Original Article

Evaluation of the Quality of Prescriptions with Antibiotics in the Government Hospitals of Yemen

Health Management & Policy Section

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ABSTRACT

Introduction: Irrational prescribing is a habit which is difficult to counteract and this may lead to ineffective treatment, health risks, patient non-compliance, drug wastage, wasting resources and needless expenditure.

Objective: The aims of this study were to investigate the prescribing of antibiotics in Yemen and provide a baseline picture of prescribing habits. It presented an overview on the quality of prescribing and the resulting patterns coming from the prescriptions.

Methods: The scope of the study was limited to four public quaternary health care facilities in Sana'a, Yemen. A prospective drug utilization review method was used in this study.

Results: Results showed that the total number of brand name antibiotics prescribed was 76.8%, and 27.5% of the antibiotics were not on the Yemen Essential Drug List (YEDL). Out of all prescriptions, it was found that 51.0% contained antibiotics. Antibiotic prescriptions were lacking in many areas of important information: the diagnosis, patient's name, gender and age as well as for the prescribed antibiotics information (strength, dosage form, dose, frequency and duration). The average number of antibiotics per each patient received was 1.2 ± 0.4 (median = 1) and the percentage of antibiotics prescribed as injections was 27.8%.

Conclusion: The patterns which emerged in prescribing showed that there were various potential problems in antibiotic usage in the government quaternary hospitals in Yemen. Advocacy, education and awareness initiatives are required to alleviate these problems.

Key Words: Antibiotics; Drug Utilization; Generic Medicines; Rational Prescribing; Yemen

KEY MESSAGE

- The quality of the prescriptions of the antibiotics in the government hospitals in Yemen was evaluated.
- A prospective drug utilization review method was used in this study.

INTRODUCTION

In Yemen, as in the other developing countries, the quality of the health services is far from satisfactory. The inappropriate, ineffective and the inefficient use of drugs commonly occurs at different health facilities [1], [2]. Irrational prescribing is a habit which may lead to ineffective treatment, health risks, patient non-compliance, drug wastage, wasting of resources and needless expenditure. Several factors affect irrational prescribing such as patients, prescribers, the workplace environment, the supply system (including industry influences), weak governmental regulations, the lack of drug information and the problem of misinformation [3], [4]. Improving the rational use of drugs (RUD) is a difficult task worldwide. To date, there has been no comprehensive study on the quality of antibiotic prescribing in the Yemeni hospitals. Therefore, there is no available information on the prescribing behaviour of antibiotics in Yemen.

Consequently, the current study aimed to investigate the current prescribing behaviour and the prescription quality of antibiotics in Yemen. Additionally, the correlation between the prescribing patterns and the specific indicators which were defined by the World Health Organization (WHO) and the Pharmaceutical Management Plus Program manuals was investigated [5], [6]. This study will provide the baseline data for further investigation and intervention, in order to determine the main factors which control the inappropriate prescribing behaviour. It is worth knowing whether the health facilities adhere to the WHO standards of the prescribing practices and to investigate the differences in the prescribing practices between the studied health facilities [5]. From the performance measurement of the antibiotic prescribing practices of the health providers, particularly the use of the National Standard Treatment Guideline (NSTG) and the National Essential Drug List (NEDL) , this study will help in developing strategies for the rational use of drugs in Yemen [7], [8].

METHODS

This study was generally a cross-sectional study. It was designed by using the methods which were described in the Rational Pharmaceutical Management Plus Program and the World Health Organization manuals [5], [6]. The study population was limited to the public quaternary health care facilities in Sana'a's capital trust. The most important government hospitals in Sana'a which are considered as educational and teaching hospitals are the Al-Thowrah (THO), Al-Gomhory (GOM), AL-Kuwait (KUW) and the Al-Sabaeen (SAB) hospitals. The first three hospitals provide all the specialty services while the SAB hospital is devoted to provide gynaecological and paediatrics care. The selection based on choosing high-level health facilities (three educational hospitals and one teaching hospital).

The primary unit of the study was the outpatient public hospitals and the study unit which was used for the analysis was the health facilities. The secondary analysis looked at the antibiotic prescribing practices. Samples of 300 prescriptions from each hospital were collected, thus making the total number of prescriptions which were collected from all hospitals equal to 1200 prescriptions. The prescriptions were collected in the middle of the clinic day around 10 am and 1 pm from the outpatient clinics of the four hospitals, during the period of December 2003 till June 2004. The information on the prescribing indicators was recorded, calculated and analysed for each health facility. Then, the average of each indicator for each hospital was calculated. Comparisons between the four hospitals were also carried out. Finally, the overall results i.e. the mean (SD) of all the health facilities which were studied were calculated. The prescribing practices of the health care providers at these different hospitals were assessed.

THE INDICATORS WHICH WERE USED IN THIS STUDY

The selected drug use indicators which were adopted from RPMPP [6] and the WHO manuals [5] which were related to the antibiotic drug use and the prescribing in hospitals were the percentage of the prescriptions which contained antibiotics with basic patient information (name, sex, age, address and diagnosis), the percentage of the basic information which was written for the antibiotic drugs which were prescribed (strength, dosage form, dose, frequency and duration), the percentage of the prescriptions with one or more antibiotic drugs which were prescribed, the percentage of the antibiotics which were prescribed from all the prescribed drugs, the average number of antibiotics which were prescribed per patient with the antibiotic which was prescribed, the percentage of the antibiotic drugs which were prescribed from YEDL, the percentage of the antibiotics which were prescribed by their generic names, the percentage of the antibiotics which were prescribed as injections and the percentage of the patients who were treated with antibiotics which were received as vitamin/tonic preparations.

The data were analyzed by using SPSS (version 10.0) and all the dependent variables were calculated descriptively. Averages, percentages and frequencies were used wherever they were appropriate. One-way ANOVA for continued data and the Chi-Square test for categorical data were used in the analysis (at a significance level of 0.05).

RESULTS

The overall mean percentage of the prescriptions which contained antibiotics in all the hospitals was 51.0% [Table/Fig-1]. The maximum number of antibiotics which were prescribed per prescription was 3 antibiotics which were found in the THO, SAB and the KUW hospitals (Chi-Square test, $p < 0.01$). Overall, the antibiotics accounted for 23.8% of all drugs which were prescribed in the four hospitals [Table/Fig-2]. The overall mean of the average number of antibiotics per prescription in the four government hospitals which were studied was 1.2 ± 0.4 antibiotics. The median number of antibiotics per prescription was 1. The mean difference in the number of antibiotics per prescription was significantly different (one way ANOVA; post hoc test). It was revealed that this difference was found in the SAB hospital ($p < 0.05$) as compared to the other hospitals [Table/Fig-1].

The prescriptions containing the injectable antibiotics are shown in [Table/Fig-3]. [Table/Fig-4] shows that the highest percentage (22.3%) of the prescriptions which contained 2 injectable antibiotics per prescription was reported in the SAB hospital and that the highest percentage (24.9%) of the prescriptions which contained at least 1 injectable antibiotic was found in the SAB hospital. On the other hand, the lowest parentage (9.6%) of the prescriptions which contained 1 injectable antibiotic was found in the GOM hospital. The mean number of injectable antibiotics in the prescriptions was found to be significantly different by using one way ANOVA post hoc tests revealed that the difference was found in the SAB hospital ($p < 0.05$) [Table/Fig-4]).

Based on the antibiotics which were prescribed by using the YEDL indicator, the results revealed that the highest percentage of the antibiotics which were prescribed was 82.5%, as was found in the KUT hospital and the lowest was 64.3%, as was found in the SAB hospital [Table/Fig-1]. The mean number of antibiotics which were prescribed, based on the YEDL prescription was found to be significantly different by using one way ANOVA, post hoc tests revealed that the difference was found in the KUT hospital ($p < 0.05$).

Concerning the antibiotics which were prescribed with vitamin/tonic preparations, the results showed that the overall mean percentage of the antibiotics which were prescribed with vitamin/tonic preparations in all the hospitals which were studied was 30.2% with no detected association (Chi-Square, $p = 0.124$), as shown in [Table/Fig-1].

Indicators	Al-Thowrah	Al-Gomhory	Al-Sabaeen	Al-Kuwait	Total	Mean	P-value
No. of Prescriptions	300	300	300	300	1200	–	
No. of Rxs with antibiotics	117	156	193	145	611	–	
Average no. of antibiotics	1.21	1.12	1.36	1.18	–	1.22	<0.05
% Rx with antibiotics	39.3	52.0	64.3	48.3	–	51.0	
% Antibiotics from all drugs	18.4	21.1	34.0	21.6	–	23.8	
% Antibiotics in generic name	13.4	19.5	26.6	22.8	–	20.6	<0.05
% Antibiotics in YEDL	69.7	73.6	64.3	82.5	–	72.5	<0.05
% Injectable antibiotics	23.9	19.9	71.5	29.0	–	36.1	<0.05
% Vitamins/tonics in antibiotics Rxs	33.3	23.1	34.2	30.3	–	30.2	NS
Max. no. of antibiotics /Rxs	3	2	3	3	–	2.8	< 0.01

[Table/Fig-1]: Antibiotic prescribing indicators in four quaternary hospitals

*Rxs= Prescriptions
*YEDL=Yemen Essential Drug List
*NS= Not statistically significant

Hospital	Number of antibiotics in prescriptions containing antibiotics			Total	*P-value
	1 (%)	2 (%)	3 (%)		
Al-Thowrah	93 (79.5%)	23 (19.7%)	1 (0.9%)	117	<0.05
Al-Gomhory	138 (88.5%)	18 (11.5%)	0	156	<0.05
Al-Sabaeen	127 (65.8%)	62 (32.1%)	4 (2.1%)	193	<0.05
Al-Kuwait	120 (82.8%)	24 (16.6%)	1 (0.7%)	145	<0.05
Total (%)	478 (78.2%)	127 (20.8%)	6 (1.0%)	611 (100.0%)	

[Table/Fig-2]: Number of antibiotics in the prescriptions containing antibiotics based on hospitals

*One Way ANOVA.

Hospital	Availability of injectable antibiotics		Total
	Prescriptions not containing injectable antibiotics (%)	Prescriptions containing injectable antibiotics (%)	
Al-Thowrah	93 (79.5%)	24 (20.5%)	117
Al-Gomhory	135 (86.5%)	21 (13.5%)	156
Al-Sabaeen	101 (52.3%)	92 (47.7%)	193
Al-Kuwait	112 (77.2%)	33 (22.8%)	145
Total (%)	441 (72.2%)	170 (27.8%)	611 (100.0%)
*P-value		<0.05	

[Table/Fig-3]: Availability of injectable antibiotics in prescriptions based on hospitals

*One Way ANOVA

Hospital	Number of injectable antibiotics in prescriptions				Total	*P-value
	0 (%)	1 (%)	2 (%)	3 (%)		
Al-Thowrah	93 (79.5%)	20 (17.1%)	4 (3.4%)	0	117	<0.05
Al-Gomhory	135 (86.5%)	15 (9.6%)	6 (3.8%)	0	156	<0.05
Al-Sabaeen	101 (52.3%)	48 (24.9%)	43 (22.3%)	1 (0.5%)	193	<0.05
Al-Kuwait	112 (77.2%)	24 (16.6%)	9 (6.2%)	0	145	<0.05
Total (%)	441 (72.2%)	107 (17.5%)	62 (10.1%)	1 (0.2%)	611 (100.0%)	

[Table/Fig-4]: Number of injectable antibiotics in prescriptions based on hospitals

*One Way ANOVA

Furthermore, it was found that the overall mean percentage of the antibiotics which were prescribed in the prescriptions which contained antibiotics by their generic names in all the studied hospitals was 20.6%, of which 20.8% of the prescriptions contained at least 1 antibiotic which was prescribed by the generic name and 2.5% of the prescriptions contained 2 antibiotics which were prescribed by their generic names. The mean number of antibiotics which were prescribed by their generic names per prescription was found to be significantly different by using one-way ANOVA, post hoc tests revealed that the difference was found in the SAB hospital ($p < 0.05$) [Table/Fig-1].

With respect to the information of the prescription of the antibiotics (strength, dosage form, dose, frequency and the duration of use), it was indicated that the association between the percentage of the antibiotics which were prescribed with information (strength, dose and the frequency of use as written in the prescriptions) and the hospitals (THO, GOM, SAB, and KUW) were significant by using the Chi-Square test ($p < 0.01$) respectively [Table/Fig-5]. In contrast, the association between the percentage of the antibiotics which were prescribed with a written dosage form was statistically not significant (Chi-Square test, $p = 0.330$).

The antibiotics which were prescribed with the patient information (name, gender, age and diagnosis) written in the prescription in the THO, GOM, SAB and KUW hospitals are shown in [Table/Fig-5]. . By using the Chi-Square test, it was found that the percentage of the prescriptions containing the antibiotics in which the name, age of the patient and the diagnosis were written, the association was statistically significant ($p < 0.01$) respectively. While in those prescriptions which contained antibiotics in which the gender of the patient was written, the association was statistically not significant ($p = 0.621$).

DISCUSSION

THE PRESCRIBING PATTERN OF ANTIBIOTICS

Officially, in most of the countries, antibiotics are considered as a prescription only medicine (POM) but in practice, in most of the developing countries, they are widely available as over-the-counter (OTC) drugs in many pharmacies, grocery shops and even street corners, which may lead to their misuse. Antibiotics are safe when they are selected properly at the appropriate dosage for a recommended period of time and the prescribing of antibiotics is assumed to be more rational if these indicators have lower values.

In this study, there was an over-prescribing of antibiotics with the average percentage of antibiotics of 51.0% encounters with prescriptions and 23.8% from the total number of prescribed drugs in all the studied hospitals. A similarly high percentage was

Indicators		Al-Thowrah	Al-Gomhory	Al-Sabaeen	Al-Kuwait	Mean/%	P-value
Percentage of antibiotics information	Strength	64.1	64.0	62.7	62.6	63.3	< 0.01
	Dosage form	81.0	85.1	68.1	80.7	78.7	NS
	Dose	71.8	57.9	34.2	69.0	58.2	< 0.01
	Frequency	71.1	74.1	32.7	67.8	61.5	< 0.01
	Duration	43.0	28.2	14.8	31.6	29.4	< 0.01
Percentage of patient information	Name	87.2	87.2	73.1	86.9	83.6	< 0.01
	Sex	0.0	1.3	0.5	0.7	0.6	NS
	Age	0.9	4.5	10.4	0.7	4.1	< 0.01
	Diagnosis	37.6	32.1	18.7	33.1	30.4	< 0.01

[Table/Fig-5]: Percentage of prescribed antibiotics with antibiotic and patient information in four quaternary hospitals

*Rxs= Prescriptions
*NS= Not statistically significant

reported in Sudan (30 to 60%) [9]. A study which was performed in different general public health facilities in Yemen showed that the percentage of prescriptions which contained antibiotics was 61.0% [10]. There was an over-prescribing of antibiotics which was recorded in other district hospitals of Yemen with the average percentage of antibiotics of 48.3% encounters with prescriptions and 21.5% from the total number of prescribed drugs [11]. A higher percentage (65.0%) of antibiotic use was recorded in Ghana [12] and between 30.0% and 60.0% of the patients in the primary health care centres received antibiotics in the developed and the developing countries [13]. Similarly, a study which was carried out in Cambodia showed that the percentage of antibiotics which was used ranged from 10.0% to 66.0% [14]. However, the average percentage of the antibiotics which was used in Malaysia was lower (23.2%) [15] and even lower percentages of antibiotic use were reported in Mongolia (20.6%) [16]. In this study, the highest percentage use of antibiotics was recorded in the SAB hospital and this high percentage was presumably due to its specialization for children and maternity.

The present findings revealed that there was a deficiency in the profiling systems for patient information. This could lead to an incorrect diagnosis and inefficient treatment. Moreover, there was a deficiency in the information which was available about a particular drug that could influence the patient with regards to the dosage, the treatment and the duration of treatment.

Moreover, there was a high incidence of prescribing antibiotics with a brand name in which the total number of antibiotics which were prescribed by using a brand name was 76.8%.

Accuracy in the patient's case diagnosis is very important for prescribing drugs rationally. Surveys carried out on the management of sick children revealed that many were not properly assessed and treated and that their parents were poorly advised [17]. Public attitudes and expectations also contribute to irrational prescribing [18]. Appropriate clinical evaluation combined with good communication and shared decision-making will minimize the risk of an incorrect diagnosis, the patient's dissatisfaction or other adverse outcomes [19].

The overuse of antibiotic prescribing is common as in some prescriptions, 3 antibiotics were prescribed for a patient at one time. Inappropriate antibiotic use is a well-documented risk factor for the infection or colonization of resistant pathogens [20-22]. Antibiotic use in Yemen is high and the statistics of the Ministry of Public Health and Population showed that the antibiotics group was the third group which was imported through the years 2002 and 2003 with percentages of 13.7% and 13.0% respectively from the total number of imported drugs [23, 24]. Therefore, it is important to promote the sensible use of antibiotics to delay and limit the spread of the emergence of resistance.

ANTIBIOTIC PRESCRIBING FROM YEDL

According to the WHO indicators and the RPMPP manuals, the existence of an STG and a list of essential (antibiotics) drugs with accurate, unbiased and reasonably current information for the prescribers concerning the antibiotic drugs which were approved for use in the hospital, is a measure of the hospital's commitment to the quality standards of patient care and rational drug use. The formulary list or the NEDL ensures that authorized essential antibiotics will be procured on a priority basis [5, 6]. The findings of this study indicated that the average percentage of antibiotics which was prescribed from the YEDL per prescription, in all hospitals which were studied was 72.5%. From the results, it can be indicated that 27.5% of the antibiotics did not follow the YEDL.

The effectiveness of YEDL is even more questionable when one considers that the number of drugs which were registered for circulation in the country is more than 7000 [1]. Additionally, the market is flooded with smuggled drugs of dubious quality which have not been registered [1]. However, it is difficult to get all the prescribers to agree on the commonly accepted YEDL and YSTG. It is worth mentioning that a YEDL does not imply that no other drugs are useful but simply that in a given situation, these drugs are the most needed for the health care of a majority of the population [7]. It is the responsibility of the Ministry of Public Health and Population to save the cost of non-essential drugs for individuals and the country and also to protect the public from the hazards of irrational drug use. The use of essential drugs will lead to better health care, better drug management and lower costs [8].

THE PERCENTAGE OF INJECTABLE ANTIBIOTICS WHICH ARE USED

In the studied hospitals, there was a high incidence of prescriptions which contained antibiotics which were prescribed as injections. Injections like antibiotics, are important and very efficient when they are prescribed and used properly but on the other hand, they are potentially harmful and dangerous when they are used carelessly. They are commonly overused in the developing countries, in the costly forms of drug therapy. In this study, there was an over-prescribing of injections. Similarly, a high result of 30.0% was also reported in Sudan [25], as well as in outpatient clinics in public hospitals in Aden, Yemen [2]. In another study, in the district hospitals in Yemen, the percentage of prescriptions which contained injections was 33.1% [11]. But in Malaysia, the average percentage of injections which were used was as low as 1.66% [15]. In Mongolia, the percentage of patients who received injections was 53.6% [13]. In Indonesia, of every 10 patients who were treated in one of the study areas, seven received an injection. In the second region, the mean injection rate was even higher, almost nine out of ten visits ended with one or more injections being given [26]. In a study which was carried out in Cambodia, the percentage of injections which was used was 2.4% [14]. However, in Ghana, that percentage was extremely high and the percentage of injections which was prescribed was as high as 80.0% [12].

THE PERCENT OF ANTIBIOTICS WHICH WAS PRESCRIBED WITH VITAMIN/TONIC PREPARATIONS

There was a high incidence of the prescription of vitamins and tonic preparations in the hospitals which were studied and the overall mean percentage of the antibiotics which were prescribed with vitamin/tonic preparations in the prescriptions which contained antibiotics in all the hospitals which were studied was 30.3%.

The findings of this study are similar to the previous results which were found in some health facilities in the Sana 'a Capital Trust [27] and in outpatient clinics in public hospitals in Aden [2] and in the district hospitals in Yemen [11], where 15.0%, 18.0% and 16.7% of the prescriptions contained vitamin/tonic preparations respectively.

THE STRENGTH AND THE LIMITATIONS OF THIS STUDY

This research was considered as a pioneer study which concerned the evaluation of the antibiotic prescribing pattern in the quaternary government hospitals of Yemen. The outcomes of the present study

have the potential as baseline data for further research on a larger scale. Due to financial and time constraints, only four hospitals in the Sana`a trust were included. Further research comprising all governorates quaternary hospitals will be more crucial to generalize the findings. It has been recommended that further research in Yemen is needed on a much larger scale to identify the main antibiotic drug use problems and relevant interventions should be used to improve the quality of prescribing.

CONCLUSION

There was an over-prescribing of antibiotics and in many cases, 3 antibiotics were prescribed per prescription. This could presumably be an irrational prescribing of antibiotics. The branded antibiotics and the injectable antibiotics which were prescribed were very high. Moreover, the diagnosis which was written in the prescriptions was very low and there was a lack of patient information in the prescription. It can be concluded that the quality of prescriptions in the study location was low.

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