pharmacy is quite common. Excessive use of antibiotics and injectable drugs prescription is quite common. There is a poor trend of prescribing drugs from essential drug list. This irrational prescribing indicates a clear need to implement a guideline by the regulatory authorities directing the prescription habits of physicians.

**Keywords**: Drug use indicators; Prescribing indicators, Rational prescribing, WHO guidelines, Yemen

## Introduction

The rational use of drugs necessitates a prescribing that ensures patients to receive medications appropriate to their therapeutic needs, in doses that meet their own individual requirements for an adequate period of time at the lowest cost (WHO, 1987). World Health Organization estimates that 50% of medications are prescribed inappropriately and 50% of them are used inappropriately (WHO, 2009). The consequences of inappropriate use of drugs include ineffective treatment, adverse drug effects, development of antimicrobial resistance, drug-drug interactions,

and economic burden on patients and society [1].

Quality of prescribing is a major determinant of how patients use their medicines.In addition to the standard prescription format, the WHO has designed standard prescribing indicators to evaluate the trends of prescribing drugs in health facilities [2]. These are the average number of drugs per medical prescription, the percentage of drugs prescribed by their generic name, the percentage of antibiotics prescribed, the percentage of prescribed injectable drugs, and the percentage of drugs prescribed from essential drug list or formulary(WHO, 2004).

Lacking of clear, comprehensive, and rational drug policy in Yemen has resulted in distortion of the pharmaceutical sector represented by pharmaceutical manufacturing companies and medicines importing agencies for the most part. Yemeni markets are flooded with more than 20,000 brand name formulations. Numerous companies operate in Yemen by importing and marketing preparations with different brand names [3]. Also, several pharmaceutical manufacturers in Yemen produce hundreds of generic preparations by brand names. This obligates them to enter into fierce competition,encouraging the prescribers to prescribe brandnames instead of generic names. This benefits the companies, but couldresult in irrational use of drugs. The WHO drug use indicators are becoming increasingly necessary to promote rational use of drugs in developing countries. Efforts should be made to describe and quantify the current situation before interventions are started to promote rational drug use [4]. The present study aimed to check the presence of various components of the standard prescription format and to evaluate the prescribing patterns based on WHO indicators at the outpatient settings in selected community pharmacies in a Thamar city, Yemen [5].

## Materials and Methods

**Study design:** A prospective, descriptive cross-sectional study was carried out in eight randomly selected busy community pharmacies from different regions in Thamar city, Yemen. The study was conducted between July 2018 and February, 2019. The study sample comprised medication prescriptions of patients from different ages and various prescriber specialties [6].

**Data collection and analysis:** During the study, 386 prescriptions of ambulatory patients of different categories of diseases and age groups were analyzed. Parameters were evaluated using the snapshots of the prescriptions. The five components of prescriptions were analyzed separately according to the standard prescription format. These are patient's identifiers, superscription, inscription, transcription, and prescriber's identifiers.Additionally, the WHO standard prescribing indicators to evaluate the trends of prescribing drugs in health facilities were assessed. These are the average number of drugs per medical prescription, the percentage of drugs prescribed by their generic name, the percentage of antibiotics prescribed, the percentage of prescribed injectable drugs, and the percentage of drugs prescribed from essential drug list or formulary in the statistical analysis, frequencies, averages/means, and percentages were obtained [7].

### Prescribing indicators measurement

- The WHO prescribing indicators were used in the present study. The adopted formulas include(WHO, 2004).
- Average number of drugs per prescription=Total number of prescribed drugs/Total number of prescriptions sampled. This indicator helps to investigate poly-pharmacy, which is a major factor contributing to the adverse drug effects and drug-drug interactions.
- Percentage of drugs prescribed by generic name=(Number of drugs prescribed by generic name/Total number of drugs prescribed) × 100. This indicator helps to estimate the drug cost, and to evaluate the influence of drug marketing on the prescribing habits of physicians.
- Percentage of prescriptions with an antibiotic prescribed=(Number of patient prescriptions with an antibiotic/Total number of prescriptions sampled) × 100. This indicator helps to estimate the excessive use of antibiotics which contributes to dissemination of the antimicrobial resistance.
- Percentage of drugs prescribed from essential drugs list=(Number of drugs prescribed from essential drugs list/Total number of prescribed drugs) × 100. This indicator helps to measure the degree to which therapeutic practices conform to the national drug policy, and to guarantee treatment of the principal diseases of the population at the least cost of medications.

## Results

Presence of patient identifiers; name, age, sex, address of the patient as well as the date of prescription were identified. Out of 386 prescriptions, name was mentioned in 346 (90.3%) prescriptions, age was mentioned in 214 (55.9%), sex was mentioned in 17 (4.4%), and address of patient was mentioned in 21 (5.5%). Date of prescription was mentioned in 237 (61.9%) prescriptions. Diagnosis was only mentioned in only 73 (19.1%) prescriptions [8].

Superscription is usually denoted by the symbol Rx. Mentioning the Rx symbol is traditionally important item while writing the prescription. The results of the present study have shown that Rx symbol was printed among 345 (90.1%) prescriptions [9].

Inscription contains names of the drugs to be taken, strength of the drug, the pharmaceutical dosage form, and the dose of the drugto be dispensed to or used by the patient. In the current study, most prescriptions were written using the trade name rather than the generic name of the drug; trade name was mentioned in 369 (95.6%) while generic name were mentioned only in 17 (4.4%) prescriptions. Strength of the drug was mentioned in 283 (73.9%) prescriptions, pharmaceutical dosage form was mentioned in 334 (87.2%) prescriptions, and the dose of drug was mentioned in 339 (88.5%) prescriptions [10].

Subscription is regardedan important component of the prescriptions. This component consists of two parts; directions regarding the dose of drug and the total amount of drug which is to be dispensed. Directions regarding the dose or frequency of the dose of the drug were mentioned in314 (82%) prescriptions, while the total amounts of the drug to be dispensed were mentioned in 172 (45%) prescriptions [11].

Transcription involves written instructions directed to the patient regarding the proper use of drugs to be dispensed. These instructions may also regard to the time differences between the medication administration and any routine event, or it may involve any necessary precaution which is to be kept in mind while taking the drug. The present study showed that instructions regarding drug utilization were mentioned in 171 (44.6%) prescriptions.

Prescriber's identifiers include name and address as well as the signature of the prescriber. In the present study, the name of the prescriber was stated in 298 (77.8%), address of prescriber was mentioned in 349 (90.6%), and signature of prescriber was mentioned in 339 (88.5%) of the evaluated prescriptions. The name and the address of the prescriber were mostly printed in the prescriptions, whereas the signature was performed manually or using stamp. **Table 1** summarizes the results of all the parameters discussed above.

| No. | Parameters that were evaluated | Percentage observed |
|---|---|---|
| 1 | Name of patient was mentioned | 90.3 % |
| 2 | Age of patient was mentioned | 55.9 % |
| 3 | Sex of patient was mentioned | 4.4 % |
| 4 | Address of patient was mentioned | 5.5 % |
| 5 | Date of prescription was mentioned | 61.9 % |
| 6 | Diagnosis was mentioned | 19.1 % |
| 7 | Rx sign was present in prescription | 90.1 % |
| 8 | Name of drug was mentioned | 100 % |
| 9 | Strength of drug was mentioned | 73.9 % |
| 10 | Dosage form of drug was mentioned | 87.2 % |
| 11 | Dose of drug was mentioned | 88.5 % |
| 12 | Directions regarding frequency of dose were mentioned | 82 % |
| 13 | Total amount of drug was mentioned | 45% |
| 14 | Instructions about use were given | 44.6 % |
| 15 | Name of prescriber was mentioned | 77.8 % |
| 16 | Address of prescriber was mentioned | 90.6 % |
| 17 | Signature of prescriber was mentioned | 71 % |

**Table 1:** Parameters to evaluate standard prescription format (n = 386).

A total of 1552 drug products were prescribed in the 386 prescriptions that were evaluated. Thus, the average number of drugs per prescription was 4.0drugs with a range between 1 and 13. The total number of drugs prescribed by generic name was only 17 (4.4%). An antibiotic was prescribed in 368 (96.1%) patient encounters, and injectable drugswere prescribed in 254 encounters (65.8%). Only 74 (4.8%) drugs were on the essential medicines list of Yemen. The overall results of the compliance with the WHO prescribing indicators are summarized in **Table 2** and graphically illustrated in **Figure 1**.

| No. | Indicator | Total | Average | Standard |
|---|---|---|---|---|
| 1 | Average number of drugs per encounter | 1552 | 4.0% | 1.6-1.8% |
| 2 | Percentage of drugs prescribed by generic name | 68 | 4.4 % | 100% |
| 3 | Percentage of encounters with an antibiotic prescribed | 368 | 96.1% | 20-26.8% |
| 4 | Percentage of encounters with an injection prescribed | 254 | 65.8 % | 13.4-24.1% |
| 5 | Percentage of drugs prescribed from essential medicines list | 74 | 4.8% | 100% |

**Table 2:** Analysis of WHO core prescribing indicators (n=386).

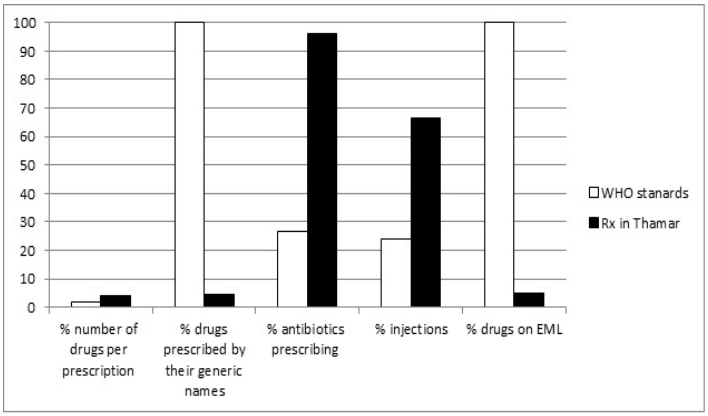


**Figure 1:** Analysis of WHO core prescribing indicators (n=386).

Of a total 1552 drugs prescribed in the 386 prescriptions, 496 (32%) were antibiotics. The most commonly prescribed antibiotics were cefotaxime 107 (21.5%), ceftriaxone 102 (20.5%), and amoxicillin-clavulanic acid 65 (13.1%). Antibiotics prescribed are summarized in **Table 3**.

| No. | Antibiotic | Total number | Percentage |
|---|---|---|---|
| 1 | Cefotaxime | 107 | 21.5 |
| 2 | Ceftriaxone | 102 | 20.5 |
| 3 | Amoxicillin+clavulanic acid | 65 | 13.1 |
| 4 | Metronidazole | 38 | 7.6 |
| 5 | Azithromycin | 25 | 5.0 |
| 6 | Cotrimoxazole | 24 | 4.8 |
| 7 | Ampicillin+sulbactam | 18 | 3.6 |
| 8 | Cefuroxime | 14 | 2.8 |
| 9 | Ampicillin+cloxacillin | 14 | 2.8 |
| 10 | Ceftriaxone+tazobactam | 14 | 2.8 |
| 11 | Nifuroxazide | 13 | 2.6 |
| 12 | Cefixime | 12 | 2.4 |
| 13 | Ceftriaxone+sulbactam | 8 | 1.6 |
| 14 | Ceftazidime | 6 | 1.2 |
| 15 | Cefpodoxime | 6 | 1.2 |
| 16 | Benzathinepencillin | 5 | 1.0 |
| 17 | Vancomycin | 4 | 0.8 |
| 18 | Cefipime | 3 | 0.6 |
| 19 | Tetracycline | 3 | 0.6 |
| 20 | Amikacin | 3 | 0.6 |
| 21 | Cefdinir | 2 | 0.4 |
| 22 | Neomycin | 2 | 0.4 |
| 23 | Nalidixic acid | 2 | 0.4 |
| 24 | Amoxicillin | 2 | 0.4 |
| 25 | Ciprofloxacin | 1 | 0.2 |
| 26 | Fusidic acid | 1 | 0.2 |
| 27 | Clarithromycin | 1 | 0.2 |
| 28 | Ampicillin | 1 | 0.2 |
| - | Total | 496 | 32 |

**Table 3:** Most commonly prescribed antibiotics in outpatient settings (n=386).

## Discussion

The results have shown that most of the prescriptions were lacking the important patient demographics. Most of the prescriptions were missing Sex, Age, and Address of the patient. First, forty prescriptions (10.7%) were missing the patient's identity. Such prescriptions are always a source of serious medication errors like dispensing of medication to any wrong patient. Age of the patient, according to the current study was mentioned in 214 prescriptions (55.9%). Age of the patient is important to be mentioned on the prescriptions. This facilitates the selection of correct dose of any drug to be dispensed to any patient and may also help in dispensing of the correct dosage form of the drug. Similar results were previously reported from Pakistan. An alarmingly very large numbers of the prescriptions did not contain sex 369 (96.6%) or the address of the patient. This shows the trend of mentioning the sex and the address of the patient is very low Yemen. Prescriber's identifiers include name and address as well as the signature of the prescriber. In this study, the name of the prescriber was stated in 298 (77.8%), address of prescriber was mentioned in 349 (90.6%), and signature of prescriber was mentioned in 339 (88.5%) of the evaluated prescriptions. The name and the address of the prescriber were mostly printed in the prescriptions, whereas the signature was performed manually or using stamp [12].

Mentioning superscription is important while writing medical prescription. Superscription is usually denoted by the symbol Rx. In the prescriptions analyzed during this study, 345 prescriptions (90.1%) out of total 386 were containing this component of the standard prescription. This large number is virtually due to the trend of printingthe Rx symbol in most prescriptions not relying on the prescriber writing. Inscription contains names of the drugs to be taken, dose of the drug, the pharmaceutical dosage form, and the strength of the drug which is the amount of drug in this dosage form to be dispensed to or used by the patient. The present study showed that most prescriptions 369 (95.6%) were written using the trade name rather than the generic name. This shows the trend of

using trade name instead of the generic name in Yemen. These data could reflect the effect of over promotion of drugs during writing prescriptions. The strength of drug was absent among 103 (26.1%) prescriptions, while the type of pharmaceutical dosage formwas absent in 52 (12.8%) prescriptions. Similarly, thedose of the drug to be used by the patient were absent in 47 (11.5%) prescriptions. These numbers are not near to ideal, and quite higher than that observed in the prescriptions analyzed in several previous studies [13].

Subscription includes directions regarding the dose of the drug and the total amount of the drug to be dispensed. Prescriptions that carry directions regarding the dose helpthe rational drug utilization by the patient and compliance with the correct dose schedule. In the present study, such directions regarding the dose were absent in 72 (18%) prescriptions. Further,the total amount of drug to be dispensed is important to be mentioned on the prescriptions. This component assists dispensing the exact amount of the drug to the patient. This number is usually mentioned in encircled form after the drug's name and strength. The importance of mentioning the total amount of drug to be dispensed appears obviously in case of such drugs like steroids, narcotics and antibiotics etc., so as to avoid any drug overuse or misuse. The results of the present study have shown thatthe total amounts of drugs were not includedin 214 (55%) prescriptions. This number islarger than the reported number in India.

Transcription is also important component in a standard prescription. This component involves written instructions directed to the patient regarding the proper utilization of drug. Instructions may also involve any necessary precaution, which is to be kept in mind while taking the drug. This component was mentioned in 171 (44.6%) prescriptions. Prescriptions that were devoid of the necessary instructions still high, however, these results are better than those observed in previous studies performed in India.

Polypharmacy often leads to high chances of drug-drug interactions, adverse drug effects and high burden of the treatment. In this study, the average number of the drugs per encounter was 4.36. This number highly deviates the standard provided by WHO, according to which, the average number of drug per encounter ranges between 1.6 and 1.8. The study reflects higher number of polypharmacy than that of studies conducted in India, Ethiopia, and Pakistan. So there is a need to decrease the total number of the prescribed drugs to the least possible extent, in order to avoid the polypharmacy that may augment chances of medication errors, increase number of adverse effects, and further substantiate burden on the patient and the society as a result of increased cost of therapy. Rational drug prescribing is defined as the use of the least number of drugs, to obtain the best possible therapeutic effects in the shortest period at a reasonable cost.

Despite having several merits as well as demerits, prescribing using generic name of drug has the benefits overweigh the losses. For this reason, WHO greatly emphasize on prescribing of the drugs by their generic names. According to the WHO standards, all drugs (100%) should be prescribed by their generic names. An alarmingly very low number 68 (4.4%) of the drugs were mentioned by their generic names in the present study. Similar results (2.5%) were reported in India. In contrast, the percentage of the drugs prescribed by the generic name in Ethiopia was found out to be 98.7%**.** Hence,there is an imminent need to implement the policy of prescribing drugs by their generic names in Yemen. Thiswould reduce the cost of drugs, reduces chances of duplication that could lead to hazardous side effects and drug-induced toxicity. It also will help to minimize over-promotion of drugs as well as the unethical marketing strategies adopted by some pharmaceutical industries.

Irrational use of antibiotics is always associated with a vast number of serious consequences and emergence of resistant strains of bacteria. Antibiotics should only be prescribed when necessary and after culture sensitivity report. A complete course of antibiotic for a particular infection should also be ensured. Abundant and irrational prescribing of antibiotics would make Yemen on a brink. In current study, it was observed that 368 (96.1%) prescriptions were carrying one or more antibiotic(s) prescribed in them. According to the standard values given by WHO, the number of prescriptions carrying antibiotics prescribed ranges between 20.0% and 26.8%. These values indicate that theobserved values observed during the present study areextremelyhigh than those in the nearby countries. For example, the value in Ethiopian study was 34.3%**.**Our study demonstrates extremely excessive prescribing of antibiotics, and thereis an urgent need to minimize prescribing antibiotics in Yemen.

Injectable formulations have several benefits, but they need expertise and great precautions to be taken during administration. They also increase the cost of therapy and burden on the patient or society. In the current study, 254(66.6%) prescriptions were containing injectable drug, most common were antibiotics, in them. According to the WHO standards, 13.4-24.1% of the prescriptions may contain injectable items in them. In Ethiopia, it has been reported that 38.1% prescriptions were containing injectable,while in Nepal, 71% of the prescriptions were reported carrying injectable**.**The results indicate the percentage of injectables prescribed in Yemen is farfrom the standard limits, so the need is there to minimize the current levels.

Essential Medicine List is made for any country to identify those drugs that fulfill the need of maximum number of patients. Although WHO gives a great emphasis on development of EML and to follow its concept,the concept of Essential Medicine List is not usually employed during prescribing in Yemen. Adding, the last EML was developed in Yemen more than 10 years ago. This study reveals that a very small number of the drugs are prescribed from the EML. WHO states that 100% of the drugs must be prescribed from the EML of any country. But in the current study 74 (4.8%) drugs out of the total 1552 drugs, in 386 prescriptions were prescribed from the EML. This number is very low when compared with WHO Standard valueas well as that found in other countries, such as Ethiopia, where 96.6% of the drugs are prescribed from EML as per the study and in India where 99.8% of the prescribed drugs

were enlisted in the EML. Thus, number of the drugs prescribed from EML needs to be increased while prescribing in Yemen to match the number with the WHO standards.

Overuse of antibiotics (32%) has been noticed in the present study. The most commonly prescribed antibiotics were cefotaxime (21.5%), ceftriaxone (20.5%), and amoxicillin-clavulanic acid (13.1%). The extravagant prescribing of antibiotics could facilitate emergence of microbial resistance. Adding factor, empirical treatment with two or more antibioticswas prevalent without proper diagnosis.

## Conclusion

From the results of present study, it could be concluded that adherence of the prescribers to the standard prescription format as well as their compliance with the WHO prescribing indicators in Thamar city is very poor. Next, poly-pharmacy is quite common and the concept of prescribing drugs by their generic names is negligible. Further, excessive use of antibiotics is quite commonwhich could bea leading factor towards emergence of resistant strains of microbes. Furthermore, injectable drugs prescription is quite common, that makes patients at high risk of serious consequences when applied wrongly. Finally,there is a poor trend of prescribing the drugs from essential drug list.This irrational prescribingdenotes a clear need to implement a guideline by the regulatory authorities directing the prescription habits of physicians.

## Acknowledgment

Sincere thanks and heartfelt gratitude are due for the pharmacists, pharmacy technicians, and pharmacy students for their kind assistance during data collection.

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