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Evaluation of Drug Prescription Pattern using Who Prescribing Indicators in Libya: A Cross-Sectional Study

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Abstract

The improper use of drugs due to irrational prescriptions is a common problem in Libya. This study aimed to investigate the prescribing practices and extent of rational therapy in primary health care facilities in three districts (east, west, and south) in Libya. In this retrospective study, 484 prescriptions were examined. World Health Organization-recommended indicators for rational use were examined (WHO): e.g., the percentage of prescriptions covering antibiotics, prescription of injections, and prescription of drugs by a generic name and from a national essential drug list, as well as the average number of drugs per prescription, were all considered. The average number of drugs per prescription was 4.72, with a maximum of 7 drugs in a prescription, and the percentage of prescriptions involving antibiotics and injections was 30.4% and 10.5%, respectively. There were 28.6% drugs prescribed by their generic name and 82.8% were retrieved from the essential drugs list. The most common category of medicines were 18.9% antibiotics, 18.3% antihypertensives, and 15.7% multivitamins and minerals. While the lowest consumed drugs were steroids 2.5%. There was some irrational drug prescribing, particularly with regard to injections and antibiotics. It is suggested that physicians should be participated in continuing education programs on rational prescribing for various medical indications.

Keywords. Antibiotic, Rationality, Prescription, Pattern.

Introduction

Nowadays, drug utilization studies (DUS) are used as potential tool in the evaluation of healthcare system [(1)]. Drug usage studies are effective tools for determining the role of drugs in society. They provide a solid socio-medical and health-economic foundation for making healthcare decisions [(2)]. The World Health Organization (WHO) describes drug utilization research as "the advertising, spreading, prescription and use of drugs in a society, with a particular focus on the medical, social, and economic consequences" [(3)].

The Evaluation of drug prescription prototype is a significant feature of patient care. It encourages the rational along with estimating the quality and efficacy of the drug and care that provides the rational use of drugs, which is essential for an efficient and disciplined health-care system. On the other hand, irrational drug use considered as a universal risk which exists in all parts of the world includes insufficient dose, poly-pharmacy, improper use of antimicrobial agents, cough and cold preparations. In addition, injections which are considered as powerful and widely overused when oral dosage forms are more applicable [(4)].

Medical prescription is a significant document of medico legal value too, that can be kept as proof in medico legal cases in court of law and thus should be cautiously and critically considered [(5)]. More than 50% of all medicines are prescribed, dispensed, or sold improperly and 50% of patients fail to take them properly [(5)]. According to a WHO report, more than half of all drugs are improperly prescribed in developing countries, where drug monitoring and assessment are in their infancy [(6)].

In addition, poor legibility was found in more than half of the prescriptions (55.3%) examined in a study on patterns of drug prescribing in a Hospital in Dubai [(7)]. This is lower than, but close to, the situation in Saudi Arabia (64.3 %) [(8)] and higher than that reported in the USA seven years ago (15%) [(9)].

In Libya, prescription of medications can easily be obtained without prescription from community pharmacies, resulting in potential drug misuse and health hazard [(10)]. It was stated previously that there were overprescribing of certain categories of drugs writing by Libyan physicians which necessitating further improvement [(11)]. Hence, the current study was aimed to assess the drug use pattern in selected general hospitals: a cross-sectional study in Libya.

Method

Study design and population

A cross-sectional study was conducted in different selected health care centers located in three districts in Libya (West, East, and South), involving prescriptions recorded from January to December 2021.Of which, randomly selected prescriptions were retrospectively assessed using WHO prescribing indicators during the study period (1 Jan to 31 Dec 2021). All patients who visited outpatient departments of selected health care centers in the three selected districts during the study period were used as a target population.

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Sampling technique and procedure

About 414 randomly selected prescriptions recorded during the study period from each health center were included. Three well-trained pharmacists were recruited and deployed to assess the prescriptions identified.

Data from the prescriptions was recorded on a data collection form. The form was thoroughly tested before being modified. Patient demographics and the prescribed item information such as dosage forms and the number of medicines per prescription, total number of drugs in the prescription, the average number of drugs prescribed per prescription, prescribed by generic name, and prescribed from the national essential drug list, as well as the category of drug prescribed, and the percentage of antimicrobials prescription were recorded in the data collection form

The following drug use indicators were used in the study to determine the prescribing pattern, according to WHO [12]; the average number of drugs prescribed per prescription (evaluate the degree of polypharmacy), the proportion of drugs prescribed under a generic name (measures the cost-effectiveness of a health system to use drugs), percentage of antibiotic-prescribed per prescription (measures the level of use of commonly overused antibiotics), the percentage of injectable preparations prescribed per prescription (which measures the level of use of a commonly overused and costly form of drug therapy) and the proportion of drugs prescribed that are on the national essential medicines list.

Index of rational drug prescribing (IRDP)

Five indexes derived from WHO drug prescribing indicators make up the index of rational drug prescribing (IRDP). The optimal level for each indicator is shown in Table 1. For each indicator, the optimal index is 1. Drug prescribing is considered more rational when the calculated index value is close to 1. Prescriptions containing three or more medications were deemed rational in the current study. The proportion of drugs given by generic name and from the national essential drug list were used to estimate the generic name index and essential medicine index, respectively. The rational antibiotic prescribing index was calculated by dividing the optimal level (30%) by the percentage of prescriptions that included an antibiotic. The prescribing injection index was measured by dividing the optimal level (10%) by the percentage of prescriptions that included the injection. By adding the indices, the IRDP with a maximum value of 5 was calculated.

Table 1. Optimal levels of drug prescribing indicators

Prescribing indicators	Optimal level (%)	Optimal index
Percentage of drugs per prescriptions	≤3	1
Percentage of drugs prescribed by generics	100	1
Percentage of prescriptions including antibiotics	≤30	1
Percentage of prescriptions including injections	≤10	1
Percentage of drugs prescribed from national essential drug list	100	1

Data analysis

The data collected were entered and analyzed using SPSS version 20, and findings were reported as frequencies and percentages.

Results

Characteristics of prescriptions

Based on our findings in Table 2, a total of 484 prescriptions compromising 1957 drugs with an average number of drugs per prescription was 4.72. The maximum of drugs in a prescription was 7, and was from the southern districts of Libya. Unfortunately, due to the uncompletedness of most of the basic information, patient age, nationality, and gender in some prescriptions, we were unable to further analyze the demographics of the patients.

About 43.6% of drugs were Tablet dosage form (54.1%, 48.3%, 35.8%; east, west, and south districts, respectively), and the percentage of prescriptions involving injections was 5.3%, 6.4%, 15.6% from the east, west, and south districts, respectively (10.5%; total). Most of drugs 82.8% were from the essential drugs list and 28.6% were generic.

Table 2. Analysis of prescriptions using WHO core prescribing indicators.

Items	East (n=140)	West (n=195)	South (n=149)	Total (n=414)
% of total number of prescriptions	140(29%)	195(40.3%)	149(30.7%)	484(100%)
Total number of drugs prescribed	410	621	926	1957
Average number of drugs per prescription	3.91	4.78	5.47	4.72
% of prescribed injectable preparation	22(5.3%)	40(6.4%)	145(15.6%)	207(10.5%)
% of drug prescribed by generic name	86(20.9%)	134(21.6%)	341(36.8%)	561(28.6%)
% of prescription with tablet dosage form	222(54.1%)	300(48.3%)	332(35.8%)	854(43.6%)
% of drug prescribed from national essential drug list	360(87.8%)	447(71.9%)	814(87.9%)	1621(82.8%)

The results of irrational medicine use are shown in Table 3. The overall IRDP used as an indicator of rational drug use was 3.91. The overall indicator was made up of the index of drugs per prescription (0.63), generic name (0.28), antibiotic (١,٠٠), injection (١,٠٠), and drugs prescribed from the national essential drug list (1.00) (Table 3).

The index of rational drug prescribing was also calculated for each districts individually. The highest IRDP was 3.96, while the lowest was 3.90. All districts had an index of 1 for injection prescription, prescription of antibiotics, and prescription of drugs from the national essential drug list. The indices of drugs per prescriptions and prescription of drugs by generic names varied among the three districts. The highest index for drugs per prescription was 0.76, while the lowest was 0.54. The highest index for prescription of drugs by generic name was 0.36, while the lowest was 0.20.

Table 3. Index of rational drug prescribing (IRDP)

Prescribing indicators	Optimal level (%)	Optimal index	Calculated level (%)	IRDP
Percentage of prescription of	≤3	1	4.72	0.63
Percentage of drugs prescribed by generics	100	1	28.6%	0.28
Percentage of prescriptions including antibiotics	≤30	1	30.4%	1
Percentage of prescriptions including injections	≤10	1	10.5%	1
Percentage of drugs prescribed from national essential drug list	100	1	82.8%	1

Antibiotic prescription rate and pattern

Out of 414 prescriptions were reviewed from the three selected districts for this study, 126 of them had at least one antibiotic prescription (Table 4), giving an overall percentage prescription with antibiotics of 30.4%. Antibiotic prescription rate with regards to the districts was as follows: the south (36.2%), > the west (23.6%) > the east (18.6%).

Because some prescriptions had more than one antibiotic prescribed, a total of 309 antibiotics were prescribed during the study period, with average of 1.81 number of antibiotics per prescription. The percentage of antibiotics prescribed by generic name in all districts was 22%, while prescriptions with brand names comprised 78% of all prescriptions. The overall percentage of drugs prescribed from EDL was 99.3, and it was 100% in both east and south districts.

Table 4. Antibiotic use indicators of visited Health Care Facilities

Antibiotic use indicator	East (n=140)	West (n=195)	South (n=149)	Total (n=414)
Antibiotic prescription rate	26(18.6%)	46(23.6%)	54(36.2%)	126(30.4%)
Total number of antibiotics prescribed	34	89	186	309
Av. no of antibiotics per prescription	2.58	3.54	4.31	3.47
% of antibiotics prescribed by generic name	23(67.6%)	70(78.6%)	148(79.5%)	241(78%)
% of antibiotics prescribed from EDL	34(100%)	87(97.7%)	186(100%)	307(99.3%)

Antibiotics prescribed and indications for prescription

The 309 antibiotics prescribed during the study period belonged to 12 different classes (Table 4). The majority (219, 71%) of these were broad spectrum (Figure 1) and mostly the penicillins. The most prescribed antibiotics were Ceftriaxone (79, 25.5%), followed by metronidazole (70, 22.6%), azithromycin (31, 10.03%), and co-amoxiclav (28, 9.06%) (Table 5). We were unable to report the diagnosis subject to antibiotic prescription, as most of prescriptions were recorded as 'No diagnosis'.

Table 5. Antibiotic category and prescription

Classes	Antibiotic	Spectrum	n(%) of times Prescribed			
			East	West	South	Total
Penicillins	Amoxicillin	Broad	1(0.3%)	4(1.3%)	0	5(1.61%)
	Procaine Penicillin	Narrow	0	4(1.3%)	0	4(1.28%)
	Co-amoxiclav	Broad	5(1.6%)	16(5.2%)	7(2.3%)	28(9.1%)
Cephalosporine	Cefalexin	Narrow	5(1.6%)	2(0.6%)	0	7(2.26%)
	Ceftriaxone	Broad	1(0.3%)	7(2.3)	71(22.9%)	79(25.5%)
	Ceftazidime	Broad	0	0	2(0.6%)	2(0.6%)
	Cefixime	Broad	5(1.6%)	8(2.6%)	0	13(4.2%)
	Cefotaxime	Broad	0	0	6(1.9%)	6(1.9%)
	Cefdinir	Broad	0	1(0.3%)	0	1(0.3%)
Macrolides	Erythromycin	Narrow	0	2(0.6%)	0	2(0.6%)
	Azithromycin	Broad	3(0.9%)	13(4.2%)	15(4.8%)	31(10%)
	Clarithromycin	Broad	0	1(0.3%)	2(0.6%)	3(0.9%)
	Spiramycin	Broad	0	1(0.3%)	0	1(0.3%)
Tetracyclines	Tetracycline	Broad	1(0.3%)	0	0	1(0.3%)
	Doxycycline	Broad	0	6(1.9%)	0	6(1.9%)
Quinolone	Ciprofloxacin	Broad	6(1.9%)	6(1.9%)	15(4.8%)	27(8.7%)
	Moxifloxacin	Broad	0	1(0.3%)	0	1(0.3%)
	Levofloxacin	Broad	1(0.3%)	0	0	1(0.3%)
	Polymyxins	Narrow	0	1(0.3%)	0	1(0.3%)
Nitroimidazole	Metronidazole	Narrow	5(1.6%)	9(2.9%)	56(18.1%)	70(22.6%)
	Tinidazole	Broad	0	1(0.3%)	0	1(0.3%)
Aminoglycoside	Gentamicin	Broad	0	1(0.3%)	0	1(0.3%)
Sulfonamides	Co-trimoxazole	Broad	1(0.3%)	0	0	1(0.3%)
Lincomycin	Clindamycin	Broad	0	1(0.3%)	0	1(0.3%)
Glycopeptide	Vancomycin	Narrow	0	1(0.3%)	3(0.9%)	4(1.3%)
Fusidane	Fusidic acid	Narrow	0	2(0.6%)	0	2(0.6%)
Carbapenem	Meropenem	Broad	0	1(0.3%)	9(2.9%)	10(3.2%)
Total			34(11%)	89(28.8%)	186(60.2%)	309(100%)

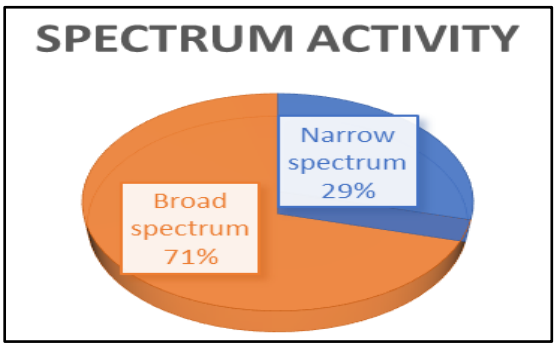

Figure 1. Percentage of antibiotics based on the spectrum activities

Categories of drug prescribed

In Table 6, the most common category of medicines were 18.9% antibiotics, 18.3% antihypertensives, and 15.7% multivitamins and minerals. While the lowest consumed drugs were steroids 2.5%. Among the three districts, the southern districts show the highest percentage of antimicrobial usage 10.2%, while they demand at lower rate with dermatology drugs. Multivitamins and Minerals was accounted for 7.2% of total prescribed drugs in the western districts as their most frequently prescribed medicine, and the rate was much lower with steroids 3.2%. Meanwhile, analgesics was observed in top prescribed medicines of several medical specialties in the eastern areas (3.9%), but the rate was much lower 0.5% with endocrine drugs.

Table 6. Drug category in the prescriptions

Drug group	East (n=140)	West (n=195)	South (n=149)	Total (n=414)
Antimicrobial	68(3.5%)	103(5.3%)	199(10.2%)	370(18.9%)
Antihypertensive	16(0.8%)	62(3.2%)	280(14.3%)	358(18.3%)
Multivitamins and Minerals	44(2.2%)	140(7.2%)	123(6.3%)	307(15.7%)
Analgesic	76(3.9%)	109(5.6%)	42(2.1%)	227(11.6%)
Gastrointestinal Tract (GIT)	36(1.8%)	65(3.3%)	162(8.3%)	263(13.4%)
Respiratory and Antiallergic	68(3.5%)	90(4.6%)	59(3%)	217(11.1%)
Dermatology	44(2.2%)	66(3.4%)	6(0.3%)	116(5.9%)
Endocrine	10(0.5%)	20(1 %)	20(1%)	50(2.6%)
Steroids	18(0.9%)	12(0.6%)	19(0.9%)	49(2.5%)
Total	380(19.4%)	667(34.1%)	910(46.5%)	1957(100%)

Discussion

In a typical drug use investigation study, the WHO recommends that at least 30 prescriptions be reviewed per prescriber [12]. However, this study reviewed 484 prescriptions from the three selected districts of Libya (an average of 161.3 prescriptions per district) within the periods of Jan to Dec 2021. This was done to get a complete and accurate picture of drug prescribing behaviors among Libyan primary health care workers, as well as to rule out the possibility of some prescribing patterns being overlooked. Using the WHO prescribing indicators, the current study explored the drug-prescribing pattern of physicians and identified areas that require intervention.

In the present study, the average number of drugs per prescription was 4.79. The value was higher than the WHO recommended optimum level of 1.6-1.8. Studies in Libya have reported this index to be 2.85 to 3.00 (11,13). The reported value was similar to study conducted in Ghana [14], but higher than that in Ethiopia (1.83) [15]. Similarly, the reported value in our result is higher than the value index that reported in studies conducted in the Eastern Mediterranean Region 2.7 [16], India 2.58 [17], Sudan 2.55 [18], Egypt 2.5 [19], and Saudi Arabia 2.4 [20]. The possible negative consequences of prescribing a large number of drugs per prescription are increased the occurrences of side effects, drug-drug interactions, patients' noncompliance with the drug regimen, and raised pharmacotherapeutic expenses as a result of the large number of drugs to be taken. The average quantity of drugs prescribed per prescription is influenced by the prevalence of diseases, the lack of clinical practice guidelines, financial incentives for prescribers, physician incompetence, culture, and other factors [20]. As a result, different values have been reported in various parts of Libya. Unnecessarily prescribed drugs could have a financial impact on the health-care system. Conversely, rational prescription can prevent medicine waste and minimize adverse effects on patients while lowering costs [20].

The inappropriate use of injections plays a significant role in the transmission of very serious blood-borne infections, resulting in disability and death [11]. According to the current study, 10.5% of prescriptions containing injections, mostly consumed in the southern district 15.6%. However, the finding was lower than the WHO recommendation (13.4-24.1), and lower than the previously reported rate in Libya 16% (21,13). Similar to our results, studies conducted in Nigeria and Kenya had shown values of 4% and 13.2%, respectively [22,23]. Moreover, a study done in the Egypt showed that 18.1% prescriptions were injectable [24], 0.66% was revealed in Saudi (25), and 27.1% in Pakistan (26). People believe that injectable drugs are more effective than oral drugs, which could be the cause of patients' demand in the use of injections, especially in rural areas, which is considered as irrational drug use [27]. This could explain the motivation for injectable drugs in our study. People, particularly in rural areas such as Libya's south, believe that injections provide faster and more complete pain relief than oral medications [26]. The primary motivation for doctors to prescribe an injectable drug is the patient's demand for faster treatment, and this irrationality could be reduced by interventions such as physician education on safe injection [28].

The use of generic name in prescription of drugs is considered very crucial for better communication among healthcare personnel [29]. Low generic prescribing is seen in this study; from 1957 drugs, only 561 (28.6%) drugs were prescribed by their generic name. This result was quite similar to studies conducted in Egypt 16.1% [30], and in Bahrain 10.2% [31]. However, it was very low comparing to other studies in the literature i-e; the values were 46.3% in Sudan (18), 61.2% in Saudi Arabia [20], 71% Sierra Leone [29], 64.1% in China (32), and Pakistan 71.6% [26]. Prescription of generic drugs is highly recommended by the WHO for safety reasons because it allows for easier information exchange and better communication between health care providers [20]. In Libya, however, prescribing decisions are based on physicians' personal beliefs and pharmaceuticals promotion, which can have an impact on this indicator [33]. Low generic prescribing

may further confuse patients who are already dealing with the burden of polypharmacy. This could result in duplication errors, where patients unknowingly take both the generic and brand versions of the same drug at the same time [33].

Prescriptions from the National Essential Drug List are a key indicator of drug use. In the current study, 82.8% of the drugs prescribed were from the list, which is quite close to the ideal value (100%). This was similar to the values reported by other studies; 81.2% in Sudan [18], 92% in Ethiopia [34], and 67.7% in China [31]. The reason for this high value is that, the majority of drugs are imported by companies registered and monitored by the Libyan Ministry of Health, and physicians are required to prescribe medicines from the officially available drugs.

According to the current findings, the overall IRDP used as an indicator of rational drug use was 3.91, compared to an optimal level of 5. This means that 78% of the rational drug-prescribing criteria were met. Our finding was in line with studies reported nearly similar values 3.56 [25] and 3.42 [35]. Dissimilarly, other study revealed lower values 2.71 [29]. Moreover, the IRDP value in our study for antibiotics was 1, which was higher than values reported from previous studies 0.45 [25], 0.62 [29], and 0.68 [32].

The prevalence of antimicrobial resistance in any population is related to the proportion of the population that receives antimicrobial and total antimicrobial exposure. Increased antimicrobial use leads to more resistance [29]. The average of antibiotic prescription in our study was 30.4% of the total prescriptions which is almost reaches to the upper permissible limit suggested by the WHO (20-26.8%; the cut-off of 30%). This rate of prescription was similar to the percentage of antibiotics prescriptions in Nigeria 34.4% [23]. However, it was lower than the previously reported antibiotic prescription rate in Libya in 2019 (80%) [11]. Some other studies conducted in Sudan, Pakistan, and Bahrain have also reported higher prescription of antibiotics 54.71%, 51.5%, and 45.8%, respectively, in comparison with the current study [18,26,31]. Irrational antibiotic use can result in adverse reactions, antibiotic-resistant hospitalizations, and high costs [3, 8, 26]. Conversely, studies conducted in Jordan and the United Arab Emirates found positive results, with 17.7% and 9.8%, respectively, falling below the cut-off point according to WHO criteria [36,37].

The current study had some limitations. It was only conducted in three districts of Libya, so it may not be applicable to other cities. Nonetheless, the prescription model is used in all three districts of Libya, and the pattern of drug prescription is likely to be consistent throughout the country. The study does not investigate the causes of irrational drug prescribing, but this can be investigated in future studies.

Conclusion

Overall, the average number of drugs per prescription and generic prescribing examined in this study were significantly higher than the recommended values and thus it is considered inappropriate. Antibiotics were also overprescribed in the study. To ensure that drugs are used rationally in Libya, we recommend re-training and ongoing education for prescribers. We encourage clinical pharmacists to take responsibility and actively participate in drug prescribing and dispensing practice, particularly in the outpatient setting. Furthermore, we advocate for effective and continuous drug monitoring.

Conflicts of Interest

The authors declare that they have no conflict of interest.

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