



# Drug prescribing patterns in geriatric patients in selected health facilities of Addis Ababa, Ethiopia

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## ABSTRACT

Drug prescribing for geriatric patients is a complex and challenging process because of age-related physiological changes. The drug prescriber plays a critical role in identifying drugs use within the community and improving drug therapy is the most important intervention in the elderly. The aim of the study was to evaluate the patterns of drug prescribing in elderly patients attending selected healthcare facilities in Addis Ababa, Ethiopia, by means of World Health Organization's (WHOs) prescribing and health facility assessment tools. The study design used was retrospective for assessing prescribing patterns and prospective methods to evaluate healthcare facilities. Data were collected in Ethiopia from April 20 to August 20, 2019. Retrospectively, 1,200 prescriptions were analyzed according to WHO guidelines. The mean number of drugs per encounter varied from 2.2 to 2.67, the percentage of drugs prescribed by generic name ranged from 436(81.95%) to 919(91.62%), the percentage of prescriptions with injections ranged from 65(16.25%) to 68(34%), and the percentage of drugs prescribed from the Ethiopian essential drug list (EDL) varied from 407 (76.5%) to 918(91.53%). This prospective study showed that in healthcare facilities the percentage availability of the copy of the Ethiopian EDL was 5(100%), standard treatment guideline was 4 (80%), drug formulary was 4 (80%), and none of the facilities had international prescribing guidelines. The methods of prescribing by generic name, prescribing drugs from the EDL, and polypharmacy were near-optimal with the standard WHO requirements. However, there is a need to improve the pattern of prescribing antibiotics and injection medicines, the availability of key essential medicines in the stock, and the availability and use of international guidelines, such as AGS Beers Criteria, which is a guide for decisions about what drugs to use in geriatric patients.

## INTRODUCTION

Drug utilization study is the most important and challenging process in the geriatric population. According to the World Health Organization (WHO), drug utilization study was defined as the promotion, distribution, prescription, and utilization of medications in a community, with special emphasis on the resulting medical, societal, and financial significances (Capellà, 1993; Shalini *et al.*, 2010; World Health Organization (WHO), 1993).

According to the UN, the definition of older persons is those people whose age is 60 years and above (World Health Organization (WHO), 2014). In 2017, the world people aged 60 years or above were 962 million, more than double and as large as that in 1980; with 382 million elderly people in the world, it is expected to increase by twofold again by 2050 and is estimated to be nearly 2.1 billion. In 2017, over two-third of the world's elderly people lived in developing countries. Between 2017 and 2050, the number of persons aged 60 years or above in the developing world is estimated to be more than twofold, from 652 million to 1.7 billion (United Nations, 2017). The number of elderly people will be increased, which is the highest and fastest in the developing regions. Asia has the largest number of elderly people, and Africa is facing the biggest proportionate growth (United Nations, 2018).

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The drug prescriber plays a serious part in identifying drug use within the community and prescribing medication for geriatric patients is a complex and challenging process. Drug prescribing has become an essential public health concern worldwide. Elderly patients have impaired pharmacokinetics and pharmacodynamics functions because of aging and there is a significant change in their physiological state. Awareness of age-associated physiological alterations, i.e., slow response time and reduced balance, will make patients and caregivers aware of the risks, make informed choices, and possibly avoid falls and adverse effects of medication. Decisions to prescribe medication are based on the aim of care, problem, and risks (Corsonello *et al.*, 2010; Duraković and Vitezić, 2013; Jaul and Barron, 2017). The functions and composition of the human body need adjustments to drug choice and dosage because of age-related alterations of the geriatric population (Turnheim, 2003). Improving drug therapy is an important aspect for geriatric patients because the most important and common medical intervention in the elderly is drug therapy (Chung, 2014; Penge and Crome 2014). The process of prescribing medication for the geriatric population needs proper decision, so that when a drug is ordered, selecting the best medication and deciding a dosage and schedule properly for the physiologic status of elderly patients is given attention. Many drugs should be used with special care because of age-associated alterations in pharmacokinetics (i.e., absorption, distribution, metabolism, and excretion) and pharmacodynamics (the physiologic properties of the medication) (Blanda, 2006; Duraković and Vitezić, 2013).

Old age is related with increased incidence of different chronic illnesses that often lead to the use of complex drug regimens (Corsonello *et al.*, 2010). The drug utilization study gives insight into various features of drug use and prescribing, such as a way of use, quality of usage, factors of use, and results of drug usage (Kanwal and Zaka, 2018). The skill to prescribe drugs is rationally affected by several sorts of working environment. The two main vital elements are sufficient supply of essential medicines and obtaining rational information about the medications, but without these elements it is challenging for health personnel to function successfully (World Health Organization (WHO), 1993). Essential drugs are those drugs that satisfy the priority healthcare needs of the people and are chosen with regard to disease occurrence and public health significance, proof of clinical efficiency and safety, and reasonable costs and cost-effectiveness, which are expected to be accessible within the healthcare system always in sufficient amounts, in the suitable dosage forms, with guaranteed quality, and at an expense the person or the community can buy (Bansal and Purohit, 2013). Aging presents several difficulties for the governments, the public, and elderly people themselves, which need urgent policy reactions, in addition to anticipatory policy actions to organize countries for meeting these difficulties (Dugarova, 2017).

Ethiopia has a national drug policy intended to ensure that the government shall deliver sufficient supply of drugs that are important for prevention, therapy, diagnosis, rehabilitation, and mitigation of diseases affecting the country's population. To achieve this, Ethiopia prepared a national list of essential drug lists (EDLs) that leads the choice of all health service workers for choosing and utilizing the most required drugs at each level

of the healthcare system and at all times with reasonable cost. The supply was conducted by government drug prescribers who prescribe drugs from the EDL that is available within healthcare facilities in adequate and affordable costs (Food, Medicine and Health Care Administration and Control Authority (FMHACA), 2014).

### **Ethical consideration**

Ethical approval was obtained from Ethical Review Board of Sharda University IRB, as well as from the Ethical Clearance Committee of Addis Ababa City Administration Health Bureau's health research and emergency management core process (HREM ERC). After approval from the ethics committee, the letter of permission was submitted to each health facility subsequently before data collection. Then, permission was obtained from the health facility's medical director and store manager of the pharmacy department to collect data. At the time of data collection, the confidentiality of the elderly patients was maintained. All elderly patients' related information was not released to anyone (PHREM ERC, public health research and emergency management core process).

### **MATERIALS AND METHODS**

Cross-sectional methods of the study were used, prescribing patterns were assessed retrospectively, and prospective methods were used to evaluate the health facilities. Five healthcare facilities were randomly chosen and data were collected from April 20 to August 20, 2019. The World Health Organization recommends a drug prescribing pattern that includes those involving cross-sectional studies whenever possible and retrospective data collection over the past year should be used (World Health Organization (WHO), 1993). Patients aged  $\geq 60$  years of either sex who visited the outpatient department from July 2017 to June 2018 were included the study, involving 1,200 geriatric outpatient prescriptions/encounters who were randomly chosen from the outpatient pharmacy previously kept at every facility.

### **Study area**

The study was conducted in the outpatient pharmacy departments of selected governmental health centers (HC) and one general hospital of Addis Ababa. Addis Ababa is the capital city of Ethiopia and lies on 9 latitudes and 38 degrees east longitude, found within the central part of Ethiopia, and covers an area of 530 km<sup>2</sup> (53,000 ha). The total number of residents was 3,041,002 million persons (Andarge, 2016). Ethiopia's healthcare system service is structured into a three-tier system: primary hospital, HC, and health post. The primary health care unit covers HCs and five health posts (HPs). A primary level hospital serves inpatient and outpatient services to an average people of 100,000 people; furthermore, it provides emergency surgical care and functions as a referral center for HCs under its catchment sites, which paramedical health professionals and nurses use as a practical training center. A general hospital serves inpatient and outpatient to a mean of 1,000,000 people. Medical professionals treat various kinds of illnesses. HCs gives curative, promotive, preventive, and rehabilitative ambulatory services, and have a basic laboratory and pharmacy facilities. HCs function

as a referral site for HPs and provide services for 15,000–25,000 people (Mann *et al.*, 2016).

**Data collection and management**

The data were collected from Ethiopia from selected health facilities by using the WHO’s drug utilization study core indicators for drug prescribing study and facility assessment core indicators for facility assessment. Necessary information was collected from the encounter and filed properly in a format, and daily the formats were checked for accuracy by two researchers who conducted the study before they were sent for analysis.

Prescriptions dispensed to geriatric outpatients were included in this study. However, the study excluded inpatient prescriptions. For this study, 1,200 geriatric patient prescriptions were randomly selected retrospectively from prescriptions written for a 1-year period during systematic random sampling. Equal proportions were taken from five outpatient pharmacy units: 200 prescriptions from each HC and 400 prescriptions from one general hospital based on patient load. The necessary data were collected by the researcher and one pharmacist from every healthcare facility. The objectives of the study, sampling procedure, and the methods to collect data from encounters using the form were explained by the principal investigator to pharmacists.

Each prescription was assessed according to the WHO’s core prescribing indicators. Prospectively, the five selected health facilities observations were carried out and assessed by core facility indicators that are accessibility of a copy of EDL formulary, standard treatment guideline (STG), reference books, international guidelines, and accessibility of key essential drugs during data collection.

The specific information required to assess the prescribing measures were recorded for every elderly patient’s prescription and entered directly into a normal prescribing indicator sheet. Based on the WHO’s drug prescribing core indicators and facility core indicators, which include the mean number of drugs per prescription, the percentage of prescriptions with generic name medications prescribed, antibiotics, injections and prescribed drugs from the EDL were calculated and the results were used to evaluate the prescribing pattern. Facility assessments were made by observing, availability of the copy of EDL, formulary, STG, reference books, international guidelines, and accessibility of key essential drugs.

The results were calculated as follows:

- The mean number of medicines prescribed per encounter was calculated as:

$$\frac{\text{Total number of different medicine products}}{\text{Number of encounters surveyed}}$$

- Percentage of drugs prescribed in generics =  $\frac{\text{Total drugs prescribed by generic name}}{\text{Total number of drugs prescribed}} \times 100$
- Percentage of antibiotics prescribed =  $\frac{\text{Total encounters with an antibiotic}}{\text{Total number of encounters surveyed}} \times 100$
- Percentage of prescriptions with injections =  $\frac{\text{Total prescriptions with an injection}}{\text{Total number of prescriptions surveyed}}$

- Availability of key essential medicines =  $\frac{\text{Number of identified products actually in stock}}{\text{Total number of medicines on the checklist}} \times 100$
- Facility indicators were used to check the availability of the copy of EDL, formulary, STG, and reference books within the facility.

**Data analysis**

All collected data prior to analysis were cleaned and coded. By means of the Statistical Packages for Social Sciences version 20, the collected data were entered and analysis was conducted. The results were expressed as actual numbers, means, frequency, percentages, and were present using tables. The interpretations of the finding were conducted according to the standard value of the WHO’s prescribing and facility core indicators.

**RESULTS AND DISCUSSION**

A total of 1,200 geriatric patient prescriptions were evaluated for 4 months from April 20 to August 20, 2019, from the selected five health facilities of outpatient pharmacy. The encounters were assessed by using the WHO’s drug use study guidelines using core indicators, and 1,200 geriatric patients’ encounters were selected from the health facilities. Analysis was carried out by means of core indicators.

**Patient characteristics**

The mean age of the geriatric patients was 67.5 years and the age structure of the study population revealed that 363 (30.3%) patients were in the age group of 60–64 years, 358 (29.8%) were aged 65–69 years, 219 (18.3%) were aged 70–74 years, 150 (12.5%) were aged 75–79 years, 68 (5.7%) were aged 80–84 years, 33 (2.8%) were aged 85–89 years, and 9 (0.8%) were aged >90 years old. From these 1,200 patients, 535(44.6%) were male and 665(55.4%) were female (Table 1)

**Evaluation by WHO’s prescribing indicators**

The mean number of drugs per encounter showed as 2.67, 2.28, 2.2, 2.35, and 2.51 in Akaki Health Center (AKHC), Arada Health Center (ARHC), Shiromeda Health Centre (SMHC), Tekilhaymanot Health Centre (TKHC), and Tirunesh Beijing

**Table 1.** Distribution of geriatric patients by age group and sex selected in the five health facilities outpatient pharmacies in Addis Ababa, Ethiopia, 2019.

Name of the factors	Types of groups	No. of patients	% of total patients (n = 1,200)
Age group (in years)	60–64	363	30.3
	65–69	358	29.8
	70–74	219	18.3
	75–79	150	12.5
	80–84	68	5.7
	85–89	33	2.8
Sex	>90	9	0.8
	Female	665	55.4
	Male	535	44.6

General Hospital (TBHL), respectively, and the encounter with the highest number of medicines had seven drugs. The percentage of medicines ordered by generic name within the five healthcare facilities was 436 (81.95%), 399 (87.69%), 373 (86.34%), 412 (87.85%), and 919 (91.62%) in AKHC, ARHC, SMHC, TKHC, and TBHL, respectively. The percentage of prescription with antibiotics was 118 (59%), 97 (48.5%), 92 (46%), 114 (57%), and 111 (27.75%) in AKHC, ARHC, SMHC, TKHC, and TBHL, respectively. The percentage of medicines prescribed injection was 33 (16.5%), 42 (21%), 68 (34%), 40 (20%), and 65 (16.25%) in AKHC, ARHC, SMHC, TKHC and TBHL, respectively. The percentage of drugs from the Ethiopian EDL prescribed was 407 (76.5%), 399 (87.69%), 373 (86.34%), 411 (87.63%), and 918 (91.53%) in AKHC, ARHC, SMHC, TKHC and TBHL, respectively (Table 2).

### Healthcare facility assessment

At the time of data collection, a prospective survey was undertaken by observing accessibility of key essential medicines, accessibility of a copy of EDL, STGs, copy of formulary, reference books, and international guidelines of the American Society of Geriatrics 2015 BEERS criterion for drug prescribing in elderly. In our study, the finding was that 5 (100%) had a copy of the Ethiopian EDL, 4 (80%) had a copy of STG, 4 (80%) had a copy of the drug formulary, 2 (40%) had reference books, and none of the facilities had international guidelines, like the BEERS criteria used to improve drug prescribing practices for geriatric patients to decrease or prevent potential risks and complications. Our findings showed that the percentage of accessibility of key essential medicines for AKHC, ARHC, SMHC, TKHC, and TBHL were 12 (92.3%), 13

(100%), 10 (76.9%), 12 (92.3%), and 13 (100%), respectively (Table 3).

### DISCUSSION

The WHO established tools for the assessment of core prescribing indicators which is used to observe the level of polypharmacy, the ability to prescribe medicines by generic name, percentage of antibiotics and injections medicines uses, and the level of prescribing practice from the essential medicine list or formulary in addition core facility indicators developed (World Health Organization (WHO), 1993).

The prescribing patterns of drugs reflect the clinical decision of the prescribers. In our study, the mean number of medicines per prescription was 2.67, 2.28, 2.2, 2.35, and 2.51 in AKHC, ARHC, SMHC, TKHC, and TBHL, respectively, which was somewhat higher than the WHO's standards and lesser than results from Indian and Ethiopian studies, where the mean number of medicines per encounter was 5.51 and 5.1, respectively, which show polypharmacy and is greater than our findings (Oumer, 2017; Sharma *et al.*, 2013). In one of the assessment of geriatric patients in India, the result was 7.02 (Nandagopal *et al.*, 2017). The encounter with the maximum number of medicines in our study had seven, whereas a similar study had a higher number (Bhaveshaikh *et al.*, 2017).

The percentage of medicines prescribed by generic name within the five healthcare facilities was 436 (81.95%), 399 (87.69%), 373 (86.34%), 412 (87.85%), and 919 (91.62%) in AKHC, ARHC, SHHC, TKHC, and Tirunesh Beijing Hospital (TBHL), respectively. The values were larger than a study conducted in India (15, 3.25%) (Nandagopal *et al.*, 2017). The study result of ARHC, Shiromeda Health Centre (SMHC), TKHC,

**Table 2.** Drug prescribing indicators in the five outpatient department health facilities in Addis Ababa, Ethiopia, 2019.

Prescribing indicator	Prescribing indicator	AK HCNo (%)	ARHCNo (%)	SMHCNo (%)	TK HCNo (%)	TBHLNo (%)	WHOstandard
Total prescription analyzed	Total prescription analyzed	200	200	200	200	400	
Total drugs prescribed	Total drugs prescribed	532	455	432	469	1003	
Mean number of drugs per prescription	Mean number of drugs per prescription	2.67	2.28	2.20	2.35	2.51	1.6-1.8
Percent of generic name prescription	Percent of generic name prescription	81.95%	87.69%	86.34%	87.85%	91.62%	100%
Percent of antibiotics	Percent of antibiotics	59%	48.5%	46%	57%	27.75%	20 – 26%
Percentage of injection	Percentage of injection	16.5%	21%	34%	20%	16.25%	13.4 – 24.0 %
Percentage of drugs from EDL	Percentage of drugs from EDL	76.5%	87.69%	86.34%	87.63%	91.53%	100%

AKHC = Akaki Health center; ARHC = Arada Health center; SMHC = Shiromeda Health Centre; TKHC = Tekilhaymanot Health Centre; TBHL = Tirunesh Beijing General Hospital.

**Table 3.** Healthcare facility assessment by indicators in the selected healthcare facilities of Addis Ababa, Ethiopia, 2019.

Health facility indicators	AKHC	ARHC	SMHC	TKHC	TBHL
STG	1	1	0	1	1
EDL	1	1	1	1	1
Dug formulary	1	1	0	1	1
Reference books	0	0	0	1	1
International guide line AGS BEERS criterion	0	0	0	0	0
Percentage of availability of key essential drugs	12 (92%)	13 (100%)	10 (76%)	12 (92%)	13 (100%)

Yes/No\*, Yes = 1, No = 0.

AKHC = Akaki Health center; ARHC = Arada Health center; SMHC = Shiromeda Health Centre; TKHC = Tekilhaymanot Health Centre; TBHL = Tirunesh Beijing General Hospital.

and Tirunesh Beijing Hospital (TBHL) was 399 (87.69%), 373 (86.34%), 412 (87.85%), and 919 (91.62%), respectively, which is greater than the same study carried out in Ethiopia where the result was 85.7% (Oumer, 2017). Among the five health facilities, the result of AKHC 436 (81.95%) was less than the WHO's standard, which is 100%.

The percentage of encounter with antibiotics was 118 (59%), 97 (48.5%), 92 (46%), 114 (57%), and 111 (27.75%) in AKHC, ARHC, SMHC, TKHC, and TBHL, respectively. In all the four facilities, the results deviate from the WHO's standards; in general, the misuse of antibiotics is the main cause of bacterial resistance. Only TBHL (111, 27.75%) is within the normal range (Aslam *et al.*, 2018), which fits the standard and is greater than the study in India, which was 21.6% (Abraham *et al.*, 2015). The finding of our study was somehow better than a study conducted in Ethiopia, which was 63.5% (Oumer, 2017) and the results in the four facilities were 118 (59%), 97 (48.5%), 92 (46%), and 114 (57%) in AKHC, ARHC, SMHC, and TBHL, respectively, which were greater than a study conducted in India, which was 128 (41.8%) (Pradhan *et al.*, 2016). The main cause for the occurrence of antibiotics resistance is antibiotics overprescribing (Worku and Tewahido, 2018). One of the major leading causes for antimicrobial resistance is the misuse of antimicrobials either by patients or healthcare professionals (Chokshi *et al.*, 2019; Rattanaumpawan *et al.*, 2019). Antimicrobial resistance is a worldwide public health problem that has speeded up the overuse of antibiotics at a global level. It is the cause of severe infections, complications, extended hospital stays, and increased death rate (Llor and Bjerrum, 2019).

Prescriptions with injections ordered were 33 (16.5%), 42 (21%), 68 (34%), 40 (20%), and 65 (16.25%) in AKHC, ARHC, SMHC, TKHC, and TBHL, respectively. The five healthcare facilities used injection drugs in a similar way mentioned in the WHO's standard that is encouraging, except in TKHC in which 68 (34%) prescribed. However, other studies, in Saudi Arabia, reported lower than our finding, which was 28.45% (Gupta *et al.*, 2016), on the other hand, and higher figures were reported in India, 92.57%, (Singh, 2017) in Ethiopia 355 (59.16%) (Sisay *et al.*, 2017), and another study in India which was 220 (73.57%) (Varghese *et al.*, 2015). The use of injection drugs has drawbacks, like sepsis, and the danger of tissue toxicity from local irritation, risk of thrombophlebitis, expensive, and unable to correct the mistake after injection; therefore, WHO's standard was limited to less than 10% of the prescription which ought to contain 1 or more injections (Cyriac and James, 2014; World Health Organization (WHO), 1993). Many injections around the world are unnecessary and often unsafe. Unsafe injections put lives at risk and every year cause 1.67 million hepatitis B infections, up to 315,120 hepatitis C infections, and up to 33,877 human immunodeficiency virus infections (Pépin *et al.*, 2014). In one study, the injectable usage was 0.15%, which is a very lower percent than our study (Nishandar *et al.*, 2017).

In our study, majority of the medicines prescribed from the Ethiopian EDL were 407 (76.5%), 399 (87.69%), 373 (86.34%), 411 (87.63%), and 918 (91.53%) in AKHC, ARHC, SMHC, TKHC, and TBHL, respectively. EDL is related to the standard rate of 100%, but in other studies done in India (66.3%) (Kashyap *et al.*, 2016) and only 35% of drugs were prescribed from the EDL (Pradhan *et al.*, 2016).

The WHO recommended that 100% of drugs have to be prescribed by generic name; on the other hand, drug prescribing by generic name has advantages. Generic medicines are duplication of brand name medicines which have similar dosage, proposed use, effects, side effects, method of administration, risks, safety, and strength equally as brand medicine, or the pharmacological results for both are identical generic drugs are essential medicine that permit better availability to healthcare for every cases and sold with low-cost (Hague, 2017). Ordering generic medicines benefits to cost reduction since it is inexpensive options, no delay of production since the chemist can distribute a wider variety of alternate supplies, relatively than being inadequate to one that cannot be kept (Dunne *et al.*, 2013). In Ethiopia, the drug policy encourages drug prescribers to prescribe drugs from EDL as known that all EDLs are generic drugs which are accessible the most required drugs at all level of the healthcare system any time with reasonable price as the supply to the health facilities are done by government. Those drugs are available within health facilities in adequate and affordable costs so patients can get medicines with low cost (Food, Medicine and Health Care Administration and Control Authority (FMHACA), 2014).

The result of this study revealed that 5 (100%) of healthcare facilities had a copy (EDL), 4 (80%) had a copy of STG for HC, 4 (80%) had a copy of drug formulary, 2 (40%) had reference books, and none of the facilities had international guidelines. The percentage of availability of key essential drugs for AKHC, ARHC, SMHC, TKHC, and TBHL were 12 (92.3%), 13 (100%), 10 (76.9%), 12 (92.3%), and 13 (100%), respectively. In a similar study conducted in Ethiopia among four hospitals, the results showed that only quarter of or 1 (25 %) hospital had a copy of (EDL) and 1 (25 %) had STG, and drug formulary. The availability of key medicines in hospitals was 65.7%, which is lower than the finding in our study (Gidebo *et al.*, 2016). In our study, 2 (40%) had reference books and none of the facilities had International guidelines, but other studies conducted in eight health facilities the results showed that only 6 (75%) of the health facilities had EDL, 7 (87.5%) had STG, and 6 (75%) had a copy of the drug formulary; however, there was no important reading resources (Nigussie, 2014). In our finding, the percentage of accessibility of key essential medicines for AKHC, ARHC, SMHHC, TKHC, and TBHL were 12 (92.3%), 13 (100%), 10 (76.9%), 12 (92.3%), and 13 (100%), respectively. In one study conducted in south India, the percentage of key drugs available was 88%, which is somewhat similar to our finding (Prasad *et al.*, 2015). A Similar study conducted in southwest Ethiopia in four facilities showed that only half or 50% of healthcare facilities had both EDL and STG for HC, and only one-fourth or 25% had a copy of the drug formulary, but others had no important reading resources (Angamo *et al.*, 2011). The research done in India had no EDL available in the health facilities. Only there were three key essential drugs (20%), which is lower than our finding (Parveen *et al.*, 2016).

## CONCLUSION

The method of prescribing in relation to the generic name, prescribing drugs from EDL, and polypharmacy was near-optimal to the standard WHO requirements. However, there is a

need to improve the pattern of prescribing antibiotics and injection medicines, availability of key essential medicine in stock, and availability and use of international guidelines, like AGS BEERS Criteria, which is a guide for decisions about what drugs to use in geriatric patients. The findings may give due attention to geriatric patients to prevent and control drug prescribing related to complications, polypharmacy, antibiotic resistances, disability, and unnecessary hospital admissions, which may improve accessibility of essential medicines and international guidelines in healthcare facilities of Addis Ababa, Ethiopia. Information collected by our study can be used by investigators and policymakers in the future as baseline. All health facilities assessed in this study were not aware of the use of BEERS criteria; the possible reasons include in Ethiopia drug prescribing is conducted by either physicians (GPs) or other professionals who are not specialized in geriatric medicine so that they are not aware of this guideline.

## RECOMMENDATIONS

Depending on our findings the following recommendations were made:

- Establishment of geriatrics medicine curriculum and implementation to medical schools that develop and implement the basic science and clinical curriculum constituents on aging with national level and opening of residency program training in geriatrics.
- Addis Ababa Health Bureau has to prepare and provide training for drug prescribers dealing with geriatric patients to offer appropriate geriatric care.
- Distribute and follow health guidelines by distributing BEERS Criteria to the health facilities in order to decrease drug-related drawback, unnecessary hospitalization, and mortality in geriatric patients.
- Improve availability of key essential medicines in stock and the pattern of prescribing antibiotics and injection medicines,
- Availability and use of international guidelines, such as AGS BEERS Criteria, should be a guide for decisions about what drugs to use in geriatric patients.

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## CONFLICT OF INTEREST

Authors declared that they do not have any conflicts of interest.

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## AUTHORS' CONTRIBUTIONS

All authors made significant contributions in planning, implementing, and investigating of the study and to develop this manuscript. WL conceptualized and designed the study along with

MI and VS. WL coordinated the data collection, along with EL. WL conducted the statistical analyses along with EL. WL wrote the manuscript. EL and MI reviewed the article and all authors agreed on its last version.

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