



## **ADDIS ABABA UNIVERSITY**

### **ASSESSMENT OF PREVALENCE AND ASSOCIATED FACTORS OF POLYPHARMACY AMONG ELDERLY PATIENTS ADMITTED TO FEDERAL POLICE REFERRAL HOSPITAL, ADDIS ABABA, ETHIOPIA**

**BY: MELKA GELETA DIRO**

**A research thesis submitted to Addis Ababa University, College of Health Sciences, Center for Innovative Drug Development and Therapeutic Trials for Africa (CDT-Africa), in partial fulfillment for the degree of master of science in Clinical Trials.**

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Addis Abab, Ethiopia**

**ADDIS ABABA UNIVERSITY**  
**COLLEGE OF HEALTH SCIENCE**  
**CENTER FOR INNOVATIVE DRUG DEVELOPMENT AND**  
**THERAPEUTIC TRIALS FOR AFRICA (CDT-AFRICA)**

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# **ADDIS ABABA UNIVERSITY**

## **SCHOOL OF GRADUATE STUDIES**

This is to certify that the thesis prepared by Melka Geleta, entitled "Assessment of Prevalence and Associated Factors of Polypharmacy among Elderly Patients Admitted to Federal Police Referral Hospital, Addis Ababa, Ethiopia" and submitted in partial fulfillment of the requirement of the degree of Masters of Science (MSc) in Clinical trials with the regulations of the University and meets the accepted standards with respect to originality and quality.

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## **DECLARATION**

I, the undersigned, declare that this thesis entitled “Assessment of Prevalence and Associated Factors of Polypharmacy among Elderly Patients Admitted to Federal Police Referral Hospital, Addis Ababa, Ethiopia”, is my original work and has not been presented for degree in any other university or organization, and that all sources of materials used for the thesis have been duly acknowledged.

Declared by:

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Date: August 2021

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## **LIST OF ABBREVIATIONS/ACRONYMS**

95% CI	95% Confidence Interval
ADE	Adverse Drug Events
ADR	Adverse Drug Reaction
AOR	Adjusted Odds Ratio
CDT-Africa	Center for Innovative Drug Development and Therapeutic Trials for Africa
CNS	Central Nervous System
CVD	Cardiovascular Disease
COR	Crude Odds Ratio
DM	Diabetes Mellitus
DDI	Drug-Drug Interaction
DIC	Drug Information Center
DTC	Drug and Therapeutic Committee
EFDA	Ethiopian Food and Drug Authority
EPP	Excessive Polypharmacy
FMOH	Federal Ministry of Health
FPRH	Federal Police Referral Hospital
HIV	Human Immunodeficiency Virus
NSAID	Non-Steroidal Ant Inflammatory Disease
SPSS	Statistical Packages for Social Sciences
WHO	World Health Organization

## ABSTRACT

**Background:** Polypharmacy is one of the major concerns in the healthcare sector as it has a strong association with increased treatment costs, morbidity and adverse drug reactions (ADR). Elderly patients are prone to these risks for they are exposed to many coexisted chronic and acute illnesses that lead to polypharmacy. In Ethiopia, there is a dearth of studies exploring the prevalence and associated factors of polypharmacy in elderly patients.

**Objective:** To determine the prevalence of polypharmacy and its associated factors among elderly patients admitted to Federal Police Referral Hospital (FPRH) in Addis Ababa, Ethiopia.

**Methods:** A healthcare facility-based, retrospective cross-sectional study was carried out in FPRH, one of the two federal-level military hospitals in Addis Ababa. Medical charts of elderly patients who were admitted to the hospital in the period 01 January 2019 to 01 January 2020 were reviewed for polypharmacy. Using an adapted and structured data extraction tool, data were abstracted on patient characteristics, diseases encountered, co-morbidities, and the type and categories of the drugs administered. Data were analyzed using SPSS software version 25. Logistic regression was used to assess the association and an odds ratio (OR) with a corresponding 95% confidence interval (CI) was used.

**Results:** A total of 376 medical charts were reviewed, of which five or more drugs were prescribed in 180 (47.9%) charts, with a mean of 4.57. This indicated the occurrence of polypharmacy in FPRH. In the logistic regression, cardiovascular disease (AOR = 7.456, 95% CI [2.109 - 26.360],  $p = 0.002$ ) and endocrine disorders (AOR = 7.331, 95% CI [1.988 - 27.043],  $p = 0.003$ ) showed a significant association with polypharmacy.

**Conclusions:** Polypharmacy is highly prevalent among elderly patients admitted to FPRH. Cardiovascular disease, endocrine disorders, and comorbidity with one to three diseases were the major predictors of polypharmacy. We recommend that medication practices for elderly patients need to be improved through training of clinical practitioners, regular review of patients' medication charts, particularly patients with cardiovascular disease and endocrine disorders, and further engagement of clinical pharmacists in elderly care and treatment.

**Keywords:** Elderly patients, polypharmacy, police referral hospital, cardiovascular disease (CVD), endocrine disorder, Ethiopia.

# 1. INTRODUCTION

## 1.1. Background

Globally the population of elderly people is a growing episode (1). The estimation of World Health Organization (WHO) of the world's elderly population will approximately be twice from 12% to 22% in the middle of 2015 and 2050 years, respectively (2). In the case of Ethiopia, the numbers of elderly people is increasing, and they account for 9.5% of the total population (1) suggesting that the health sector must plan to meet the need of effective and efficient treatment care for this age groups (3).

Even though prescribed medicines substantially cover a wide-range of health benefits, they also cause significant problems to patients (4). Elderly patients admitted to hospitals are usually manifested by the coexistence of chronic and acute illnesses leading to polypharmacy (5,6).

Appropriate polypharmacy on the standard treatment guideline may improve a patient's condition, while inappropriate polypharmacy rather affects the health of patient by negative clinical consequences (7). Polypharmacy also intensifies the probability of drug-drug interactions (DDIs), resulting in adverse drug reactions (ADRs) in patients (8). The possibilities of cumulative toxicity, as well as compliance issues due to increasing schedule period are the problems of polypharmacy (9).

The definition of poly-pharmacy varies in the literatures. The term “poly-pharmacy” was originated from two Greek words namely “Poly” to mean greater than one, and “pharmacy” to mean medicine derived from a Greek word “pharmacon”(7,10). Hence, the complete meaning of poly-pharmacy is using several medicines simultaneously. Mostly it is defined as the concurrent use of five or more drugs for treatment. For this study, polypharmacy was defined as prescribing  $\geq 5$  different medications concomitantly in a single prescription at least once during the study period (3,8).

Polypharmacy is higher in hospitalized patients compared to ambulatory patients. For instance study conducted in Puducherry on polypharmacy described that the number of medications prescribed in elderly admitted patients increased by rate of 0.296 only by one increment stay day

in hospital(11). A survey conducted in Ethiopia at Yekatit 12 hospital, from March 2018 to March 2019 also reported that it was significantly associated with inpatient cases ( $P = 0.047$ ) (1).

Polypharmacy is one of the major challenges in the management of chronic diseases in elderly patients (12). Depending on the number of drugs administered together for management of these diseases, the co-administered drugs could interact with each other to mild or severe adverse drug reactions (ADRs)(13,14). The mild ADRs accounted for 36% , while the severe ones accounted for 84% in all-causes of mortality(15). Such interactions are usually seen in cancer patients as this group of individuals are frequently prescribed with a wide-range of therapies for supportive care and treatments purposes. To mention some ADRs; due to polypharmacy are like the increased risk of serious hypoglycemia when prescribed sulfonylureas or insulin therapy with the use of five or more therapeutic classes. Similarly drug interactions may be associated with an increased risk of toxicity(16). Some common interactions of digoxin with diuretics, that result in digoxin and the use of non-steroidal anti inflammatory drugs and diuretics are associated with renal failure (17).

Although polypharmacy can happen in any age category, it is mostly seen in elderly patients due to the high prevalence of coexisting several chronic diseases in this age group (18). A cross-sectional study conducted in Saudi Arabia reported that patients with diabetes mellitus and musculoskeletal disease were three times more likely to have polypharmacy (AOR=3.16; 95%CI 2.31 to 4.30) compared with patients without diabetes mellitus and musculoskeletal conditions. Additionally their findings showed that, chronic diseases like patient cardiovascular diseases, mental conditions, respiratory and musculoskeletal diseases are all linked with polypharmacy (19).

Polypharmacy may have a burden of direct or indirect financial costs on health (20). A retrospective cohort study showed that polypharmacy increased possibility of taking unnecessary treatment and hospital admissions leading to the increments of medical costs by 30% (17).

Polypharmacy is independently related with falls and fall related harms in the overall public, while some classes of medications including antidepressants, analgesics, benzodiazepines and antihypertensive have been related to risk of falling(13,21). Based on the results of meta-analysis study among community dwelling older adults, for each added medication contributing, there

was a 5 % increase in fall risk (AOR = 1.05 with 95 % CI). This study shows polypharmacy as the risk factor to fall (22).

## **1.2. Statement of the problem**

In spite of improved health care system, the problems associated with elderly people have become a prominent issue in the world as they develop more chronic illnesses that require several medications to make them recover from these conditions (23). For example, study on polypharmacy in Puducherry reported that more than half of patients admitted to a ward received 5 to 9 diverse number of drugs simultaneously (11). In most countries the percentages of this problem in elderly individuals is still hardly known. Hence, it is important to estimate the prevalence and associated factors with polypharmacy. Recognizing and taking necessary actions in polypharmacy may reduce morbidity and health cost spending (24).

Existing literature related to polypharmacy and associated factors among elderly patients mostly focused on western countries (25). In Ethiopia, sociodemographic and medical factors that contributing to polypharmacy were addressed only in limited research reports (26). Hence, determining the prevalence of polypharmacy among elderly patients admitted to FPH in Addis Ababa and investigating factors associated to polypharmacy in this population (1) will have important programmatic and policy relevance.

## **1.3. Significance of the Study**

The purpose of this study was to investigate the prevalence of polypharmacy and the associated factors among elders. The Ethiopian Ministry of Health as a policy maker and health professionals as providers of healthcare service to the patients are likely to use the findings for the betterment of elderly patients. The findings will make them aware of the prevalence and the associated factors to polypharmacy in elders that help design strategy to ensure appropriate care and treatment for their future engagement linked to the issue. Not recognizing this information may expose many clients to unnecessary polypharmacy. Besides to that the patient may expose ADRs, drug interactions, prolonged hospitalization or increased hospital stay, and poor survival that can increase overall healthcare costs beyond the challenges of the clients themselves. The study serves as base line data and plays a major role in adding valuable information for interested researchers and academicians for further analysis in the sector.

#### **1.4. Research questions**

1. What is the prevalence of polypharmacy among elderly patients admitted in Federal Police Referral Hospital?
2. What are the socio demographic and medical factors associated with polypharmacy among elderly patients admitted in Federal Police Referral Hospital?

## **2. LITERATURE REVIEW**

### **2.1. Prevalence of polypharmacy**

The prevalence of polypharmacy has increased with age over many years, with the largest volume seen in patient cardiovascular (+ 13.4%) and gastrointestinal (+ 7.3%) drugs, and the use of these drugs in elder patients have become a major concern in recent years (12). Several studies reported that the prevalence of using multiple drugs is increasing in elderly population (27,28).

The prevalence of polypharmacy in elderly patients estimated up to 37% in the outpatient setting and up to 92% in those who are hospitalized, and the prevalence increased, probably because of the availability of new treatment options (29).

Polypharmacy was realized extremely in chronic kidney diseases and other coexisting chronic illnesses compared to those without chronic illnesses (30). A cross-sectional retrospective study in Saudi Arabia reported that polypharmacy was much higher in diabetic patients with two or more concomitant comorbid situations compared with no concomitant chronic situations (89.6% vs 48.6%,  $p < 0.001$ ) (19).

A study conducted in Ethiopia on prevalence and determinants of polypharmacy reported that the polypharmacy prescriptions in elderly patients were nearly two times than in younger patients with AOR: 1.97; 95% CI: 1.08–3.61;  $p = 0.027$  (26). A prospective observational study in a private hospital also reported that polypharmacy is high at the age group of 65-69 years (24). Similarly, another study found that 35% of elderly patients identified by different cancer disease were all taking more than five drugs, and the prevalence of polypharmacy in this study group raised with age (39% of 80-90 year old and 41% of 90-91 year old patients (17).

### **2.2. Factors associated with polypharmacy**

Use of many drugs can be clinically correct in chronic diseases as, these drugs could improve treatment effectiveness (31). One descriptive cross-sectional study reported that patient cardiovascular drugs, analgesics, anti-inflammatory drugs, antirheumatic drugs, antilipid drugs and gastrointestinal drugs were the most associated factors with polypharmacy (23).



Age was reported as a contributing factor for polypharmacy among elderly cancer patients, which might affect the outcome of the cancer therapy (17). Observational study on polypharmacy at a private hospital also reported that the age, comorbid conditions and amount of treatments during the course of hospital stay were predictors of polypharmacy (24).

Men of lower socioeconomic status were more likely hurt by patient cardiovascular illnesses and therefore hurt by patient cardiovascular polypharmacy (12). A cross-sectional retrospective study in Saudi Arabia identified that age, gender, coexisting chronic conditions, lower socioeconomic status and lower education increased the chances of polypharmacy (19).

Researchers have established an association between DDI, polypharmacy, acute hospital admission and death in elderly patients with or without cancer (16,32). A narrative review of existing literature on polypharmacy in elderly cancer patients indicated that ADRs and drug interactions were the contributing factors for polypharmacy leading to several visits to emergency department. To mention some ADE, the polypharmacy increases risk of serious hypoglycemia when prescribed sulfonylureas or insulin therapy with the use of five or more therapeutic classes. Similarly drug interactions may be associated with an increased risk of toxicity. Some common interactions of digoxin with diuretics, that result in digoxin toxicity and the use of non-steroidal anti inflammatory drugs and diuretics are associated with in renal failure (17). The other problem of polypharmacy was that it increased pill burden which could affect treatment adherence of patient (33). Non-adherence is a negative impact of polypharmacy which has direct effects on treatment outcomes (34). A cross-sectional study in China among the elderly patients on compliance described that there was only 32.6% with their prescriptions. In addition, drug classes were negatively associated with adherence of polypharmacy (35).

Reports have shown that persistent multi-substance (including alcohol, tobacco, non-medical use of controlled medications, and non-prescription psychoactive drugs) use can lead to drug-substance interactions of polypharmacy outcome in HIV positive patients (36).

The mean average of hospital stay was also considered a contributing factor to polypharmacy. A prospective observational study on polypharmacy in private hospital described that mean average of hospital stay was  $10.22 \pm 8.7$  days that showed the majority of the populations were discharged within one week (24).

Among problems that correlated to polypharmacy, one of the most complications that related with it was its association with mortality due to escalation of disease conditions (36).

### 2.3. Conceptual framework

Although polypharmacy is mostly a consequence of multiple chronic conditions (multimorbidity), there might be other modifiable factors that determine polypharmacy independent of the disease burden. The relationship of polypharmacy with health outcome is also a complex condition. Moreover, many of these outcomes might increase the amount of drug, thus the association is likely to be bidirectional (figure 1.)

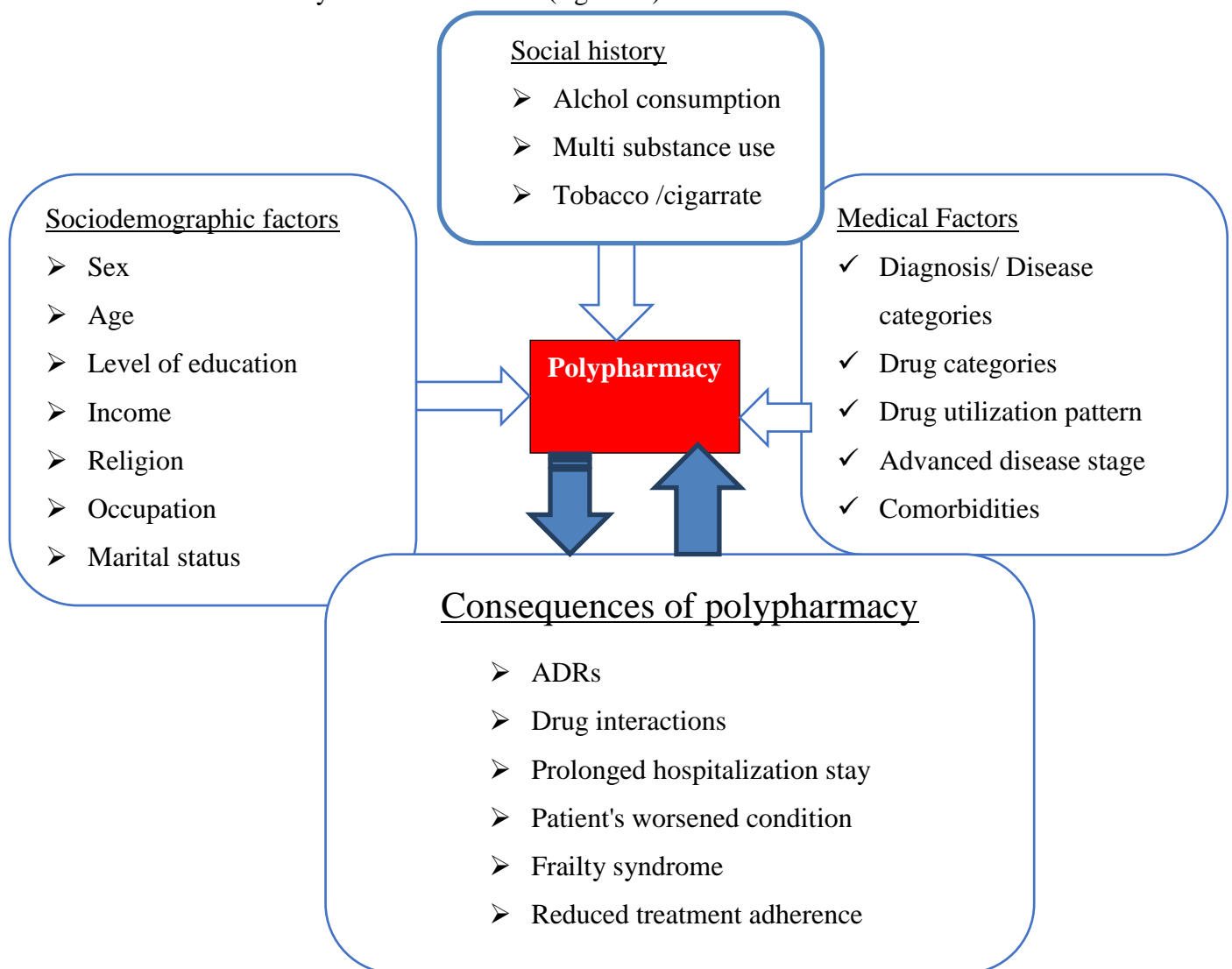


Figure 1. Conceptual framework showing the relationships between risk factors and polypharmacy (36).

### **3. OBJECTIVE**

#### **3.1. General objectives**

- ✓ To study the prevalence and associated factors of polypharmacy among elderly patients admitted to Federal Police Referral Hospital.

#### **3.2. Specific objectives**

- ✓ To determine the prevalence of polypharmacy among elderly patients admitted to Federal Police Referral Hospital.
- ✓ To investigate associated factors with polypharmacy among elderly patients admitted to Federal Police Referral Hospital.

## **4. METHODS AND MATERIALS**

### **4.1. Study setting and period**

The proposed study was conducted at the Federal Police Referral Hospital, Addis Ababa, Ethiopia. Federal Police Referral Hospital is one of the two military hospitals located in the capital of the country, Addis Ababa. The hospital was established in 1961 as “Police force hospital” to provide medical services to the police community and their families with minimal monthly fee that was expected to be contributed from police community. Currently, the hospital is administered under the Federal Police Commission and it is now renamed “Federal Police Referral Hospital”. The hospital has a total of 310 beds and is engaged in providing diagnostic and medical treatment to in-patients along with other services, such as out-patient, laboratory services, pharmacy services, emergency, delivery, family planning, reproductive health services, voluntary counseling and testing. It also provides training and apprenticeship services for students from the Police health professional training institutes. There are a total of 629 employees in the hospital of whom 317 are health professionals. Among the health professional categories, 7 were specialists, 34 general practitioners, 17 pharmacists, 23 public health officers, 12 druggists, 140 nurses and others. Two hundred thirty of the health professionals are also military, while the remaining 87 are civilians (37). The data for this study were collected from March 15/2021 to April 15/ 2021.

### **4.2. Study design**

An institution based retrospective study design was employed in this study. The relevant data were extracted using structured data collection formats.

### **4.3. Population**

#### **4.3.1. Source population**

All charts of patients’ profiles that admitted to FPRH during the study period were considered the source population.

#### **4.3.2. Study participants**

The study participants constituted all medical records including any prescribed drug for elderly patients admitted to FPRH and that fulfilled the inclusion criteria.

#### 4.3.2.1. Inclusion criteria

- ✓ Patient's  $\geq 50$  years of age
- ✓ Both genders, male and female
- ✓ Charts of patient's profiles who were admitted to wards from 1<sup>st</sup> January 2019 to 1<sup>st</sup> January 2020 were included in the study.

#### 4.3.2.2. Exclusion criteria

- ✓ Charts of patients which had no drug orders.

### 4.4. Sample size determination

The sample size was calculated using the standard sample size calculation formula for single population proportion and the focus in our sample size was on prevalence of polypharmacy.

Where;

$$n = \frac{(Z\alpha/2)^2 \times P(1-P)}{d^2}$$

n- the minimum required sample size

d- margin of error, 0.05

$Z\alpha/2$ - is the standard normal value at confidence interval of 95%, which is= 1.96

**P- 0.427** was taken as the best possible available estimate for the prevalence of polypharmacy which was reported in yekatit hospital of Addis Ababa, Ethiopia (1).

With this prevalence estimate, 95% confidence and 5% margin of error, the minimum sample size was  $n = (1.96)^2 \times 0.427 (1 - 0.427) / (0.05)^2 = 376$ . Since no patient charts were excluded for any reason and no contingency was added for illegible hand writing and incomplete patient charts, the sample size for the current study was 376.

### 4.5. Sampling procedure

A systematic random sampling technique was employed to select 376 patient charts and extracted data from 796 total numbers of eligible patient charts within study period in the FPRH.

First, all the eligible patient charts were put in frame order and the interval k was calculated using the formula:  $K = N/n$  where; N is number of total patient charts on sampling frame, n = the required number of patient charts;  $= 796 / 376$  which was approximately 2. From the list of patients 1 to 2, the first patient chart was selected using lottery method. Collecting data continued until 376 patient charts were obtained from ordered frame.

#### **4.6. Data collection procedure**

The data extraction format was prepared by reviewing different literature for important variables of polypharmacy. Data were extracted from patient medical charts and medical records using structured data collection format (**Annex I**) by two trained data collectors. Data on patient characteristics, diseases encountered and medications used were collected from the patients and their medication chart.

#### **4.7. Data quality control**

To assure the quality of the data, properly designed data collection checklist was used. Every day the collected data were reviewed and checked for completeness and consistency.

#### **4.8. Data processing and analysis**

Data were entered using Epi Info version 7.1 and analyzed using the Statistical Package for Social Science (SPSS) version 25.0 for Windows. Descriptive statistics was used to describe the percentage and number of variables in the study. Logistic regression analysis was used to assess the association between the independent variables with poly-pharmacy. The results were presented as percentages using tables, figures and texts based on type of data. The strength of association was reported using odds ratio (OR) with its corresponding confidence interval (CI). Values of  $P \leq 0.05$  considered as significant

#### **4.9. Study variables**

##### **4.9.1. Dependent variable**

- ✓ Outcome variable: Polypharmacy

##### **4.9.2. Independent variables**

Independent variables: variables used to measure the Socio-demographic and clinical variables

- ✓ Age in years
- ✓ Gender
- ✓ Patient admission category (medical or surgical ward)
- ✓ Disease Diagnosis (infection disease, CVD, endocrine disorders, GIT disease, CNS disease, urologic disease, respiratory disease, hematologic or liver disease)

- ✓ Number of comorbidity (no comorbidity, 1-3 comorbidity,  $\geq 4$  comorbidity)
- ✓ Drug category of (Anti-infective drugs, cardiovascular drugs, Gastro-intestinal drugs, CNS drugs, hypovolemic drugs, respiratory drugs, anesthetic drugs, NSAID).

#### 4.10. Operational Definition

**Polypharmacy:** Is defined as the treatment of  $\geq 5$  different medications concomitantly on a single day at least once during admission.

**Excessive polypharmacy:** Is defined as the concomitant use of nine/ten or more medications taken regularly or as-needed.

**No polypharmacy:** Taking four or less drugs on a single day.

**Elderly:** Peoples whose age are greater or equal to 50 years of age.

**Patient chart:** Otherwise called as charts, patient medication records or cards are patient records with detailed personal, diagnostic and medication histories

**Drug category:** Pharmacologic classification of prescribed drugs for elderly patient.

**Comorbidity:** Concomitants/ other chronic disease in addition to main diagnosis during admission to ward of FPRH.

**Primary diagnosis:** is the main diagnosis for which the patient is admitted and treated with high attention while other diseases are taken as co-morbidity and can get their respective treatment.

#### 4.11. Ethical Considerations

Ethical clearance was obtained from the Scientific and ethics review committee of CDT-Africa, Addis Ababa University (reference number of CDT /0152/21 on 5/2/21) as well as from FPRH. Respecting privacy and protecting confidentiality of study participants were ensured during review of patients' chart. Thus, name and address of study participants were not recorded in the data abstraction format. The data were accessed only by the researchers and data collectors.

#### **4.12. Dissemination of the results**

The results will be submitted to Addis Ababa University, College Of Health Science, Center for Innovative Drug Development and Therapeutic Trials for Africa as part of postgraduate thesis and also to FPRH. The study is expected to generate evidence on the prevalence and associated factors of polypharmacy among elderly patients in FPRH and will provide the basis for designing appropriate interventions. The result will also be disseminated through presentations on specific conferences and in form of publications in a peer reviewed scientific journal.



## 5. RESULTS

### 5.1. Socio demographic characteristics of participants

In the current study, 376 charts of admitted patients to this hospital were collected. The minimum age was 50 years, while the max was 90 years. The mean age was 59.53 years. From the admitted charts reviewed, majority of patients were below 60 years of age. More than half (57.7%) of prescriptions were written for males and 81.6% of the patients were from Medical wards (Table 1). From the total study participants distribution of comorbidity occurrence of was more frequent in males (57%) than in females (43%) as depicted in figure 2.

Table 1. Socio-demographic of elderly patients at FPRH from January 1, 2019 up to January 1, 2020

Socio-demographic		Frequency		Percent
Gender	Female		159	42.3
	Male		217	57.7
Patient category	medical		307	81.6
	surgical		69	18.4
	Total		376	100.0
Age in groups		50-60	231	61.4
		61-70	86	22.9
		71-80	51	13.6
		≥80	8	2.1
Age profiles		Mean	59.53	
		maximum	90	
		Minimum	50	

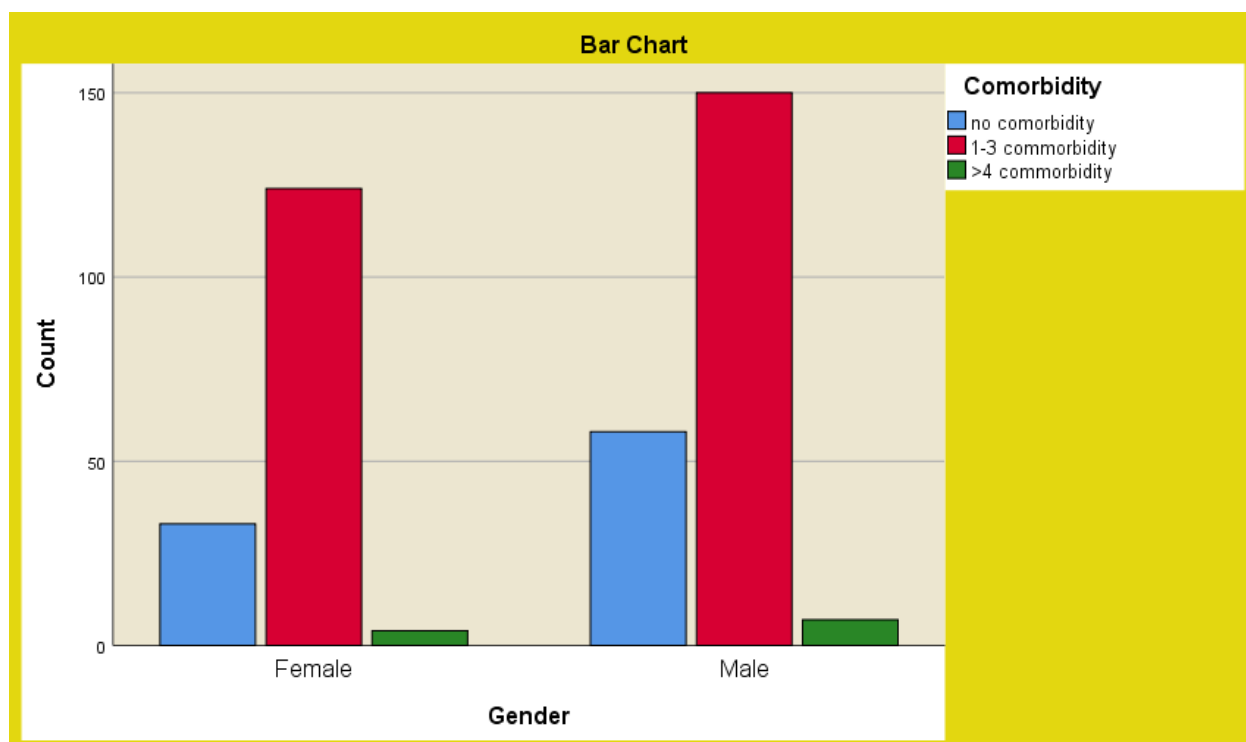


Figure 2. Level of comorbidity by gender of elderly patients at FPRH from January 1, 2019 up to January 1, 2020.

## 5.2. Clinical characteristics of study participants

From the total study participants admitted to hospital ward, the most commonly diagnosed disease was cardiovascular disease (CVD). It contributed for 30.3% of all diseases followed by diabetes mellitus (19.4%) and infectious diseases (17.6%) as shown in table 2. As indicated in Figure 3, the prevalence of comorbidity in 1-3 comorbid level was 274 (72.9%) and that of  $\geq 4$  comorbidity was 11 (2.9%). This shows that the highest number of comorbidity is seen in 1-3 comorbid level. DM was the most type of comorbidity seen and accounts in (31.4%) of the total comorbidity (Table 3). The minimum number of comorbidity per patient was one, while the maximum was four excluding the diagnosed diseases (Figure 3). The widely used drug group was cardiovascular drug (57.7%), followed by anti-diabetic drugs (46.8%) and NSAID (29.5%) as shown in table 4. The minimum total number of drugs taken per person was one, while the maximum was 12 drugs of different classes. From the total study participants, the amount of nopolypharmacy=52.1%, polypharmacy=40.7%, Excessive pharmacy=7.2 % respectively as indicated in figure 4.

From a total study participants, 52.1% of patients were taking at least 1-4 drugs, and the mean of prescribed drugs was 4.57, almost half 180 (47.9%) of the study participants have prescribed 5 or more treatment drugs and, this shows almost half of the study populations had polypharmacy (47.9%) as shown in table 5. Among of patients prescribed with 5 or more drugs, 107 were males.

Table 2. Primary diagnosis of elderly patients at FPRH from January 1, 2019 up to January 1, 2020.

Primary Diagnosis		
types	Frequency	Percent
Infection disease	66	17.6
CVD disease	114	30.3
Endocrine disorders	73	19.4
Gastro-intestinal disease	26	6.9
CNS disease	9	2.4
Urologic disorders	34	9.0
Respiratory disorders	15	4.0
Hematologic disorders	23	6.1
liver disease	16	4.3
Total	376	100.0

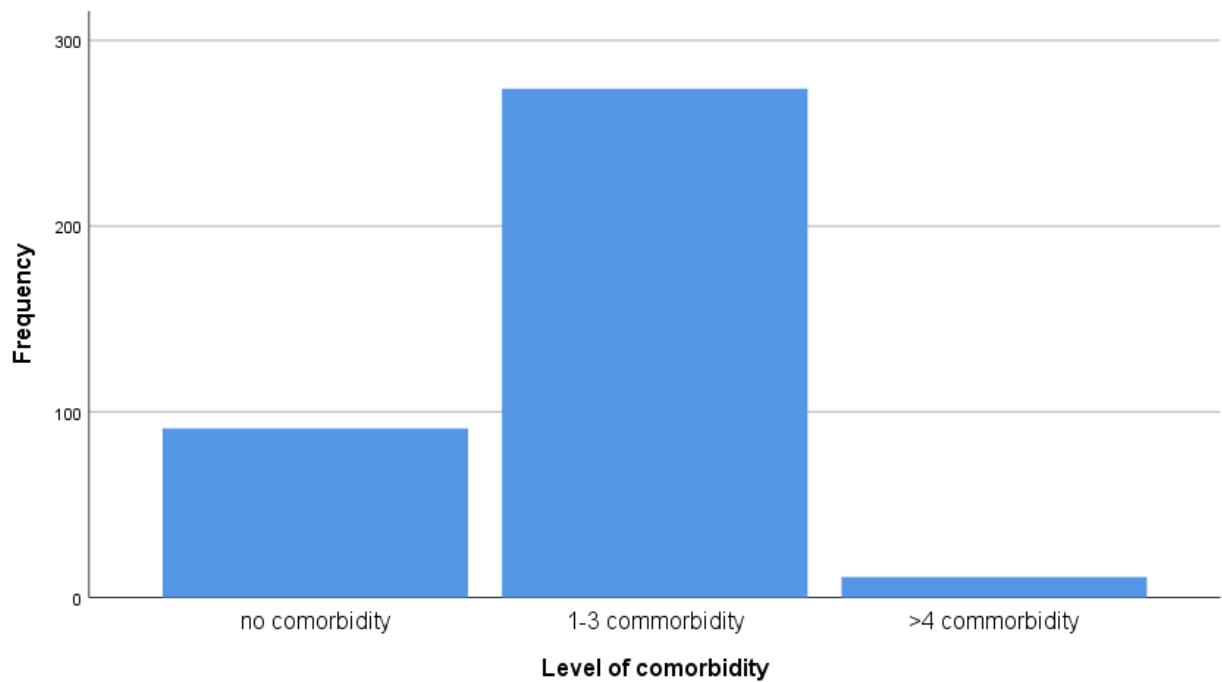


Figure 3. Bar chart that shows level of comorbidity among elderly patients at FPRH from January 1, 2019 up to January 1, 2020.

Table 3. Types of comorbidity among elderly patients at FPRH January 1, 2019 up to January 1, 2020.

Types of comorbid diseases		
	Frequency	Percent %
Infectious disease	286	17.6
Respiratory	44	11.7
Gastro intestinal disease	49	13.0
CVD	111	29.5
DM	118	31.4
Joint disease	29	7.7
Dyslipidemia	114	30.3

Urinary tract diseases	26	6.9
Psychiatry	13	3.5

Table 4. Pharmacologic category of prescribed drugs for elderly patients at FPRH from January 1, 2019 up to January 1, 2020.

Pharmacologic category of drugs	Frequency of prescribed drugs	
Anti-infective	134	35.6%
Cardiovascular	217	57.7%
GIT drugs	53	14.1%
Hypovolemic	76	20.2%
CNS	21	5.6%
Anesthetic	44	11.7%
Respiratory	28	7.4%
NSAID	111	29.5%
Lipid lowering	122	32.4%
Antidiabetic drugs	176	46.8%

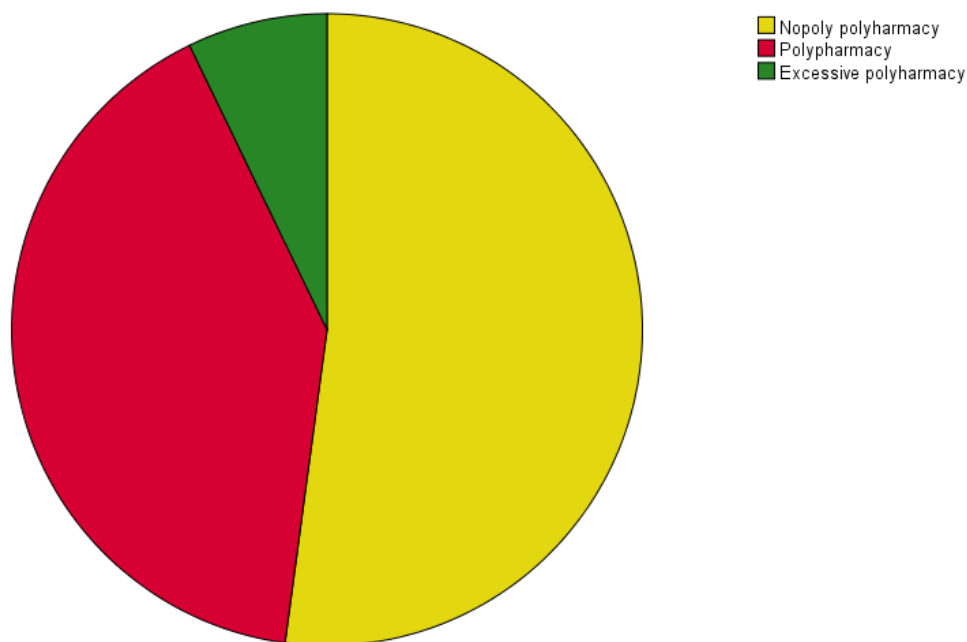


Figure 4. The types and magnitude of polypharmacy in elderly patients at FPRH from January 1, 2019 up to January 1, 2020.

Table 5. Frequency of prescribed drugs and related profiles of elderly patients at FPRH from January 1, 2019 up to January 1, 2020.

Prescribed drugs		Frequency	Percent
Number of drug prescribed	$\leq 1$	18	4.8
	2-4	178	47.3
	5 and more	180	47.9
Measures of prescribed drugs	Mean	4.57	
	Minimum	1	
	Maximum	12	

### 5.3. Associated factors to polypharmacy

Analysis of association between all independent variables and poly-pharmacy was first done by binary logistic regression as shown in table 6. The binary logistic regression showed that disease

[CVD] with (OR=0.148(.045-.490); p value=0.002 at 95% CI), [Endocrine disorders] with (OR =0.148(.045-.490); p value=0.002 at 95% CI), comorbidity with (OR =0.135(.039-.465); p value=0.002 at 95% CI), [CNS disorders] with (OR =0.167(0.028-.997); p value=0.05 at 95% CI) and patient category [medical] with (OR =0.400[0.230-.6950]; p-value=0.001) were significantly associated with polypharmacy. Age and gender were excluded from multivariate logistic regression because of p values were greater than 0.05. However, the multivariate logistic regression showed that disease [CVD] with (AOR=7.456(2.109-26.360); p value=0.002 at 95% CI), [Endocrine disorders] with (AOR=7.331(1.988-27.043); p value=0.003 at 95% CI) and comorbidity [1-3 comorbid] (AOR=4.472(1.049-19.063) at 95% CI, P=0.043) have a significant association with polypharmacy. Accordingly, patients with CVD were about 7.456 times (AOR=7.456(2.109-26.360); p value=0.002 at 95% CI) more likely to experience polypharmacy compared to others. Patients with endocrine disorders were about 7.331 times (AOR=7.331(1.988-27.043); p value=0.003 at 95% CI) more likely to experience polypharmacy compared to others. Patients with at least one co-morbidity were about 4.472 times (AOR=4.472(1.049-19.063) at 95% CI, P=0.043) more likely to experience polypharmacy compared to those with no co-morbidities

The assessment of medical records of hospitalized patients revealed that 75.6% of the patients received  $\geq 5$  drugs concurrently, whereas 24.4% of surgical patients received equal number of medications.

Table 6. The associated factors of poly-pharmacy among elderly patients at FPRH from January 1, 2019 up to January 1, 2020.

S.NO	Variables	Categories	Poly-pharmacy					
			Yes	No	COR [95% CI]	P-value	AOR [95% CI]	P-value
1.	Gender	Male	107	108	.	.		
		Female	71	90	0.796(0.528-	0.276	1.373(0.861-2.189)	0.183
2.	Age	50-60	105	126	1.389(0.324-	0.658	671(0.131-3.441)	0.632
		61-70	45	41	1.829(0.411-	0.428	0.407(.075-2.195)	0.296
		71-80	25	26	1.603(0.346-	0.547	0.585(.104-3.273)	0.541
		>=80	3	5	.	.	.	.
3.	Disease	Infection diseases	42	24	0.583(0.169-	0.393	1.801(0.491-6.611)	0.375
		CVD	35	79	0.148(.045-.490)	0.002	7.456(2.109-26.360)	0.002
		Endocrine disord	21	52	0.135(0.039-.465)	0.002	7.331(1.988-27.043)	0.003
		Gastro intestinal	19	7	0.905(0.218-	0.891	0.699(0.152-3.224)	0.646
		CNS disorders	3	6	0.167(0.028-	0.050	3.391(0.493-23.339)	0.215
		Urologic disord	26	8	1.083(0.272-	0.910	0.729(0.170-3.133)	0.671
		Respiratory disea	7	8	0.292(0.064-	0.112	3.114(0.619-15.677)	0.168
		Hematologic	13	10	0.433(0.107-	0.242	2.286(0.523-9.982)	0.272
		Liver disease	12	4	.	.	.	.
4.	Comorbi dity	Yes	149	136	1.197(0.745-	0.458	0.765(0.423-1.383)	0.375
		No	29	62				.
5.	Patient category	medical	134	17	0.400(0.230-	0.001	1.746(0.907-3.361)	0.095
		surgical	44	23	.	.	.	.
6.	Level of comorbid ity	No comorbid	29	62	.	.	.	
		1-3 comorbid	140	134	0.281(0.076-	0.056	4.472(1.049-19.063)	0.043
		≥4 comorbid	9	2	0.606(0.173-	0.432	1.381(0.354-5.384)	0.642

COR: Crude odd ratio, AOR: Adjusted odd ratio, CI: confidence interval

P-value is significant at  $\leq 0.05$  level



## 6. DISCUSSION

To the best of our knowledge, this study was the first to assess the prevalence and associated factors of polypharmacy among elderly patients admitted to federal police referral hospital. According to this study polypharmacy was defined as prescribing >5 different medications concomitantly in a single prescription at least once during the study period. In this study, medical charts of elderly (aged 50 year and above) admitted to ward were studied for the prevalence of polypharmacy and associated factors. The majority of patients were males (57.7%) %, which is in line with the finding of studies conducted in Yekatit 12 Hospital compared to women of a similar age(1). The mean age of study patients were  $59.52 \pm 9.666$  years, which was comparable to the data reported from previous studies in cardiovascular patients attending outpatient clinic in one of the university hospitals of Ethiopia (26).

Many studies reported that disease burden as the main reason for occurrence of polypharmacy (12). In current study the most common diagnosis identified was CVDs that encompassing 30.3%, and hypertension, congestive heart failure and stroke were some of the identified CVDs. Similar report of a cross-sectional study conducted in China showed that CVD (hypertension) was the most frequent diagnosis in the elderly ( $\geq 80$  years of age) patients (35).

In our study the prevalence of comorbidity in 1-3 comorbid level was seen 274 (72.9%) when compared with the rest, which shows that the highest number of comorbidity and this finding is in line with the other studies prevalence of co-morbidity (35–80%) among elderly populations (2) but the finding was lower than that reported in Canada (83.6%)(38). One of the possible reasons for the difference in prevalence of comorbidity might be differences in life style of individuals like smoking, alcohol intake, physical activity or other socioeconomic status. The most commonly identified type of comorbidities was DM (diabetes mellitus II) that account for 31.4%. The minimum number of comorbidity per patient was one, while the maximum was four excluding the diagnosed diseases.

The mean number of prescribed drugs in this study ( $4.57 \pm 2.361$ ) was lower than the study conducted in medical ward of Ayder Referral Hospital, Northern Ethiopia with a mean of 6 ( $\pm 4$ ) medications per patient during admission and in tertiary Care Hospital in Puducherry which was ( $7.61 \pm 3.37$ )(11,39). This difference could be attributed to the difference in health professional's

status, difference in health professional's knowledge and practice toward management of elderly people and identifying polypharmacies in these settings. The maximum numbers of drugs recorded per patient in this study was 12. The most widely used drug group was cardiovascular drugs 57.7% followed by antidiabetic (46.8% and this finding is comparable to the data reported from previous studies in Iran (15). In contrast to this the study conducted in Shashamane hospital reported that drug group of antimicrobials (58.7%), followed by cardiovascular drugs (25%) is the most widely used pharmacologic group (3).

The prevalence of polypharmacy reported in literature varies between 10% to as high as around 90% according to the age group, definition used, healthcare and geographical setting of the study (40). In the current study, the overall prevalence of polypharmacy was (47.9%), which is (5–8 drugs) polypharmacy and (> 9/10 or more drugs) excessive polypharmacy is 40.7% (n = 153) and 7.2% (n = 27) respectively, which is similar with the finding of cohort study conducted in Sweden 44.0% and 11.7%, respectively (27). However, the finding of this study was lower than a study conducted in Kuwaiti (58.4%) and Saudi Arabia (78%) (19,27). In contrary to the above, our finding was higher when compared to that of the study conducted in India (33.7%) (41), which might be attributed to the difference in demographics, socioeconomic circumstances and self-assessed health factors that can independently associated with polypharmacy. A retrospective cohort study also reported that polypharmacy participants were significantly elder and more frequently obese, had lower educational attainment and were former smokers (11).

The data revealed that prevalence of polypharmacy was not significantly associated with age and gender. This finding was similar with the result of a study conducted in Addis Ababa and in India (1,41). In contrast to this finding, study of polypharmacy among the elderly in northern Iran reported that, marital status, being retired, or being employed apart from homemakers was significantly associated with the increase of polypharmacy (15). However, it was significantly associated with medical ward. This higher figure might have been obtained because smaller number of surgical patients, or due to the difference in extent of comorbidity; severity of diseases, or knowledge of prescribers.

The present study also showed that prevalence of polypharmacy was significantly associated with CVD (p value=0.002), endocrine disorders; (p value=0.003) and comorbidity (p value=0.043) were significantly associated with polypharmacy. According to the findings,

patients with CVD were about 7.456 times (AOR=7.456(2.109-26.360); p value=0.002 at 95% CI) more likely to experience polypharmacy compared to those with no this disease. Patients with endocrine disorders were about 7.331 times (AOR=7.331(1.988-27.043); p value=0.003 at 95% CI) more likely to experience polypharmacy compared to those with no this disease. Patients with at least one co-morbidity were about 4.472 times (AOR=4.472(1.049-19.063) at 95% CI, P=0.043) more likely to experience polypharmacy compared to those with no co-morbidities. However, statistically significant association between gender and polypharmacy was also not observed. Similarly, polypharmacy and age was not statistically significant,  $p>0.05$ . In contrast to this finding a British Birth Cohort Study reported that cardiovascular medications in particular are most commonly associated with adverse drug reactions in elder adults, and men individuals from lower socioeconomic groups, are more likely to suffer from cardiovascular disorders and consequently cardiovascular polypharmacy (12). The most commonly used pharmacologic medications group was CVD agents that accounts (57.7%) and followed by antidiabetic drugs (46.8%). Unlike the above finding, the research conducted in Kuwait found that the most commonly used medications (82.6% of the study population) were blood glucose-lowering agents, and this difference might be due to differences in burden of co-morbidity and life styles in these settings (27). Moreover, the number of study participants might also affected the result differences.

## **7. STRENGTH AND LIMITATIONS**

### **7.1. Strength**

To our knowledge, this retrospective study of polypharmacy in elderly patients was the first study in FPRH which has given an insight on the prevalence and associated factors of polypharmacy among elderly patients admitted to the hospital. Furthermore, findings from this study have added knowledge on this specific topic among elderly patients and identified the magnitude of polypharmacy. Besides to that, our results highlighted the factors that may contribute to polypharmacy. Thus, it is significant to recognize the prevalence and factors associated with polypharmacy. Such studies would be helpful in understanding the magnitude of polypharmacy in treatment of elderly patient. Moreover, taking action to reduce polypharmacy in turn results in reduction of morbidity, mortality and health expenditure.

### **7.2. Limitations**

Although this study highlights a number of very important issues, there are also limitations.

This study suffers all the limitations of a retrospective study (relevant variables may not be available in the original records, and attrition problems may be serious due to loss of records, incomplete records or difficulties in tracing or locating all of the original population for further study). Due to the retrospective design of the study, there was a limited ability to consider prescribers opinions and clinical judgments.

As the study was done from secondary data, there might be discrepancy in actual number and type of medication that the patient received. Polypharmacy was defined as number of drugs prescribed for patient on date of admission only than the whole hospital stay of the patient.

The other main limitation is, since this study was conducted in one institution and it might be difficult to generalize for the general population.

## **8. CONCLUSIONS**

From these findings, it can be concluded that polypharmacy in elderly patients is prevalent in FPRH and the major factors associated with the polypharmacy are CVD, endocrine disorders and comorbid conditions. As we can conclude from our result age, gender and patient admission category are not associated with polypharmacy in this population.

## **9. RECOMMENDATIONS**

From the finding of this study, it is possible to recommend that health professionals should follow guidelines and they have to use references for preventing the occurrences of unnecessary polypharmacy that may rise from CVD, endocrine disorders and other comorbid conditions in elderly patients. Health facilities and health bureaus should avail different guidelines for prescribers and dispensers for referencing purposes; All stakeholders in health care, Ministry of health or regulatory authority should prepare updated guidelines which provide evidence based prescribing patterns.

### **9.1. For the health professionals**

From the finding of this study it is possible to recommend that prescribers should improve their prescribing patterns in elderly patients those identified with CVD, endocrine disorders and comorbid conditions. Regular medication chart review is required among health care professionals to avoid unnecessary prescriptions in elderly patients.

### **9.2. For the institution (hospital)**

Selective and trainings and seminars that focus on polypharmacy, CVD, endocrine disorders and comorbid conditions must be given to the health professionals especially for those who are responsible to prescribe medications like physicians, nurses and so on. Follow up and strengthening of the DTC as well as DIC in the hospital can narrow the gaps similarly the drug and therapeutic committee better discusses about drug prescribing pattern at least during morning session with other health workers. In addition to that the drug information service should prepare drug news and post update on news board and this could, primarily, be initiated and coordinated by the pharmacy department. The EFDA and the Federal Ministry of Health (FMOH) must also take the lead to ensure narrowing of this gap.

### **9.3. For researchers**

We strongly recommend that more prospective studies design that is organized training for the data collectors and participates those more experienced and high-level medical professionals and further study is essential at country level.

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## 11. ANNEXES

### 11.1 Annex: Data abstraction tool

Questionnaire tool for assessment of prevalence and associated Factors with polypharmacy among elderly patients admitted to Federal Police Hospital, Addis Ababa, Ethiopia.

001. Data collector: code \_\_\_\_\_ Name \_\_\_\_\_ Patient chart registration number \_\_\_\_\_

002. Date of data collection \_\_\_\_/\_\_\_\_/\_\_\_\_ Time \_\_\_\_\_

003. Checked by Supervisor: Signature \_\_\_\_\_ day \_\_\_\_\_ month \_\_\_\_\_ year \_\_\_\_\_

#### Section 1: Demographic characteristics

1. Gender i. Male ☐ ii. Female ☐
2. Age (years) i. 50-60 ☐ ii. 61-70 ☐ 71-80 ☐ ii i. ≥80 ☐
3. Marital Status i. Single ☐ ii. Married ☐ iii. Widowed ☐ iv. Divorced ☐

#### Section 2: Socio-Economic Characteristics

1. Education level i. Primary (≤10 years) ☐ ii. Secondary (11-12 years) ☐  
iii. Graduate & above ☐
2. Patient category i. Medical ☐ ii. Surgical ☐
3. Residence i. Rural ☐ ii. Urban ☐

#### Section 3: Health and disease related Characteristics

1. Health Risks i. Smoking ☐ ii. Alcohol Consumption ☐ iii. Obesity ☐  
iv. Multi substance use ☐ v. None ☐
2. Primary diagnosis /or with other chronic condition(s):
  - i. Infection disease
  - ii. CVD disease
  - iii. Endocrine disorders
  - iv. Gastro-intestinal disease

- v. CNS disease
  - vi. Urologic disorders
  - vii. Respiratory disorders
  - viii. Hematologic disorders
  - ix. liver disease
3. Comorbid diseases,
- i. Yes
  - ii. No
4. Number of comorbid diseases, if yes for question number 3
- i. No comorbid diseases
  - ii. 1-3 comorbid diseases
  - iii.  $\geq 4$  comorbid diseases

#### **Section 4: Drug utilization characteristics**

- 1. Number of drugs taken by patient per day or/ admission
- 2. Categories of prescribed drugs
  - i. cardiovascular
  - ii. Antihypertensive
  - iii. Anti-Diabetic
  - iv. Steroid
  - v. Antibiotic/Antifungal
  - vi. NSAID
  - vii. Anticoagulant
  - viii. Laxative
  - ix. Sedative, Psychoactive
  - x. Antacid
  - xi. Antiemetic
  - xii. Opioids
  - xiii. Others, specify\_\_\_\_\_