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Assessment of drug use pattern using WHO core drug use indicators in selected general hospitals: a cross-sectional study in Tigray region, Ethiopia

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ABSTRACT

Objective Inappropriate use of medicine is a global challenge with greater impact on developing countries. Assessment of drug use pattern is used to identify gaps in medicine utilisation to implement strategies for promoting rational drug use. This study aimed to assess drug use pattern using the WHO drug use indicators in selected general hospitals in Tigray region, Ethiopia.

Design A cross-sectional study was conducted using WHO drug use indicators in two public hospitals located in Tigray.

Setting Prescriptions recorded from 1 January 2017 to 1 June 2019 were randomly selected, and participants who visited the public hospitals from 1 March 2019 to 30 August 2019 and hospital pharmacies were interviewed.

Participants 100 patients who visited both outpatient clinics and hospital pharmacy departments of the public hospitals.

Results The average number of medicines per prescription was 1.69 (±0.81). Prescriptions containing antibiotics and injectables were 58.2% and 15.9%, respectively. The percentages of medicines prescribed with a generic name from essential medicines list of Ethiopia were 97.5% (974) and 88.1% (970) in Mekelle Hospital and Quiha Hospital, respectively. The patients spent an average of 6.6(±3.5) min with their general practitioners, while only 22.8 (±21.7) s with their pharmacists. Of the patients interviewed, 56.9% knew their dosing regimen and 32.7% of them had their medication labelled.

Conclusion The finding of the present study revealed deviation of drug use pattern from the WHO optimal levels suggesting the hospitals had limitations in appropriate utilisation of medicines. Understanding the factors attributed to the observed gaps and implementing corrective measures are required to conform with the recommended standards of appropriate drug utilisation.

Strengths and limitations of this study

- The study used all three of the WHO core drug use indicators to assess quality of patient care in a hospital setting.
- Evidence about rational drug use has been provided in an area rarely assessed.
- The study did not try to identify the factors that contributed to the observed gaps making it difficult to propose improvement strategies.
- As diagnosis was missing in considerable number of prescriptions, we did not confirm that the drugs were prescribed for right diagnoses.

INTRODUCTION

The rational use of drugs depends on rational prescribing, correct dispensing and adherence to treatment by patients.[1] According to the WHO, a medicine is used rationally if patients received appropriate medicines, in doses that meet their individual requirements, for an adequate period of time and with an affordable cost.[2] The concept of rational drug use can be summarised as the right medicine at the right dose by the right route at the right time for the right patient ('five rights').[3] Conversely, irrational use of medicines is termed to have occurred when one or more of the above-mentioned conditions are not met.[2] Irrational use of medicine is a global challenge with the highest prevalence in developing countries. Multiple stakeholders including patients, prescribers, workplace and supply system may be attributed for irrational drug use[4] due to many reasons such as limited knowledge about medicines, unethical medicine promotions and improper prescribing habits of clinicians.[5 6]

WHO drug use indicators are used to evaluate rational drug use at all levels in the chain of medicine utilisation (facility, clinician, pharmacist and patient) using highly standardised indicators developed by WHO Action Program on Essential Drugs and International Network for Rational Use of Drugs to be used for drug use evaluations without further national validation.[7 8] Prescribing indicators include average number of medicines prescribed per encounter, percentage of those prescribed by generic name and

those from national essential medicines list, percentage of encounters with antibiotics and those with injections prescribed. Patient care indicators are used to evaluate the interaction between the patients with their clinicians and pharmacists, and include average consultation and dispensing times, percentage of medicines dispensed and those adequately labelled, as well as patients' knowledge of correct dosage. The availability of the copy of essential medicines list and key medicines is assessed using facility indicators.[9]

Ethiopia has introduced a national drug policy in 1993 with the aim of meeting the demand for essential medicines together with appropriate use, making them affordable to the public as well as ensuring their safety, efficacy and quality. The policy also encourages domestic manufacturing, enhancing manpower training and research and development of medicines as well as devising ways to integrate traditional medicines into conventional medicine as objectives.[10] Despite these policy directions, studies conducted so far reported gaps in rational medicine use.[11 12] Considering the very large population size of Ethiopia and the diversity of geographical areas, there are very few studies on medicine use conducted so far. Therefore, this study was conducted to evaluate drug use and contribute to addressing the information gap in drug use pattern in Ethiopia, specifically Tigray region.

METHODS AND MATERIALS

Study setting and period

The study was conducted in Mekelle and Quiha General Hospitals between 1 March 2019 and 30 August 2019. Both hospitals are located in Mekelle, the capital city of Tigray regional state, Ethiopia.

Study design and population

All prescriptions recorded from 1 January 2017 to 1 June 2019 were considered. Of which, randomly selected prescriptions were retrospectively assessed using WHO prescribing indicators during the study period (1 March 2019 and 30 August 2019). All patients who visited outpatient departments of Mekelle and Quiha Hospitals during the study period were used as a target population. Of note, patients aged less than 18 years or not willing to participate in the study were excluded.

Sampling technique and procedure

The WHO recommends assessments of at least 600 prescriptions and 100 patients per each hospital for drug use evaluation. Accordingly, 600 randomly selected prescriptions recorded from 1 January 2017 to 1 June 2019 from each hospital were included. Twenty key drugs were also selected from each hospital as per WHO recommendation which is a minimum of 15 essential drugs for each health facility.[9]

Data collection instruments and process

Three well-trained pharmacists were recruited and deployed to assess the prescriptions identified using prescription registration books, interview patients, and evaluate availability of copy of essential medicines list and key medicines in the hospitals. Data on quality of prescribing were collected by using WHO's prescribing indicators. In assessing patient care indicators, the average number of medicines prescribed per encounter, the percentage of medicines prescribed with generic names and those prescribed from essential medicines list, the percentage of prescription encounters which ended up with antibiotics and those with injections prescribed were collected. However, immunisations of children were not considered as injections. In measuring the proportion of medicines prescribed with generic names, the essential medicines list of Ethiopia was used as a source for generic names.[13]

For assessment of patient care indicators, consultation time and dispensing time were obtained by recording the time that the patients spent with their physicians and pharmacists, respectively. The knowledge of the patients on their dosage regimen was assessed by asking the patients to explain whether they knew about the medicine dispensed to them. Availability of formulary, essential drugs, standard treatment guidelines, and key drugs at the time of the visit were assessed to confirm whether the hospitals comply with WHO standards.

Operational definitions

Drug use evaluation is a systematic approach that assesses the appropriateness, safety and effectiveness of a medication to improve patient care.

Percentage of drugs prescribed by generic name

It measures the tendency to prescribe by generic name.

Percentage of drugs prescribed from a list of essential drugs

It measures the degree to which practices conform to a national drug policy.

Average number of drugs per encounter

Average number of drugs per encounter measures the degree of polypharmacy.

Average consultation time

The average time that physicians spend with patients. It does not include waiting time.

Average dispensing time

The average time that pharmacists spend with patients while dispensing the medications.

Data analysis procedure

The data collected were entered and analysed using SPSS V.20. The data on prescribing indicators as well as patient care indicators were described using frequency, percentage, mean and SD.

Table 1 Number of drugs per prescribing encounter in the selected general hospitals

Number of drugs	Quiha Hospital n (%)	Mekelle Hospital n (%)	Overall result N (%)	WHO standard[22]
One	306 (51)	286 (47.7)	592 (49.7)	
Two	206 (34.3)	214 (35.7)	420 (35)	
Three	72 (12)	82 (13.7)	154 (12.9)	
Four	15 (2.5)	17 (2.8)	32 (23.5)	
Five	1 (0.2)	1 (0.2)	2 (0.2)	
Average	1.67 (±0.8)	1.72 (±0.82)	1.69 (±0.81)	≤2 (1.6–1.8)

Patient and public involvement

Patients and/or the public were not directly involved in this study.

RESULTS

Prescribing indicators

A total of 1200 prescriptions, 600 from each hospital, were evaluated using WHO prescribing indicators. On average, 1.69 (±0.81) drugs were prescribed and 44.7% of the prescriptions contain one or two drugs (table 1).

A total of 2028 drugs were prescribed, of which 1944 (92.8%) were prescribed in generic name. More than 50% (58.2%) of the prescriptions contained antibiotics and 191 (15.9%) include at least one injectable medication (table 2). Amoxicillin was the most frequently prescribed antibiotic in both hospitals (table 3).

Patient care indicators

On average, each patient spent approximately 7 min with his/her general practitioner and 22 s with his/her pharmacist. A total of 81.2% of the prescribed drugs were dispensed. Of which, 32.7% of them were adequately labelled. A total of 56.9% of patients knew about the dosage regimen of their medications (table 4).

Health facility indicators

Both Quiha and Mekelle Hospitals had their own formulary, essential drugs list and standard treatment guidelines. From the list of key drugs of the hospitals, on average, 77.5% of them were available in stock (table 5).

DISCUSSION

In this study, the average number of drugs per prescription was within the WHO acceptable standard. The finding was comparable with studies done in different parts of Ethiopia including Jimma (1.59),[14] Hawassa University Teaching Referral (1.9)[11] and Bahir Dar Hospital (1.8).[12] However, studies in Debre Tabor (2.2),[12] Felege Hiwot Referral Hospital (2.49)[15] and Karamara Public General Hospital in Ethiopia (2.46)[16] reported higher average number of drugs per prescription. Such discrepancy may be attributable to differences in the level of awareness among clinicians working in different parts of the country and lack of harmonised national prescribing guidelines.

In terms of percentage of medicines prescribed by generic name, our finding is lower than the WHO's recommended standard value. Similar results were reported in Hawassa University Hospital (98.7%),[11] Felege Hiwot Specialized University Hospital (97.4%)[15] and selected health centres in eastern Ethiopia (97%).[17] This may be attributable to increasing promotion of brand drugs names influencing clinicians to prescribe drugs in their brand names. Of note, Workneh *et al*[18] have shown the prescribing decisions of clinicians working in Mekelle were influenced by promotion of medical representatives. This suggests that there is a gap in ensuring patients to get cost-effective medicines on the side of prescribers and the health institution, which in turn reduces health-seeking behaviour of the community.[19]

The percentage of encounters with antibiotics, which is 58.2% in the present study, is comparable with a

Table 2 Percentages of encounters with generic drugs, antibiotics and injections in the selected general hospitals

Prescribing indicators		Quiha Hospital	Mekelle Hospital	Overall result (N)	WHO standard[22]
Generic prescription	Drugs prescribed, n	999	1029	2028	
	Drugs prescribed in generic name, n (%)	974 (97.5)	970 (94.3)	1944 (95.6)	
Antibiotics	Prescriptions with antibiotics, n (%)	392 (65.3)	306 (51)	698 (58.2)	<30% (20–26.8)
Injections	Prescriptions with injections, n (%)	56 (9.3)	135 (22.5)	191 (15.9)	13.4%–21.1%
Drugs from essential drugs list, n (%)		974 (97.5)	930 (90.4)	1904 (93.9)	100%

Table 3 Antimicrobial/antibiotics prescribed in the selected general hospitals

Class of antimicrobial agent		Frequency, n		
		Quiha Hospital	Mekelle Hospital	Overall
Antibacterial agents	Amoxicillin	160	76	236
	Ciprofloxacin	56	44	100
	Ceftriaxone	33	57	90
	Metronidazole	42	40	82
	Cephalexin	20	35	55
	Amoxicillin/clavulanic acid	15	28	43
	Azithromycin	19	16	35
	Cloxacillin	21	11	32
	Norfloxacin	17	11	28
	Sulfamethoxazole/trimethoprim	13	11	24
	Doxycycline	13	7	20
	Ampicillin	1	9	10
	Clarithromycin	8	1	9
	Erythromycin	2	2	4
	Gentamycin	1	2	3
	Ceftazidime	–	2	2
	Crystalline penicillin	–	1	1
Antiprotozoal/anthelmintics	Tinidazole	14	17	31
	Albendazole	16	7	23
	Mebendazole	11	5	17
	Coarthem	2	–	2
	Praziquantel	1	–	1
Antifungal	Ketoconazole	4	–	4
	Clotrimazole vaginal supp	3	–	3
	Fluconazole	1	–	1
Antiviral	Acyclovir	2	–	2

Amoxicillin or amoxicillin/clavulanic acid, and ceftriaxone were commonly prescribed antibiotics.

study conducted in public hospitals in eastern Ethiopia (57.9%)[16] and Hawassa Teaching Referral Hospital (58.1%).[11] As high as 85.5% were also reported in selected health centres in eastern Ethiopia.[17] However, our finding is higher than the WHO recommended standard (20%–26.8%). This finding should be interpreted cautiously as high prevalence of infectious diseases in developing countries may partly contribute to such high antibiotic prescribing. However, overprescribing of antibiotics is a problem that needs to be carefully

Table 4 Assessment of patient care using WHO patient care indicators in selected general hospitals

Patient care indicators	Quiha Hospital	Mekelle Hospital	Overall	WHO standard
Average consultation time (min)	3.66±2.2	9.5±4.8	6.6±3.5	10
Average dispensing time (s)	21.5±19.9	24.0±23.5	22.8±21.7	>180
Total number of drugs prescribed	189	171	360	
Total number of drugs dispensed	170	124	294	
Percentage of drugs actually dispensed	89.9	72.5	81.2	100%
Number of drugs adequately labelled	29	50	79	
Percentage of drugs adequately labelled	15.4	50	32.7	
Knows dosage	25 (25%)	48 (88.8%)	56.9	

Table 5 Availability of key drugs in selected general hospitals

List of key drugs	Quiha Hospital	Mekelle Hospital
Amoxicillin/clavulanic acid	✓	X
Ciprofloxacin tablet	✓	X
Cloxacillin capsule	✓	X
Azithromycin	✓	X
Diclofenac injection	✓	✓
Diclofenac tablet	✓	✓
Tramadol	X	✓
Metronidazole	✓	✓
Insulin	✓	✓
Nifedipine	X	✓
Lasix	X	✓
Spironolactone	X	✓
Ceftriaxone	✓	X
Vancomycin	✓	✓
Metformin	✓	✓
Enalapril	✓	✓
Cephalexin	✓	✓
Ferrous sulfate	✓	✓
Paracetamol syrup	✓	X
Amlodipine	✓	X

monitored as it is associated with antimicrobial resistance which is a threat to global health.[20] The percentage of prescription encounters with injections was within the WHO standard level.

The WHO recommends healthcare professionals to adhere to national essential medicines list for drug prescribing. To this end, a deficiency was noted in terms of prescribing according to essential medicines list of Ethiopia compared with the WHO standard of a 100%[8] and to that of the national assessment results of 2003 (99%).[21] This may be attributable to patient preference, clinician decision and availability of the medications.

In this study, the average consultation time that the patients spent with clinicians was approximately 7 min, which is higher compared with studies conducted in public hospitals in eastern Ethiopia (4.6 min).[16] The duration, however, does not seem to be sufficient to make physical examination and select the best available treatment choices. High patient load could have contributed to such below optimal duration of consultation time. The average dispensing time recorded in the present study was approximately 23 s. This is significantly lower than the WHO recommendation of 180 s.[8] The lower the dispensing time, the poorer the understanding of the patients would be about their medications, which may lead to frequent encounters of drug therapy problems.

The percentage of drugs actually dispensed out of the total drugs prescribed to the patients stood at 80% compared with the recommended 100%.[6] Frequent stock out of medicines may account for this finding. Regarding the adequacy of labelling of medicines dispensed, slightly over one-third of medicines were appropriately labelled, which is far from the recommended level of 100%.[8] High patient load encountered at an outpatient pharmacy department and negligence of the pharmacists together with poor concern and follow-up from the hospital side could be implicated for such low level of performance in this indicator. Of note, only about half of the patients knew the dosage schedules of medicines prescribed to them, which is far below the expected level of 100%.

Both Quiha and Mekelle Hospitals had their own essential drugs list and standard treatment guidelines. Only 7.5% of key drugs were in stock and this is lower than the 100% of the WHO recommendation. Absence of key drugs may impair patient care and compromise patient quality of life.

CONCLUSION

The findings of the present study showed prescribing practices of antibiotics, prescribing from essential drugs list and injections were not within the acceptable WHO recommendations. Overuse of antibiotics facilitates the emergence of antimicrobial resistance which is a threat to global health. There was a little deviation in terms of generic prescribing, whereas the average number of drugs per encounter was within the acceptable standard. Poor generic prescribing coupled with shorter consultation and dispensing time may lead to frequent encounters of drug therapy problems. Future studies should investigate underlying factors that contributed to the observed gaps to improve patient care in those hospitals.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not required.

Ethics approval The study was approved by the Institutional Review Board of Mekelle University (reference number: ERC/224/2019). Based on this, a letter of support was written from Tigray regional health bureau. During data collection on patient care indicators, a written consent was obtained from each participant after provision of all the necessary information. In addition, the data collected in the study did not use patient identifiers and were kept strictly confidential and were only used for the purpose of the study.

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Data availability statement Data are available upon reasonable request. The data of this study are available from the corresponding author upon reasonable request.

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