

Assessment of Drug Therapy Problems and Contributing Factors among Adults Admitted to Tirunesh Beijing General Hospital, Addis Ababa, Ethiopia



By

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A Thesis Submitted to the Department of Pharmacology and Clinical Pharmacy School of Pharmacy, College of Health Sciences, Addis Ababa University in partial fulfillment of the requirements for the Degree of Master in Pharmacy Practice.

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This is to certify that the thesis prepared by Tsegaye Ababiya entitled “Assessment of drug therapy problems and contributing factors among adults admitted to Tirunesh Beijing General Hospital” and submitted in partial fulfillment of the requirements for the degree of master of Pharmacy in pharmacy practice complies with respect to University regulation and laws of originality and quality.

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Abstract

The philosophy of pharmaceutical care (PC) is the sum of responsibilities of the pharmacist to meet all of the patient's drug-therapy needs through direct patient care and cooperation with other facets of the health care. It is important to avoid drug therapy problems (DTPs) as they may cause morbidity and mortality, reduce quality of life and increase health expenses for the patient and for society. This study aimed to assess DTPs and associated factors among adults admitted to Tirunesh Beijing General Hospital. A prospective cross-sectional study was conducted on 220 adults admitted to medical ward of TBGH. Cippole's DTPs classification system was used for identification, intervention and documentation of DTPs. Thirty-eight percent of patients encountered at least one DTP and 298 DTPs were identified in 177 patients (104 males and 73 females) with prevalence of 80%. Out of 1467 drugs prescribed, 62 drugs were significantly associated with the occurrence of DTPs. "Needs additional drug therapy" (36.9%), was the most frequently identified DTPs followed by "inappropriate dose" (19.8%) and "noncompliance" (19.5%). Hospital stay more than seven days ($AOR=3$, 95% $CI:1.394-5.843$; $p=0.004$) and polypharmacy ($AOR=2$, 95% $CI: 1.168-5.287$; $p=0.019$) were potential risk factors for the occurrence of DTPs. In conclusion, there is high prevalence of DTPs, with the most frequent one being needs additional drug therapy followed by inappropriate drug therapy and noncompliance. Polypharmacy and number of hospital stay were potential risk factors for the occurrence of DTPs. In recommendation, all stake holders should work in collaboration to combat drug therapy problems as it poses harm and poor quality life to patients and great attention should be given for those drugs which are associated with the occurrence of DTPs.

Key words: Drug therapy problems, Adults, Tirunesh Beijing General Hospital, Addis Ababa, Ethiopia.

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Abbreviations and Acronyms

AOD	Adjusted Odds Ratio
ADR	Adverse Drug Reaction
CI	Confidence Interval
CNS	Central Nervous System
CVD	Cardiovascular Drugs
COR	Crude Odd Ratio
DTPs	Drug Therapy Problems
ESTG	Ethiopian Standard Treatment Guidelines
GIT	Gastrointestinal Tract
OR	Odds Ratio
PC	Pharmaceutical Care
RR	Relative Risk
RHZE	Rifampin, Isoniazid, Pyrazinamide, Ethambutol
SPSS	Statistical Package for the Social Sciences
SD	Standard Deviation
TB	Tuberculosis
TASH	Tikur Anbesa Specialized Hospital
TBGH	Tirunesh Beijing General Hospital

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1. Introduction

1.1 Background

Medicine is an ever-changing science, which will make the health-care system extremely complex and sophisticated. In this sense, it is very crucial to assess risk and harm to patients in the search for ultimate patient safety [1]. The philosophy of pharmaceutical care (PC) is the sum of responsibilities of the pharmacist to meet all of the patient's drug-related needs through direct pharmaceutical care and cooperation with other disciplines of health care teams [2] and by identifying and resolving drug-therapy problems (DTPs) [3].

A DTPs is an event or circumstance involving drug therapy that actually or potentially interferes with desired health outcomes. An actual DTP has result in clinical manifestations like adverse drug reaction (ADR) or therapy failure. A potential DTP is the one that is not manifested, but if left unresolved, it may lead to drug-related harm to the patient [5].

It is important to prevent DTPs as they may pose morbidity and mortality, reduce quality of life and increase health care costs for the patient and for society. To avoid actual and potential DTPs, we need to have basic knowledge about the patient's total drug use and handling as well as other factors influencing the patient's use of medicines [4]

It would be much better to prevent DTPs than to correct them, but this is not always possible because of the complexity of pharmacotherapy, lack of training and knowledge of health care providers and the behavior of the medicine users. Also, some pharmacotherapy problems are the result of an unexpected reaction of the individual, like allergies, which cannot always be predicted. Therefore, even if one could analyze the medication and patient related factors during a medication review before a medicine is handed over to the patient, the evaluation of the pharmacotherapy after it has been initiated still remains necessary to detect DTPs and optimize outcomes [6]. An enormous number of DTPs exist because of the rapidly expanding array of drug products available, the growing number of diseases being recognized & diagnosed, and the growing number of patients entering the health care system. All patient problems involving medications can be categorized into one of the seven types of drug therapy problems. These include "unnecessary drug

therapy”, “need for additional drug therapy”, “ineffective drug”, “dosage too low”, “adverse drug reaction”, “dosage too high” and “noncompliance” [7].

The most commonly mentioned factors involved in DTPs are the social pressures, to which prescribers are subjected, the structure of the health system and pharmaceutical marketing. Patients also play an important role in this phenomenon, since they may agree to treatment and then show only partial adherence or may simply decide not to adhere to the treatment [8].

Drug therapy is growing more widely, thus making appropriate drug prescribing increasingly challenging. A collective team approach, including clinical pharmacists addressing DTPs, has been shown to reduce the frequency of DTPs. By applying pharmaceutical care services economical savings, reduction of adverse drug events and enhanced quality of life have been reported [9].

One or more DTPs may develop in a given patient after the initial drug therapy. Researchers have shown that costs associated with DTPs exceed the expenditures for initial drug therapy; that is, the total cost of drug-related morbidity and mortality exceeds the cost of the medications themselves. DTPs are increasingly recognized as a serious and urgent—but largely preventable—medical problem [10].

1.2 Statement of the problem

Drug-related problems are an important cause of morbidity and mortality and causes significant burden on health- care resources [11]. Although medications play an important role in the cure, palliation and prevention of disease, they also expose patients to drug-related problems [7]. DTPs could prevent or delay patients from achieving desired therapeutic goals and it has been attributed to unnecessary over prescription of drugs, substantial worsening of diseases, avoidable increases in hospital admission rates, and longer hospital stays leading to a significant medical burden [12].

It has been shown that drugs may give negative health outcomes, such as increased morbidity and mortality and reduced quality of life. Moreover, lack of effect of the chosen drug can also be a challenge in the management of patients, and often optimal levels of blood glucose, cholesterol or blood pressure are not reached during drug treatment. The reason could be the choice of drug or dosage, or patient factors such as drug-disease interactions or adherence problems [13].

It is estimated that the annual cost of drug-related morbidity and mortality is nearly \$ 177 billion in the United States. Twice as much money is used to solve drug therapy problems and adverse drug events than on the drug themselves [7]. Analysis of original publications published between 1990 and 2005 on the topics of medication errors and/or adverse drug events in hospitalized patients, focusing on the frequency of, risk factors for and avoidance of such problems associated with pharmacotherapy, indicated that medication errors occurred in a mean of 5.7% of all episodes of drug administration [13][14].

A 6-month prospective study which was conducted, including hospitalized patients in the internal medicine ward of the University Hospital of Beirut, in order to identify drug-related problems showed that among 572 hospitalized patients, 90 patients developed DTPs (41 women and 49 men). Hydro-electrolytic and gastrointestinal problems accounted for 32% and 24% respectively. Cardiovascular drugs were the most frequently implicated (44%), followed by anticoagulants (17%) and corticosteroids (14%). The most commonly identified DTPs were drug interactions (37%), over-dosage (28%), non-conformity to guidelines or contra-indications (23%), under dosage (10%) and improper administration (2%) [16].

A prospective cross sectional study conducted at Tikur Anbesa Specialized Hospital among medical ward patients shows that, from 225 admitted patients, DTPs were found in 52% of study subjects. A drug-drug interaction (48% of all DTPs) was the most common DTP followed by ADR (23%). Anti-infectives and gastrointestinal medicines were commonly involved in DTPs [7]. Similar prospective observational cross sectional study conducted at Jimma specialized Hospital among medical ward patients reported that, out of 257 study participants, 189 (73.5%) had DRPs and a total of 316 DTPs were identified. From the six classes of DTPs studied (Table 1), 103 (32.6%) cases related to untreated indication or need additional drug therapy, and 49 (15.5%) cases related to high medication dosage. Unnecessary drug therapy was observed in 49 (15.5%) cases, low medication dosage in 44 (13.9%), and ineffective drug therapy in 42 (13.3%) cases. Noncompliance in 31 (9.8%) cases [17].

To our knowledge, there was no previous study on drug therapy problems in hospitals of Addis Ababa City Administration Health Bureau, particularly Tirunesh Beijing general Hospital. Thus, this study was aimed to determine the prevalence of DTPs and associated factors among adults admitted to medical ward of Tirunesh Beijing general hospital, Addis Ababa, Ethiopia.

Table 1. Drug therapy problems based on unmet drug related needs¹⁷

Drug related needs	Categories of drug therapy problems
Indication	Unnecessary drug therapy Needs additional drug therapy
Effectiveness	Ineffective drug therapy Dosage too low
Safety	Adverse drug reaction Dosage too high
Compliance	Noncompliance

1.3 Literature Review

1.3.1 Prevalence and Types of DTPs

Different studies report the prevalence of DTPs among hospitalized patients across the world. Studies done in Ethiopia shows that 75.51%, 73.5% and 52% DTPs was reported among hospitalized medical ward patients from Dessie, Jimma and Tikur Anbessa Specialized Hospital respectively [18] [17] [7]. Another studies from Gedo Hospital, West Showa Zone and Gondar Teaching Hospital reports that the prevalence of DTPs was 75.6% and 66% respectively [19] [20]. Another study from Jimma also reports that out of 257 study participants 140(54.5%) had unnecessary drug therapy or inappropriate dosage [21]. From a prospective observational study conducted among hospitalized medical ward patients at Dessie referral hospital 159 DTPs were identified among 140 patients of which needs additional drug therapy (35.85%) was the most common followed by unnecessary drug therapy (30.19%) and dosage too low (13.2%). Antibiotics, 75 (40.32%) was the most frequent drug class involved in drug therapy problems followed by cardiovascular drugs, 69 (37.1%) and nonsteroidal anti-inflammatory drugs, 9(4.84%). Ceftriaxone (25.81%) was the most frequent specific drug prone to the drug therapy problems followed by spironolactone (14.52%), enalapril (6.45%) and furosemide (6.45%) [18].

Another hospital based cross sectional study conducted at Jimma University Specialized hospital reported that among 257 study participants, 189 (73.5%) had DTPs and a total of 316 DTPs were identified. From the six classes of DTPs studied, 103 (32.6%) cases related to untreated indication or need additional drug therapy, and 49 (15.5%) cases related to high medication dosage. Unnecessary drug therapy in 49 (15.5%) cases, low medication dosage in 44 (13.9%) cases, and ineffective drug therapy in 42 (13.3%) cases were the other classes of problems identified. Noncompliance in 31 (9.8%) cases was the least prevalent DTP. Independent factors which predicted the occurrence of DTPs in the study population were sex, age, polypharmacy, and clinically significant potential drug-drug interactions [17].

A prospective observational study conducted at Tikur Anbessa Hospital in medical ward admitted patients (Ethiopia) reports that among 225 study participants, DTPs were found in 52% of study subjects. A drug-drug interaction (48% of all DTPs) was the most common DTP followed by adverse drug reaction (23%).

Anti-infective and gastrointestinal medicines were commonly involved in DTPs. Drugs with the highest drug risk ratio were gentamycin, warfarin, nifedipine, and cimetidine. The number of drugs taken by the patient per day was an important risk factor for DTPs [7].

A prospective cross sectional study was conducted among hospitalized patients at Gedo Hospital (Ethiopia) also reports that from the seven classes of drug related problems studied, 75 (35.9%) of the drug related problems were non-compliance followed by need of additional drug therapy 63 (30.1%). Factors independently predicted the occurrence of drug related problems in the study were sex, educational status, occupation, poly pharmacy and number of diagnosed diseases [19]. A similar hospital based prospective cross sectional study conducted in University of Gondar Teaching Hospital (Ethiopia) reports that of the 256 study subjects, 169 (66.0%) of patients had DTP. A total of 174 DTPs were identified on average of 1.04 DTPs per patient. Of the identified DTP the most common DTPs were found to be due to inappropriate dosage 39.1 %, non-compliance 28.9%, and need additional therapy 24.2%. Length of hospital stay [adjusted odds ratio (AOR) =2.416 [95% confidence interval (CI) 1.111-5.253, p=0.028]), number of disease (AOR=3.315 [95%CI: 0.301-36.573], p=0.027) and number of drugs per patient (AOR=9.088 [1.012-81.623], p=0.033) significantly affect DTP [20]. A cross sectional study conducted at internal medicine of Turkey Hospital reports that among 100 study subjects, at least one potential DTP was seen in 80% of the patients and 163 potential DTPs were identified (average = 1.6 DTPs/patient). The most common causes of DTPs were errors in drug selection (44.78%), dose selection (27.61%) and medication procedures (21.47%). There were significant correlations ($p < 0.05$) between DTPs and age ($r = 0.4$), number of drugs used ($r = 0.32$), duration of hospitalization ($r = 0.25$), renal impairment ($r = - 0.34$) and inflammation ($r = 0.31$) [22].

Another retrospective cross-sectional study was performed in an acute-care hospital in Singapore. It showed that, of 347 patients prescribed polypharmacy (43% female and 58.2% geriatrics), age and gender were not statistically correlated with developing DTPs. An increased number of medications was associated with higher risk for patients with DTPs on admission ($p = 0.001$), but not for inpatients with DTPs ($p = 0.119$). Results from patients with ADRs showed that the relative risk (RR) of geriatrics prescribed polypharmacy and major polypharmacy (10 and more drugs)

were 1.01 and 1.23, respectively. Female patients had a RR of 0.79 compared with male patients in developing ADRs [23].

A 7-month prospective study was conducted at a multispecialty tertiary care teaching hospital in South Indian Hospital reports that a total of 261 DTPs were identified from 189 patients. The incidence of DTPs was found to be 7.9 per 100 patients. The most common DTP was found to be drug use without indication (18%) followed by improper drug selection (14%). Seventeen percent of the DTPs observed were in patients suffering from cardiovascular disorders followed by respiratory disorders (15%). The average time spent for each intervention was 12.5 minutes [26].

1.3.2 Role of clinical pharmacist on prevention of DTPs

In pharmaceutical care practice the pharmacist takes responsibility for meeting patients' drug-therapy needs by detecting and resolving drug therapy problems (DTPs) [3].

A 6-month prospective observational study conducted in India from 189 study participants also revealed that 130 patients have at least one DTP. A total of 416 DTPs were identified (on average, 2.2 DTPs per each patient). Of the 416 DTPs, 125 (30.04%) interventions were accepted, 7 (1.68%) interventions were not accepted, while remaining (68.26%) accepted but no action taken. The results of the study indicate that incidence of DTPs was substantial and pharmacist-led interventions resulted in resolution of DTPs. This represents the need for the active role of the clinical pharmacist in the developing countries like India [24].

A cross-sectional observational study which was conducted at one of the largest hospitals in Istanbul, Turkey by clinical pharmacist to identify DTPs at medical ward shows, at least one potential DTP was seen in 80% of the patients and 163 potential DTPs were identified (average = 1.6 DTPs/patient). The most common causes of DTPs were errors in drug selection (44.78%), dose selection (27.61%) and medication procedures (21.47%). There were significant correlations ($p < 0.05$) between DTPs and age ($r = 0.4$), number of drugs used ($r = 0.32$), duration of hospitalization ($r = 0.25$), renal impairment ($r = -0.34$) and inflammation ($r = 0.31$) [22].

Clinical pharmacists also have influence on medication reconciliation intervention according the study done to assess the incidence of unintentional medication discrepancies in Ethiopia. According to this study, 123 patients were included (pre-intervention, 49; post-intervention, 74).

The proportion of patients with at least one unintended discrepancy was reduced from 59% to 10.5% after the intervention ($p < 0.001$). Similarly, the percentage of patients with potentially severe clinical impact medication discrepancies reduced significantly after the intervention ($p < 0.01$). Most importantly, the likelihood of occurrence of unintentional medication discrepancies was approximately 17 times more often in the absence of pharmacist intervention (OR 16.45, 95% CI 5.22, 51.85) [25].

A 7-month prospective study was conducted at a multispecialty tertiary care teaching hospital in South Indian Hospital reports that, most frequent change initiated by the intervening pharmacist was cessation of the drug (20%) and pharmacist initiated change in drug therapy was well accepted by the physicians. The study demonstrates that routine clinical pharmacist review of in-patient drug therapy can improve patient outcome and reduce patients' healthcare cost [26].

A 6-month non-randomized clinical trial from Sri Lanka also reports using data from 361 patients in the intervention group and 354 patients in the control group. Resolutions of drug-related problems were higher in the intervention group than in the control group (57.6%; 592/1027, versus 13.2%; 161/1217; $P < 0.001$) and the medication was more appropriate in the intervention group. Mean score of medication appropriateness index per patient was 1.25 in the intervention versus 4.3 in the control group ($P < 0.001$). Patients in the intervention group were less likely to be readmitted due to drug-related problems (44 patients of 311 in the intervention versus 93 of 311 in the control group; $P < 0.001$) and a ward-based clinical pharmacy service improved appropriate prescribing, reduced drug-related problems and readmissions for patients with no communicable diseases [27].

1.4 Significance of the study

Drug therapy is growing more complex, thus making appropriate drug prescribing increasingly challenging. Drug therapy problems is described as a circumstance or an event concerning to the drug therapy that potentially or actually interferes with desired health outcomes. In current clinical practice, prescribers regularly utilize more number of medications to treat each comorbid conditions in patients; and this circumstance convolutes, when patients visit physicians of various specialities, which may prompt the occurrence of potential DTPs. To identify, resolve and prevention of drug therapy problems, the practitioner must understand how patients with drug therapy problems present in the clinical setting. Despite few researches done in different parts of Ethiopia still there is gaps on the knowledge and it`s economic impact of DTPs and associated factors among hospitalized or medical ward patients. This an institution based cross sectional study help to advance one step towards identification and prevention of DTPs and it also make concrete ground for the policy makers towards improving the community health outcome.

In general, the aim of this study was to assess and identify drug therapy problems and associated factors among admitted adult medical ward patients at TBGH.

1.5 Conceptual Frame Work of DTPs

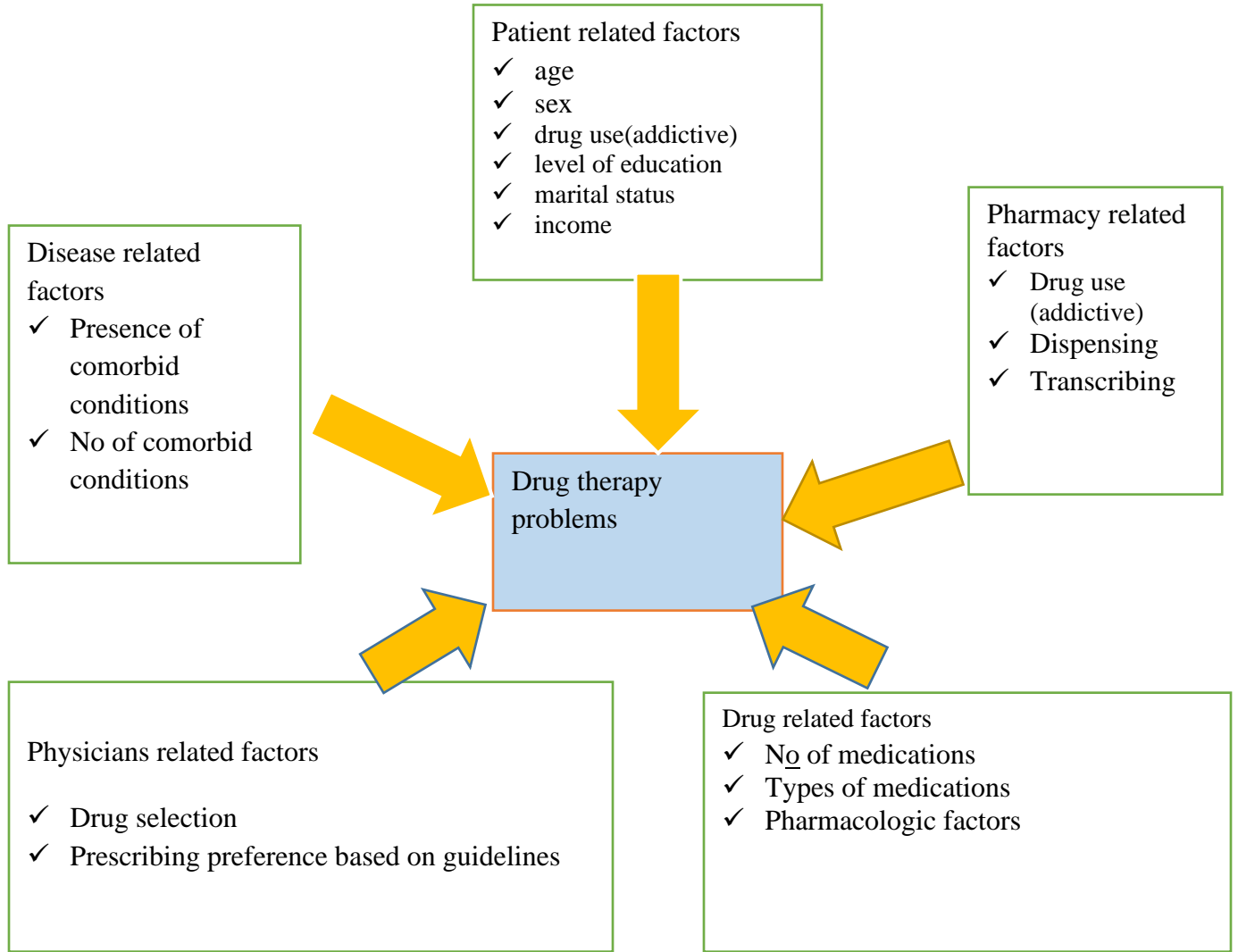


Figure 1. Conceptual frame work of DTPs

2. Objectives

2.1 General Objectives

To Assess DTPs and Contributing Factors among adults admitted to TBGH, Addis Ababa Ethiopia.

2.2 Specific Objectives

- To determine the incidence of DTPs among adults admitted at medical ward of TBGH.
- To identify the most common drugs and drug classes involved in DTPs based on cippole's classifications of DTPs.
- To identify potential risk factors for the occurrence of DTPs among adults admitted to medical ward of TBGH.

3. Methodology

3.1 Study area

The study was conducted at TBGH, Addis Ababa, Ethiopia. TBGH is one of the hospitals under Addis Ababa City Administration Health Bureau that has been giving routine health services for the city community and other referral cases from different regional states of Ethiopia. It is a referral hospital in Addis Ababa that serves for a large number of people from the surrounding zones and nearby regions both for inpatient and outpatient treatment at medical, surgical, emergency, outpatient, pediatrics, Gynecology, wards and acupuncture unit. It is situated in Akaki Kality sub city in woreda 01 near to Debrezeit road. It was built by the Chinese Government after the Beijing Olympic, in which Tirunesh Dibaba won two gold medals in 10000m and 5000 meters' race so that the hospital is named after the Athlete, Tirunesh Dibaba. The hospital has started serving the surrounding catchment, which is around 400,000 people, in the year 2004 E.C. It provides both outpatient and inpatient services. It has 156 beds for the inpatient services (Medical, Pediatrics, Oby/Gyn, Neonatal, and Surgical) and the OPD services are: OPD medical, pediatric, MCH, ANC, ART service, Psychiatry, Dental, Ophthalmology, Pharmacy and laboratory and etc.

3.2 Study Design and Period

A prospective cross sectional study was conducted to assess DTPs and contributing factors among adults admitted ton medical wards of TBGH from September 1,2019 to Nov 30,2019.

3.3 Population

3.3.1 Source Population

The source population was all adult patients admitted to TBGH medical ward.

3.3.2 Study Populations

The study populations consisted of all adults admitted to medical ward of TBGH from September 1,2019 to Nov 30,2019 and who fulfilled the inclusion criteria.

3.4 Eligibility Criteria

3.4.1 Inclusion criteria were

- Patients admitted to the medical wards
- Patients with more than 48 hours of length of stay
- Patients >18years' old

3.4.2 Exclusion criteria were

- Refusal to participate in the study
- Patients re-admitted during the study period
- Self-discharged patients during the study period (against medical advice)

3.5 Sample Size Determination and Sampling Techniques

The sample size was calculated based on single population proportion formula by assuming that confidence interval=95%, where $Z_{\alpha/2}$ of 95%=1.96, $P=66\%$ ($P=66\%$ of Gondar University referral hospital ,[28] and $d=5\%$).

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

$$n = \frac{(1.96)^2 * (0.66) * (1-0.66)}{(0.05)^2}$$

$$n = \frac{3.8416 * 0.66 * 0.34}{0.0025} = 344 \text{ (estimated sample size)}$$

The expected number of source population in the study period (N), based on the previous three-month admission rate in medical ward of TBGH on average gave us (N) = 478.

$$\begin{aligned} \text{So, corrected estimated sample size will be} &= (n \times N) / (n+N) \\ &= (344 \times 478) / (344+478) = \sim 200 \end{aligned}$$

Finally, adjusted estimated sample size= $[200+(200 \times 0.10)]$ taking 10% contingency was **220**.

Where;

N= Minimal sample size required.

P = Estimated prevalence of DTPs.

$Z^2_{\alpha/2}$ = Standard normal deviate at 95% confidence interval corresponding to 1.96.

d = Absolute error between the estimated and true population prevalence of DTPs of 5%.

3.5.1 Sampling Techniques

Due to small number of source population in medical ward of TBGH, convenient sampling technique was used as per the data collection period, inclusion and exclusion criteria.

3.6 Study Variables

3.6.1 Dependent variables

- Drug therapy problems

3.6.2 Independent variables

- Age
- Sex
- Co-morbidity
- Length of hospitalization
- Number of drugs
- Drug type
- Disease type

3.7 Data Collection Procedures

Data collection period was from 01 September to November 30, 2019. Relevant information about each patient like patient characteristics, physical examination, laboratory results, current medications, co-morbidities, length of hospitalization, relevant previous medical and medication histories were recorded using data abstraction format through reviewing patients' medical chart (**Annex I**). Two data collectors (one junior clinical pharmacy and one BSc nurse) were trained on how to collect the necessary data from patient's chart, on the use of questionnaire and the ethical principles of confidentiality and data management prior to their involvement with data collection.

Then the patient medical records and treatment chart belongs to each study participant were reviewed by the investigators after each clinical encounter by using various references like ESTG, Up-to-date, Medscape and Micromedex.

Micromedex® and Lexicopm drug interaction checker were used to identify drug-drug interactions. Identified DTPs were recorded and classified using DTP registration format (taken from Cipolle et al. 2004 with modification). Drugs involved in DTPs were recorded. Then the possible intervention measures were proposed and communicated to either the resident/senior physician or the patient to resolve or prevent DTPs.

3.8 Data quality assurance

Pre-test study was conducted among 10 patients before two days of data collection period to check for the uniformity and understandability of the questionnaire, and other ethical issues. From sociodemographic characteristics, monthly income was categorized and adjusted according to Ethiopia Civil servant salary scale as very low, medium, and high.

In order to assure its quality, data was collected by one junior clinical pharmacist who had basic knowledge on pharmaceutical care services and one BSc nurse who was working in medical ward during the study period; the data collectors were trained for 2 days on the documentation of DTPs and techniques of data collection; the principal investigator supervised the data collection process and had reviewed all filled DTP registration formats and data abstraction formats. All materials used for data collection was arranged sequentially and data was stored in safe and secure place.

3.9 Data processing and analysis

Data was checked for its completeness every day. It was edited, cleaned and analyzed. The collected data was entered into a computer using SPSS software and was analyzed using SPSS version 25. Cross tabulation was used in bivariate analysis. A test of association was done using binary and multiple logistic regressions. P value < 0.05 was considered significant. Drug risk ratio (frequency of involvement in DTPs divided by frequency of prescription) was used to identify drugs that were prone to create DTPs. Descriptive statistics was used to characterize drug therapy problems. Results of the study were organized in the form of frequencies and percentages. The data was summarized and described using tables and figures.

3.10 Definition of Terms

Adverse drug reaction: - any noxious, unintended, and undesired effect of a drug, which occurs at doses used in humans for prophylaxis, diagnosis or therapy.

Drug-related problem: - an event or circumstance involving drug therapy that actually or potentially interferes with desired health outcomes.

Hospital stay: - the time gap spent by the patient in the hospital from his/her admission till the date the data was taken.

Medication error: - any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient or consumer.

Pharmaceutical care: - the process through which a pharmacist cooperates with a patient and other professionals in designing, implementing and monitoring a therapeutic plan that will produce specific therapeutic outcomes for the patient.

Poly-pharmacy: - the daily consumption of 5 or more medications. Different strengths of the same drug were counted as one item. However, formulations of one drug requiring different routes of administration were regarded as separate items. Combination drug, that is a drug with more than one active ingredient in it, is regarded as a single item.

Drug-drug interaction: - An interaction is defined as occurring when the effects of one drug are changed by the presence of another drug, food, drink or some environmental chemical agent.

NB: Within this study drug interaction which are categorized under risk D (i.e., Consider therapy modification) or X (i.e., Avoid combination) was taken as a drug-drug interaction DTPs.

Unnecessary drug therapy: - The drug therapy is unnecessary because the patient does not have a clinical indication at this time.

Needs additional drug therapy: - Additional drug therapy is required to treat or prevent a medical condition or illness from developing.

Ineffective drug therapy: - The drug product is not being effective at producing the desired response or outcome.

Inappropriate dosage: - The dosage is too low to produce the desired response or outcome or the dosage is too high, resulting in undesirable toxic effects.

Intervention fully accepted[29]:- The recommended intervention is accepted and implemented

Intervention partially accepted: - The recommended intervention is accepted and implemented with modification or not implemented at all

Intervention rejected: - The recommended intervention is not accepted.

3.11 Ethical consideration

Prior to initiation of this study, the proposal was reviewed by Research Ethics Board of School of Pharmacy (**Annex VI**), Addis Ababa University. An official letter for permission was obtained from Department of Pharmacology and Clinical Pharmacy, to initiate the study at TBGH under protocol number of **ERB/SOP/113/07/2019**. Moreover, the objective of the study was explained to both hospital administration and the patients who were included in the study. Verbal consent from the patients was asked and Confidentiality of the information was assured by using code numbers than personal identification names.

4. Results

4.1 Demographic details and characteristics of study participants

During a three-month study period, a total of 220 eligible participants were enrolled in the study, among which 125 (56.8%) were males and 95 (43.2%) were females. The mean age was 47.1 (**SD =17.9**) years with the maximum number of study participants being between 35 to 64 years followed by 40 to 60 years. More than half of the study participants were married 136 (61.8%) followed by single 62 (28.2%), Orthodox Christian 172 (78.2) % and Muslims 26 (11.8%). Less than half of the study participants had no formal education 90 (40.9%) ,69 (31.4%) were house-wife. Most of the study subjects 97(44.1%), had monthly income of less than 860ETB and 68 (30.8%) had no monthly income (**Table 2**).

Table 2. Sociodemographic characteristics of hospitalized patients in medical ward of TBGH, Addis Ababa Ethiopia, from September 1-November 30,2019 (N=220).

Variables	Categories	N (%)
Gender	Male	125(56.8%)
	Female	95(43.2%)
Age (years)	18-35	69(31.4%)
	35-64	100(45.5%)
	≥65	51(23.2%)
Marital status	Single	62(28.2%)
	Married	136(61.8%)
	Divorced	15(6.8%)
	Widowed	7(3.2%)
Religion	Orthodox	172(78.2%)
	Protestant	20(9.1%)
	Muslim	26(11.8%)
	Others *	2(0.9%)
Education	Can` t read and write	11(5%)
	Non formal education	90(40.9%)
	Primary education	78(35.5%)

	Secondary education	28(12.7%)
	Tertiary educations	13(5.9%)
Occupation	Farmer	34(15.5%)
	Merchant	10(4.5%)
	Employed	31(14.1%)
	Non employed	21(9.5%)
	House wife	69(31.4%)
	Students	18(8.2%)
	Retried	25(11.4%)
	Others **	12(5.5%)
Monthly income††(ETB)	<860	97(44.1%)
	861-1500	27(12.3%)
	3000-5000	20(9.1%)
	≥5001	8(3.6%)
	No any income	68(30.9%)
	Yes	84(38.2%)
Alcohol drinking	No	136(61.8%)
	Yes	26(11.8%)
Ciggarate smoking	No	194(88.2%)

Chat chewing	Yes	29(13.2%)
	No	191(86.8%)
Traditional and herbal medicines use	Yes	87(39.5%)
	No	133(60.5%)
Living status	With family	186(84.5%)
	With friends	7(3.2%)
	Alone	24(10.9%)
	Others ***	3(1.4%)
	Urban	65(29.5)
Residence	Rural	155(70.5%)

catholic, adventist, pagan; **religious teachers' servants; * homeless, displaced*

†† Based on Ethiopian civil servant monthly salary scale

Significant proportion of study participants 135 (61.4%) were never hospitalized since last year and 26 (11.8%) one times followed by 37(16.8%), 22(10%); two, more than two times were hospitalized respectively. Majority of the study participants 146 (66.4%) were stayed at hospital more than seven days as compared to less than seven days 74 (33.6%). Majority of the study participants constitutes with the diagnosed disease of two and above 133(60.5%) and those taking more than five drugs 152(69.1%) (**Table 3**).

Table 3. Clinical data of hospitalized patients in medical ward of TBGH, Addis Ababa Ethiopia, from September 1-November 30, 2019 (N=220)

Variables	N(%)	
Number of hospital admission since last year	Never	135 (61.4%)
	One times	26 (11.8%)
	Two times	37 (16.8%)
	More than three times	22 (10%)
Length of hospital stay	<7days	74 (33.6%)
	≥7days	146 (66.4%)
Number of diagnosed disease	One	86 (39.1%)
	Two and above	133 (60.5%)
Number of drugs taken daily	<5	68 (30.9%)
	≥5	152 (69.1%)

As illustrated in the (**Figure 2**) below the most diagnosed disease of study subjects during the study period showed high incidence of disease of infectious origin 103 (25%), cardiovascular disorder 97 (24%), endocrine disorder 47 (11%), retroviral infection 42 (10%), opportunistic infections 31 (8%), electrolyte abnormality 24(6%), central nervous system disorder 21 (5%), gastrointestinal disorder 19 (4.6%), urologic disorder 15 (4%) & renal disorder 10 (2 %).

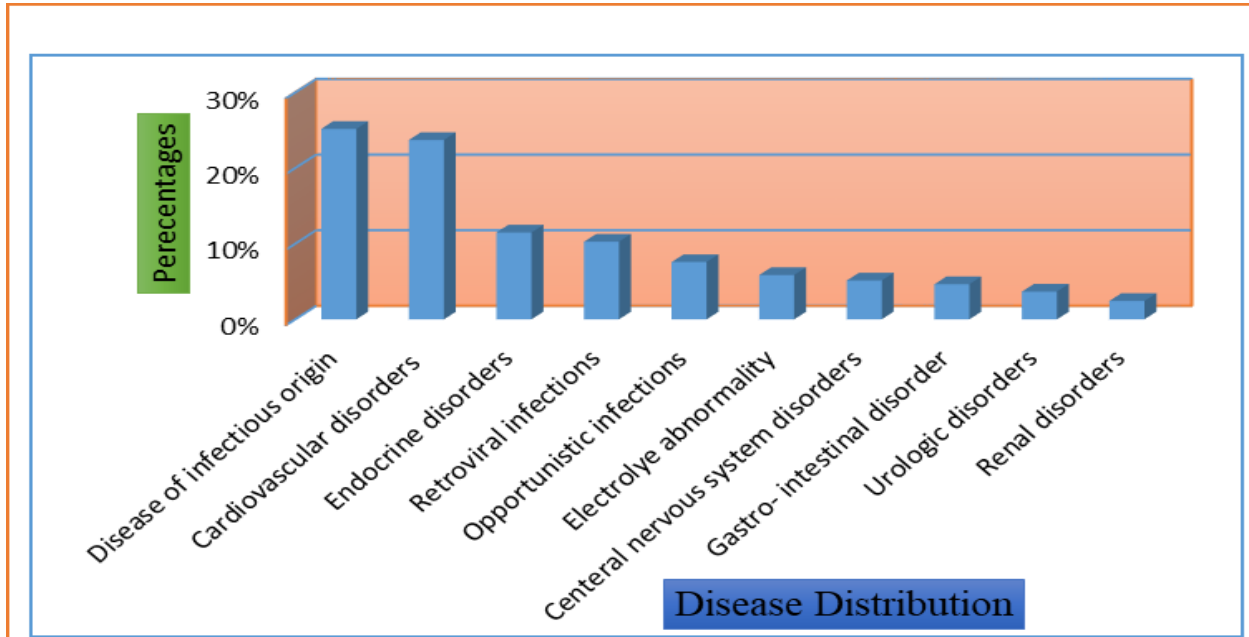


Figure 2. Most diagnosed disease distribution of study subjects in medical ward of TBGH, Addis Ababa Ethiopia, from September 1-November 30, 2019 (N=220).

Totally 1467 medication were prescribed during the study period, with average number of drugs per day for individual patient was 6.6. The most prescribed drug classes during the study period were anti-infective 150(19.3%), analgesics and antipyretics 105(13.5), GIT drugs 104(13.4%), drugs of blood disorder 86(11.1%), CVD drugs 77(9.9%), endocrine disorder drugs 62(8.0%), acid base disorder drugs 59(7.6%), diuretics 56(7.2%), antiviral drugs 41(5.3%) & anti-TB drugs 36(4.6) (**Figure 3**).

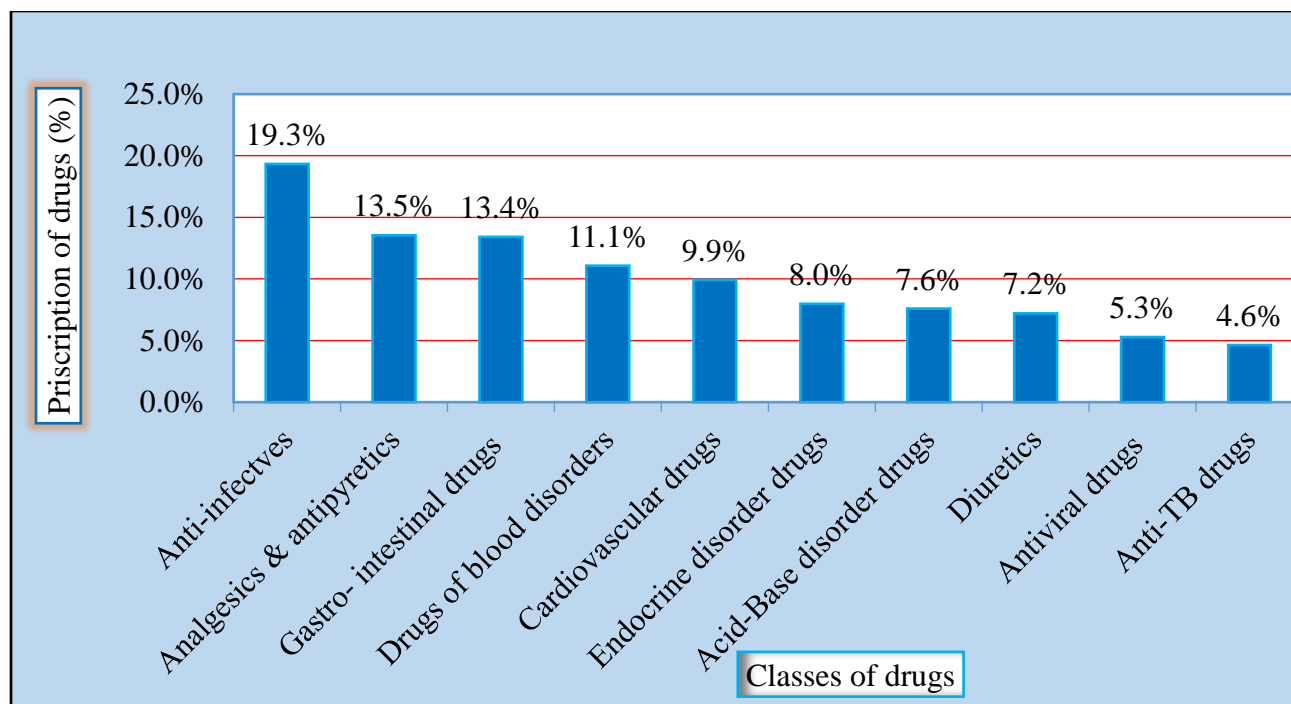


Figure 3. Most frequently prescribed drug classes during the study period of TBGH, Addis Ababa, Ethiopia, from September 1-November 30, 2019 (N=220).

As depicted in the figure 4 below ceftriaxone 125(56.8%) takes significant proportion of all prescribed medications and with least percentages of 40 (18.2%) regular insulin.

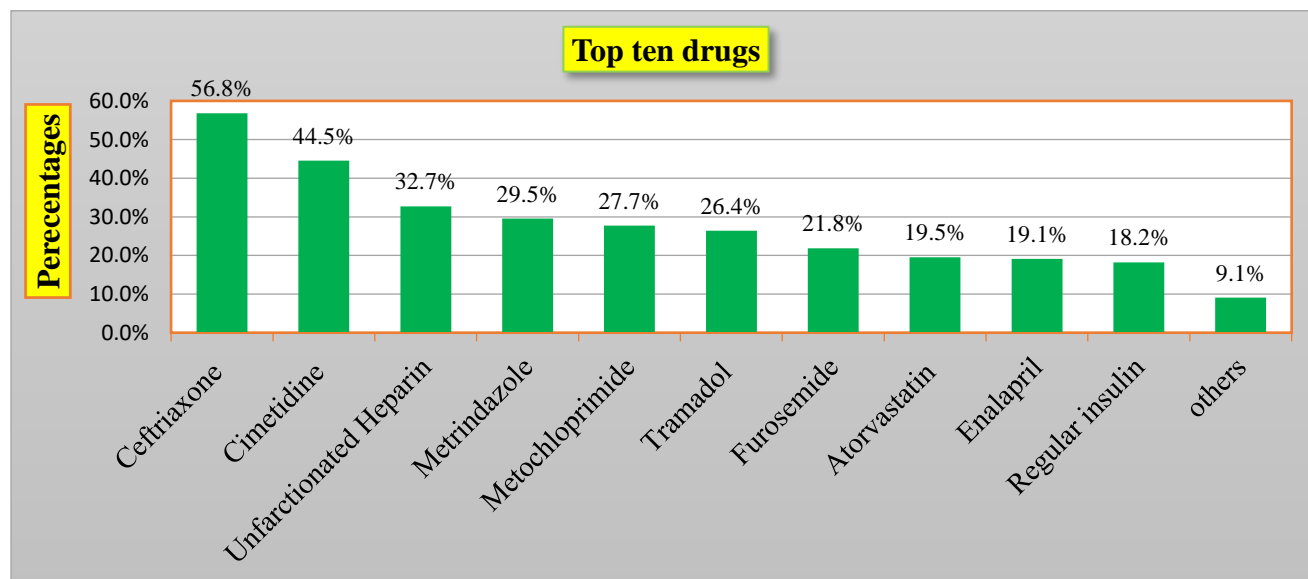


Figure 4. Most frequently specific prescribed drugs during the study period of TBGH, Addis Ababa, Ethiopia, from September 1-November 30, 2019 (N=220).

4.2 Prevalence of DTPs

The prevalence of DTPs among study subjects were found to be 80%. (**Figure 5**).

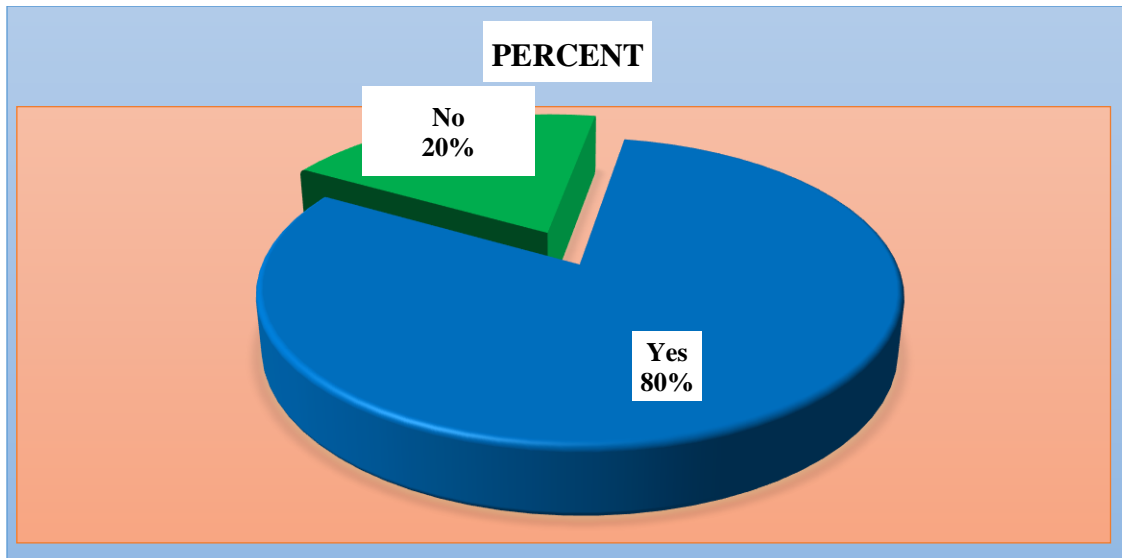


Figure 5. Prevalence DTPs among study subjects in medical ward of TBGH, Addis Ababa, Ethiopia, from September 1-November 30, 2019 (N=220).

A total of 298 DTPs were found among study subjects from which one DTP accounts considerable proportion 84 (38%) patients followed by 68 (31%), 20(9%), 7(3%); two, three and four DTPs respectively with average DTPs per patient was 1.35 (**Figure 6**).

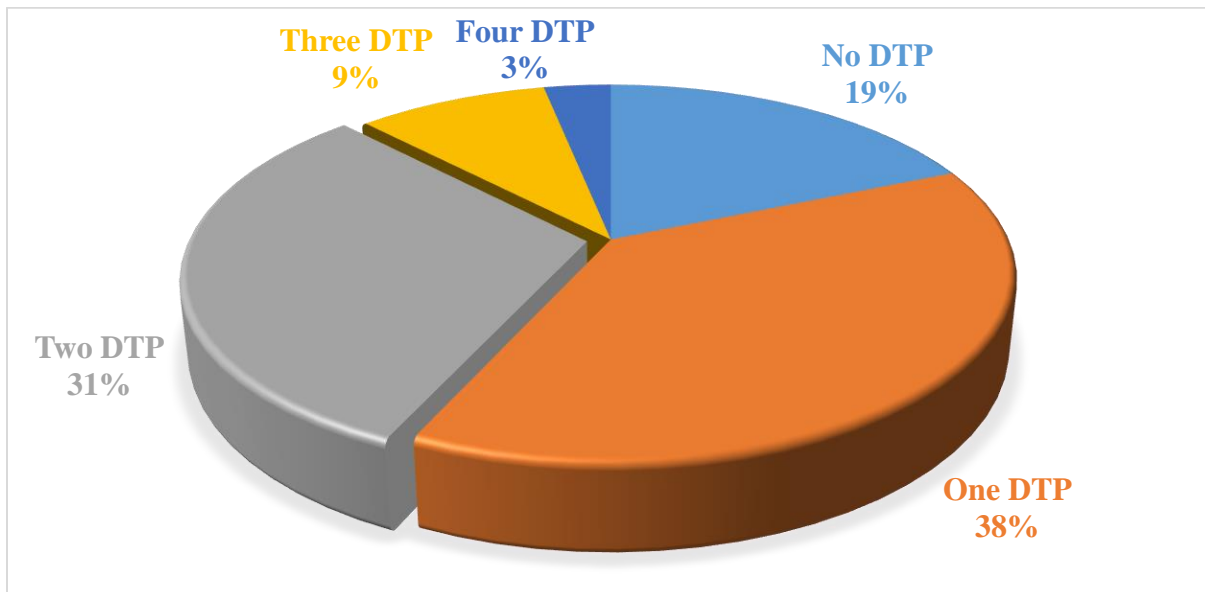


Figure 6. Percentage DTPs among study subjects during the study period at medical ward of TBGH, Addis Ababa, Ethiopia, from September 1-November 30, 2019 (N=220).

Needs additional drug therapy accounts the highest proportion of all DTPs 118 (39.6%) followed by non-compliance 59 (19.8%), inappropriate dose 58 (19.5%), adverse drug reaction 33 (11.1%) unnecessary drug therapy 23 (7.7%) and ineffective drug therapy 7 (2.3%) (**Figure 7**).

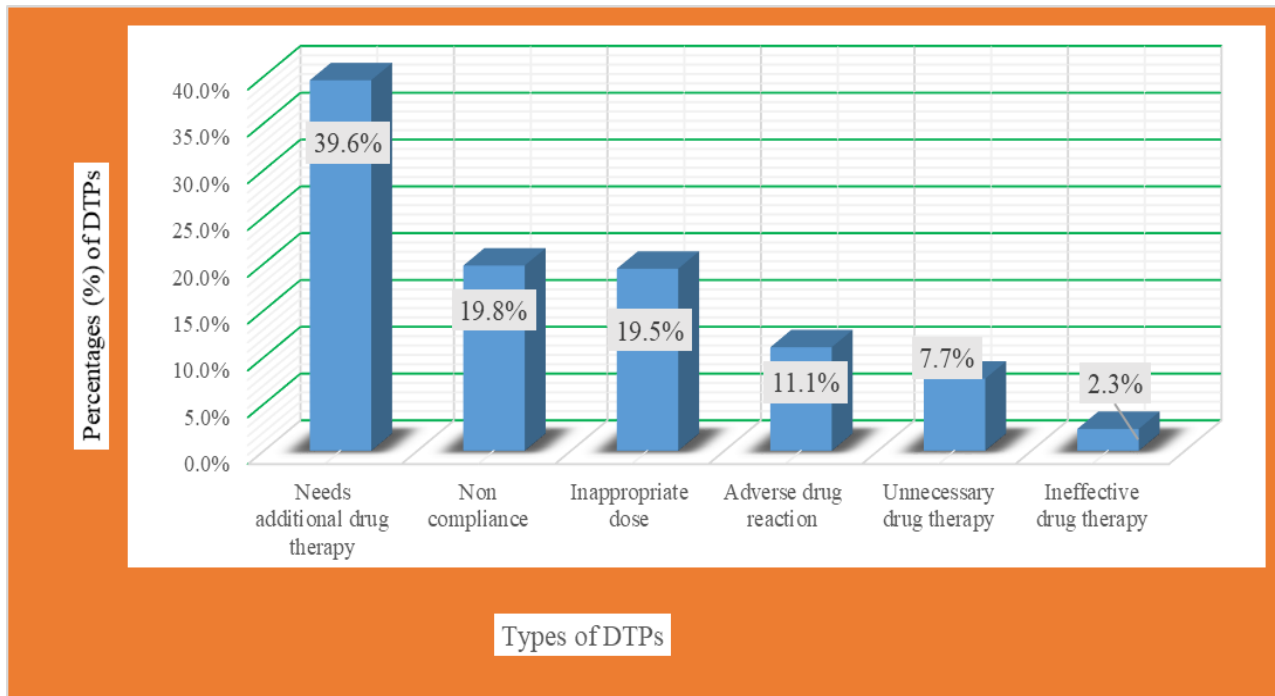


Figure 7. Types of DTPs identified during study period at medical ward of TBGH, Addis Ababa, Ethiopia, from September 1-November 30, 2019 (N=220).

Each types DTPs such as needs additional drug therapy, noncompliance, inappropriate dose has adverse drug reaction, unnecessary drug therapy and ineffective drug therapy has its own detailed descriptions. Needs additional drug therapy 118(36.9%), and non-compliance 59(19.8%) were top ranking identified DTPs, followed by inappropriate drug therapy 58(19.5%) and adverse drug reaction 33(11.1%). However, DTPs related to unnecessary drug therapy and ineffective drug therapy accounts less than 10% (**Table 4**).

Table 4. Details of each identified DTPs during study period at medical ward of TBGH, Addis Ababa, Ethiopia from September 1-November 30, 2019 (N=220).

Description of DTPs		Number of DTPs	Total	%
Needs additional drug therapy	Initiation of drug therapy	56	118	39.6%
	Preventive drug therapy	35		
	Synergistic or additive	27		
Non compliance	Does not understand the instructions	19	59	19.8%
	Drug product is too expensive for the patient	20		
	Patient prefers not to take the medication	20		
Inappropriate dose	Dose too high	30	58	19.5%
	Dose too low	20		
	Dosage interval is too infrequent	8		
Adverse drug reaction	An undesirable reaction	14	33	11.1%
	Drug interaction	16		
	Drug product causes an allergic reaction	3		
Unnecessary drug therapy	Duplicate therapy	15	23	7.7%
	No valid medical indication	8		
Ineffective drug therapy	Dosage form inappropriate	5	7	2.3%
	More effective drug available	2		
		Total	298	100

4.3 Drugs and drug classes involved in the occurrence DTPs

As illustrated in the table 5, Anti-infectives agents were the most common drug classes significantly involved in occurrence of DTPs followed by analgesics and antipyretics, GIT drugs, drugs of blood disorder and CVS drugs with least of Anti-TB drugs.

Table 5. Most common drug classes involved with DTPs during study period at medical ward of TBGH, Addis Ababa, Ethiopia from September 1-November 30, 2019 (N=220).

S.No	Drug classes	Frequency	Percent (%)
1	Anti-infectives	123	55.9%
2	Analgesics	90	40.9%
3	Gastrointestinal agents	89	40.45%
4	Drugs of blood disorder	76	35.9%
5	Cardiovascular system drugs	64	29.09%
6	Endocrine disorder drugs	52	23.63%
7	Medicines correcting water, electrolytes and Acid-base balance	51	23.18%
8	Diuretics	42	19.09%
9	Antivirals	37	16.18%
10	Anti -TB	34	15.45%

A total of 62 drugs were associated with the occurrence of different types DTPs. Among them, Potassium chloride takes significant proportion of all DTPs 29(9.7%) followed by Vancomycin 25(8.4%), Cimetidine 23(7.7%), Pyridoxine 21(7.0%), Ferrous sulphate 20(6.7%), Warfarin 19(6.4%), Rifampin, Isoniazid, pyrazinamide, Ethambutol (RHZE) 15(5.0%), Metformin 13(4.4%), Atorvastatin 11(3.7%) and Ceftriaxone 10(3.4%) with their respective percentages as depicted in the (Figure 8).

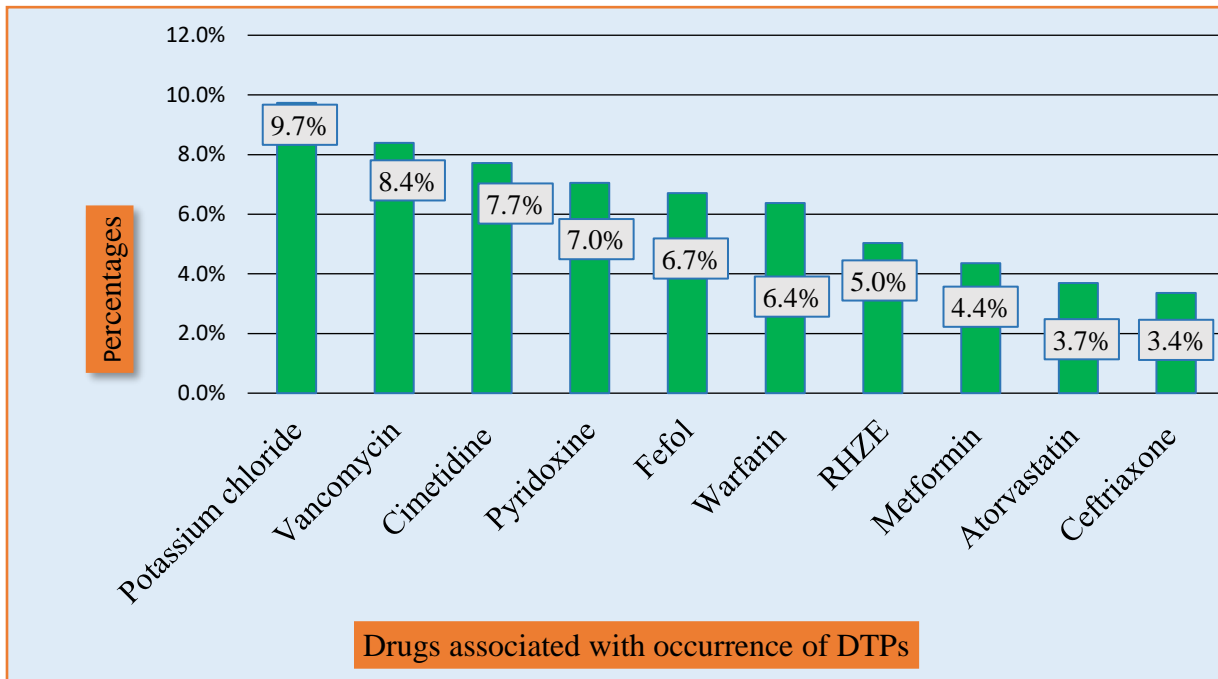


Figure 8. Top ten drugs associated with the occurrence of DTPs among study subjects during the study period at medical ward of TBGH, Addis Ababa, Ethiopia, from September 1-November 30, 2019(N=220).

4.4 Interventions made for DTPs

Appropriate interventions were made to correct the identified DTPs with attending physicians and concerned stakeholders. More than half 250 (83.9%) interventions were made by the principal investigator and the rest 48 (16%) were made by in collaboration with hospital staffs. Majority of the intervention were informing all concerned stakeholders like attending physicians, nurses, hospital mangers including pharmacy staff heads; about the consequences of drug and drug therapy problems on the patient quality of life and outcome improvement.

Of the 298 DTPs identified more than half of the intervention 201 (91.3%) was fully accepted, 17(7.7%) partially accepted and 2 (0.9%) interventions were not accepted.

4.5 Factors associated with DTPs

Medications continue to be primary treatment options for the management of acute and chronic illness. So, identifying individuals prone to DTPs is of important in risk identification and resolution. To identify factors associated with occurrence DTPs, univariate binary logistic regression was employed taking the cut point p- value of 0.25 to control confounders. Accordingly, sociodemographic characteristics like age, sex, marital status, occupations, educational level and clinical characteristics like length of hospital stay, number of drugs taken per day and number of diagnosed disease were analyzed whether they predict the occurrence of DTPs or not. From all these variables, employing univariate binary logistic regression number of diagnosed disease, length of hospital stays and number of drugs taken per day was associated with occurrence of DTPs with p-value <0.05 as illustrated (**Table 4**).

As univariate logistic regression analysis shows that study subjects who have more than two diagnosed diseases were about two (**COR=2, 95% CI:1.087-4.186**) times more likely to experience DTPs than those study participants who have one diagnosed disease. In the same manner study subjects who stayed for more than one week were about three (**COR=3, 95% CI:1.617-6.365**) times more likely to experience DTPs as compared to those study subjects who stayed less than one week during the study period.

Number of drugs taken daily was also another factor for the occurrence of DTPs. Those study subjects who took more than five drugs per day were three (**COR=3, 95% CI:1.546-6.109**) times more likely to experience DTPs as compared to those who took less than five drugs.

Table 6. Univariate binary logistic regression analysis results of factors associated with the occurrence of DTPs during study period at medical ward of TBGH, Addis Ababa, Ethiopia, from September 1-November 30, 2019 (N=220).

Variables	Category	DTPs		COR (95% C.I)	P-value
		Yes (%)	No (%)		
Age (in years)	18-35	48(27.1)	15(34.8)	1.00	0.576
	36-64	93(52.5)	21(48.8)	1.607(0.594-4.350)	0.350
	≥65	36(20.3)	7(16.3)	1.161(0.455-2.967)	0.755
Sex	Male	104(58.7)	21(48.9)	1.00	
	Female	73(41.2)	22(51.1)	0.670(0.34-1.308)	0.240
Number of diagnosed disease	One	62(35)	23(53.4)	1	
	Two and above	114(64.4)	20(46.5)	2.133(1.087-4.186)	0.028*

Length of hospitalization	<7days	50(28.2)	24(15.5)	1		
	≥7days	127(71.7)	19(10.7)	3.208(1.617-6.365)	0.001*	
Number of drugs taken	<5	45(25.4)	22(51)	1		
	≥5	132(74.5)	21(48.8)	3.073(1.546-6.109)	0.001*	

**Significance (95%, C.I), COR= Crude odds ratio*

In order to control confounder`s, multivariate logistic regression analysis was carried out to analyze variables which were strongly associated with occurrence of DTPs in univariate logistic regression. The multivariate logistic regression analysis showed that length of hospital stay and number of drugs taken per day had significant association with occurrence of DTPs. Accordingly, study subjects who had stayed more than seven days in the hospital were about three (**AOR=3, 95% CI:1.394-5.843**) times to experience DTPs as compared to study subjects who stayed less than seven days in the hospital (**p=0.004**). Study subjects who took more than five drugs per day were about two (**AOR=2, 95% CI: 1.168-5.287**) times to experience DTPs as compared to study subjects who took less than five drugs (**p=0.019**).

Table 6. Multivariate binary logistic regression analysis results of factors associated with the occurrence of DTPs during study period at medical ward of TBGH, Ethiopia, 2019 (N=220).

Variables	Category	DTPs		AOR (95% C.I)	P –value
		Yes (%)	No (%)		
Length of hospitalization	<7days	50(28.2)	24(15.5)	1	
	≥7days	127(71.7)	19(10.7)	2.854 (1.394-5.843)	0.004*
Number of drugs taken	<5	45(25.4)	22(51)	1	
	≥5	132(74.5)	21(48.8)	2.480 (1.168-5.287)	0.019*

**Statistically significance (95%, C.I), AOR= Adjusted odds ratio, CI= Confidence Interval*

4.6 Examples of various types of DTPs identified

Table 7. Examples of DTPs identified in study subjects, recorded and intervened during study period at medical ward of TBGH, Addis Ababa, Ethiopia, 2019 (N=220).

S.No	Description of DTPs	Type of DTPs	Intervention status
1	A 52 years old female patient was diagnosed having acute exacerbation of Bronchial asthma + newly Diagnosed T2DM+DKA+ Stage I HTN was taking metformin 500mg PO bid from two brands (Sandoz and East African pharmaceuticals) for two doses as evidenced by the patient that one drug is taken as antihypertensive ordered by the physician. Later the patient complains about GIT discomfort.	Drug duplication	To Discontinue one brand and to continue the one brand & to add PPI.

2	A 34-year-old female patient was diagnosed having stage IV RVI + External hemorrhoid +R/O drug toxicity + severe anemia 2 ^o to blood loss with Hgb Value 5.91g/dl, the patient took only 2units blood transfusion and later Hgb values became 7.91g/dl..... still the patient should get benefit if ferrous preparations. i.e. ferrous fumarate is ordered. later on after consultation of ward physician the patient was prescribed ferrous gluconate with PPIs.	Needs additional drug therapy	Still the patient should get benefit if ferrous preparations are given. later on after consultation of ward physician the patient was prescribed ferrous gluconate with PPIs.
3	A 55 years old female patient was dx having Stage 4 RVI + Right sided hemiparesis sec? Brain abscess +? CNS toxoplasmosis +R/O DTB(CNS) was taken ceftriaxone 1gm iv bid with metronidazole 500mg iv TID.	Dose too low	The physician was consulted and ceftriaxone was changed in to 2gm iv bid for brain abscess.
4	A 45years old male patient was dx having PTBC and started anti-TB at nearby HC. At 2 nd phase Treatment failure was reported and again started RHZE 3 tabs PO/day according to his body weight 43kg. while interviewing the patient, there was no pyridoxine prescribed for the prevention of peripheral neuropathy from INH.	Needs additional drug therapy	Pyridoxine was added

5	A 65 years old male patient was diagnosed having T2DM+DFU R/O CKD prescribed enalapril 5mg PO BID. During data collection the patient was thoroughly assessed about all the prescribed medications and told that he stopped enalapril 5mg PO BID for one 1month. Later the PI asks about the whole medications and the patient again told that he prefers to take the drug when he feels only hypertensive like headache, confusion and neck pain.	Non compliance	Later on discussing with the physician enalapril 10mg PO BID was prescribed and counseled not to discontinued medicine without consulting health care professionals.
6	A 52 years old male patient was taken to nearby HC for food poisoning and typhus and given one dose of unspecified dose of cotrimoxazole as the patient reports. later on after 20minutes he develops rash most likely SJS all over his body especially around genital area. As the patient reports that he was allergic for cotrimoxazole and was written on his chart, but HCP gave him the medications without asking or reading the patients chart very well at nearby HC. The patient complains pruritus and lack of sleep at night time, then the attending physician consulted to add anti histamines, later on cetirizine 10mg PO/day was prescribed on discharge with advice to take on bed time since the patient was driver.	ADR	Cotrimoxazole was discontinued and treated with supportive care
7	A 30-year-old female patient was diagnosed having Ludwig`s angina + 2 nd trimester pregnancy + anemia of chronic illness + septic shock + HAP + bicytopenia was prescribed HCT 25mg PO BID.	Unnecessary drug therapy	HCT 25mg PO BID was discontinued

8	A 23years old male patient was diagnosed having DTB (Lung, peritoneum and pleura) + superimposed pneumonia+? Anemia of Chronic Illness have severe anemia with Hgb value of 6.11g/dl and the attending physician was consulted.	Needs additional drug therapy	Later the patient was prescribed haemup syrup up on follow up Hgb become 5.46mg/dl, the attending physician was consulted to give blood transfusion. later on 2units of PRBC was given and Hgb become 7.4mg/dl.
9	The above patient was given anti-emetic metoclopramide 10mg iv TID, after one dose the patient develops rash and hypersensitivity reaction. While interviewing the patient whether rash may be from anti-TB or other medications, the patient confirm that the condition was after metoclopramide injection.	ADR	Later attending physician was consulted to discontinued metoclopramide and to give supportive therapy.
10	The patient was diagnosed with left sided hemiplegia sec to ischemia R/O hemorrhagic stroke + CAP+AF complains GI discomfort when taking PO medication.	Needs additional drug therapy	Later cimetidine 200mg Iv BID as stress ulcer prophylaxis was added.
11	A 50years old female patient was diagnosed having acute exacerbation of B. Asthma + newly T2DM complains constipation,	Needs additional drug therapy	Later consulting attending physician bisacodyl 10mg PO/day was added up on discharge.
12	A 70 years old male patient was diagnosed having Lt sided hemiparesis +Aphasia sec to Hemorrhagic Stroke was taking cimetidine 200mg iv bid and omeprazole 40mg iv bid.	Drug duplication	Later attending physician was consulted to discontinued cimetidine 200mg Iv BID and continue omeprazole

13	A 36-year-old female patient dx having? DTB (P, B, L&L) +R/O IBD + R/O Colonic cancer +hypokalemia +severe anemia 2 ⁰ to chronic illness + CLD 2 ⁰ to?? + G-II HE was taking ceftriaxone 1gm iv BID for more than 2weeks, i.e. 20 days. Up consultation it was discontinued.	Inappropriate dose	Ceftriaxone was DC
14	The above patient was taking anti-TB drugs RHZE 3tabs PO/day and phenytoin 100mg PO TID. The DDI b/n rifampin and phenytoin was found to be Category D using Lexi Comp DDI checker.	DDI Category D	Attending physician was consulted to increase the dose of phenytoin. Unfortunately, the anti-TB was discontinued after 7 days because of hepatic liver enzymes and bilirubin elevations.
15	An 83 years old male patient was diagnosed having GI onset sepsis + BPH taking vancomycin 1gm iv bid with base line Serum Creatinine 0.94ml/min. later on serum creatinine becomes 1.53ml/min.	Dose too high	Attending physician was consulted to adjust the dose of vancomycin based on Creatinine Clearance.
16	For the above patient KCL 600mg PO TID was prescribed while his serum K value was 3.5mmo/L. The attending nurse was consulted whether it was prescribed or not by the physician. It was found not prescribed.	Unnecessary drug therapy	KCL was DC
17	A 48 years old female patient dx having stage III RVI + Severe asthma + CAP + R/O PTB has CD4 count of 49%.	Needs additional drug therapy	Attending physician was consulted to initiate PCP treatment unless contraindicated.
18	An 85 years old male patient was diagnosed having Right sided hemiparesis sec to Ischemic Stroke + severe hyponatremia + Aspirational pneumonia was taking Atorvastatin and Phenytoin, DDI was found between two drugs using Lexi comp DDI checker.	DDI category D	Attending physician was consulted to add the dose of atorvastatin or to DC phenytoin or else to monitor lipid profile to check atorvastatin efficacy.

19	A 23-year-old male patient was dx having AFI 2 ⁰ to malaria + mild anemia 2 ⁰ to? + R/O AGN was taking artesunate 150mg IM at 0,12 th ,24 th ,48 th , and 72 th hr. and attending physician was consulted to do deep investigation. Later on through deep investigation the patient was found having DTB (military TB) + bicytopenia 2 ⁰ to? Chronic illness + fever of unknown origin.	Needs additional drug therapy	Anti- TB RHZE 3tabs PO//day with pyridoxine 50mg PO/day was started.
20	A 22-year-old male patient was dx having coma sec to HE + CLD sec to HVB + Bicytopenia (anemia + severe thrombocytopenia) + R/O Renal failure + HAI was anemic 6.45mg/dl and hypokalemic k=2.79mmol/l	Needs additional drug therapy	Attending physician was consulted to add KCL and iron products.
21	A 43-year-old male patient was dx having Acute lower extremity DVT was taking warfarin and heparin together. At the time of interviewing the patients INR was 3.49.	Inappropriate dose	Then the attending physician was consulted to DC heparin 1,7500 IU SC BID injection.

5. Discussion

The occurrence of DTPs in hospitalized patients is associated with different reasons and risks. With a complex diagnosed disease and use of different types of drugs, inappropriate drug use is common as different study shows in different countries. Therefore, to achieve therapeutic outcome and improve patient`s quality of life; identification and resolution of DTPs is of important priority.

Small number of studies from developed and middle-income countries had different classes of DTPs, drug classes involved in DTPs, factors associated with occurrence of DTPs. This prospective study was employed to assess DTPs in one of general hospitals of Ethiopia.

The current study showed that study subjects who admitted in the medical wards of TBGH during the study period had prevalence of 80% DTPs. This result is higher than study done in Jimma (73.5%), Dessie (75.51%), Addis Ababa (TASH) (52%) [17][18][7]. Also, our study results showed higher than study done in Gondar teaching hospital (66%) [28] and Gedo referral hospitals (75.6%)[19]. The slightly low rate of DTPs in the previous reports may be due to study settings which are tertiary and teaching hospitals equipped with skilled personnel`s and different materials for identification and resolution of DTPs than our study settings. Another reason for the higher prevalence DTPs in the current study might be due to shortage of trained clinical pharmacy professionals and those assigned at medical ward were also working in dispensaries and other related activities. The other reason for high prevalence of DTPs from that of Jimma and TASH, our study includes adherence and ADR in counting the rate of DTPs. Our study also showed high findings than study done in an inland hospital of Northern Sweden 53% and Jordan 66% among admitted medical ward patients but comparable findings (80.7%) study done in Adama general hospital among hypertensive patients [30][31][32]. Such variations may be due to study settings (Intensive care unit vs medical, outpatient vs inpatient), types study design (prospective vs retrospective, interventional vs observational). Over all, the variation seen on the incidence of DTPs across studies might be due to different classification of systems used to classify DTPs and settings in which DTPs were assessed.

The most frequently encountered DTPs in our current study were needs additional drug therapy (39.6%), noncompliance (19.8%), inappropriate dose (19.5%), unnecessary drug therapy (11.1%), ADR (7.7%) and ineffective drug therapy (2.3%). This result is in line with reports from Jimma, Dessie, Gedo and Gonder with top ranking DTPs of needs additional drug therapy, noncompliance and inappropriate drug therapy [28][33] [19]. Another similar study done among admitted and ambulatory clinic cardiovascular diseases patients in Hiwot Fana Specialized hospitals, Ethiopia reports that needs additional drug therapy was the most identified DTPs (58%) followed by unnecessary drug therapy and non-compliance both of which estimated to be (12.2%) [34].

DTPs study done in stroke patients in Thailand reports untreated condition (22.6%) and non-compliance (21%) as the most frequent identified DTPs [35]. In line with our studies, drug choice problem or inappropriate drug selection (57.76%) and under treated condition (27%) as the most frequently encountered DTPs in Iran and China, respectively [36] [37]. Study done in Kuwait reports that, unnecessary drug therapy (17.3%) and needs additional drug therapy as the most identified DTPs [38]. Another DTPs study done in Jimma among admitted surgical patients, Jimma Ethiopia reports that dose too low (27.6%) and dose too high (18.0%) were the most frequent identified DTPs [39]. But compared to our current study dose too low (6.7%) and dose to high (10%) constituents lower rate occurrence of DTPs. This difference might be due to the study setup which is surgical and level of services given to the community, University hospital versus general hospital and small sample size than our current study. Similar study done in Jimma Ethiopia among heart failure patients reports higher rate (27.6%) of ineffective drug therapy than our current study which is 2.3%. This higher rate of reports might be due to long study period which is one year and study done on specific patient groups which is heart failure patients [40].

The current study showed a total of 298 DTPs were identified. Of these one DTPs was seen in 84 (38%) patients, two DTPs in 68 (31%), no DTPs in 41(19%), three DTPs in 20 (9%), four and above DTPs in 7 (3%) patients. This finding was comparable with study done in Jimma (37.7%)[17] and but lower than study done in Brazil (91.7%) and Mekelle (82%) with at least one DTPs per patient respectively [41][42]. This higher finding might be due to smaller sample size in both studies than in our current study. Local studies done in different parts of Ethiopia showed that

higher one DTPs per patient than our current studies (38%) Gondar (54.7%) [28], Addis Ababa (70.1%) [43], Dessie (46.94%)[18] but our findings also report higher two DTPs per patient than the above-mentioned studies (31%).

The top ranking drugs responsible for the occurrence of DTPs in our current study was potassium chloride (9.7%) followed by vancomycin (8.4%), cimetidine (7.7%), pyridoxine (7%) and ferrous sulphate (6.7%) with the least responsible drug ceftriaxone (3.4%). Similar studies in Gondar, Ethiopia showed that potassium chloride, vancomycin, RHZE, warfarin and atorvastatin are associated with occurrence of DTPs [28]. However, study done in Addis Ababa, Ethiopia shows cimetidine, warfarin and ceftriaxone predominates for occurrence of DTPs is inconsistent with our current study [43]. The variety of drugs involved in the DTPs was due to different disease conditions physician, patient preferences availability issues and using different guidelines and references.

In our current study interventions were made to tackle or avert the identified DTPs among study subjects. Suitable interventions made by principal investigator were informing the treating physicians, nurses, and care givers to add, to change the dose, to discontinue drugs and to counsel the patients to improve compliance. For 250 DTPs (83.9%) interventions were made by the principal investigator. But this result is lower than what is done in India (87.45%) among admitted geriatric patients. This higher intervention by Indian study might be due to nature of study period (one year) and large sample size (520) [44]. Similar findings reported from Norway shows lower intervention 80% for extremely important clinical DTPs than our current studies [9].

Similar study done in Gondar; Ethiopia shows also lower intervention (55%) rate than our current study. This might be because of intervention was given by Principal investigator and physicians only [28]. In our current study, acceptance of intervention rate was done. Of the 298 DTPs identified, more than half of the intervention 201 (91.3%) was fully accepted, 17(7.7%) partially accepted and 2 (0.9%) interventions were not accepted. Similar study from Switzerland reports lower acceptance rate than our current study (84%) [45]. This lower acceptance rate might be due small sample size than our current study. But our acceptance rate was found to be comparable with study done in Sweden (93.1%).

Risk factors associated with the occurrence of DTPs were also done in our current study. Age, sex, gender, marital status, and number of diagnosed diseases were not found to be risk factors for the incidence of DTPs. But length of hospital stay and polypharmacy (>5drugs per day) were positively associated with the occurrence of DTPs. This result is in line with study done in Gondar and Jimma, Ethiopia by which length of hospital stays and number drugs per patient were associated with the occurrence of the DTPs [46][39]. The reason might be due to the patients who had prolonged hospital stay have higher probability to develop different hospital acquired infection which requires complex therapeutic managements and skills. Studies done in Jimma ,Mekelle and Gedo, Ethiopia reports that only polypharmacy is positively associated with the occurrence DTPs among admitted patients[19][17][42]. The reason might be the potential drug-drug interaction as the result of polypharmacy.

6. Limitations and strengths of the study

This study has some limitations. Because of single centered study conducted in one general hospital, generalization to other hospitals was limited. In addition, cross-sectional nature of study design and small sample size may not provide the causation of DTPs and contributing factors. Also, generalization of the results to other wards than medical ward like pediatrics ward, surgery ward etc. were limited. Our current study didn't classify DTPs in their severity level. i.e. mild, moderate, and severe due to its complexity. DTPs related to drug administration error weren't included to our current study. Nevertheless, our current study contains all types of DTPs (i.e. ADR, Non-compliance.....) and being prospective and interventional could offset these limitations.

7. Conclusion

The current finding showed that the prevalence of DTPs was high at TBGH that needs great attention. The most frequently identified DTPs during the study period were needs additional drug therapy followed by noncompliance and inappropriate therapy. Also, this study finding reveal that length of hospital stays and polypharmacy or number of drugs patients taking per day were independent factors for the occurrence of DTPs. From all interventions provided by principal investigator, to add the drug, to counsel patients and to change in dose of the drug were among most important.

8. Recommendations

The prevalence of DTPs among adults admitted to TBGH were found to be high. Therefore; the following recommendations are forwarded based on the findings of the study.

Federal Ministry of Health

- ❖ Policy makers should include and encourage clinical oriented pharmacy professionals in each hospitals
- ❖ There should be updated guidelines for disease treatment and standard operating procedures for practicing clinical pharmacists.

Tirunesh Beijing General Hospital

- ❖ Clinical pharmacist should be routinely assigned to medical ward to give better pharmaceutical service.
- ❖ The hospital should work in collaboration with supplying agents (EPSA) for drugs which are stocked out at hospital level.
- ❖ There should be a forum that integrates clinical pharmacists with attending physicians, nurses and patient care givers during the selection and use of different drug classes.

Physicians and Clinical pharmacists

- ❖ The hospital staffs; physicians, nurses, clinical pharmacist, and other stakeholders should pay great attention for those drugs which are associated with the occurrence of DTPs like potassium chloride, warfarin, vancomycin and RHZE.
- ❖ Medication education program should be prepared for patients and care givers on daily bases.
- ❖ Drug ADR should be reported and action should be taken in collaboration with stakeholders.

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10. Annexes

Annex I: Consent Form

Addis Ababa University

School of Pharmacy

Department of pharmacology and clinical pharmacy

Prospective cross-sectional study on assessment of drug therapy problems and associated factors among adults admitted to medical ward of TBGH.

Greetings: Hello, my name is_____. I am here today to collect data to assess drug related problems in medical wards of Tirunesh Beijing General Hospital, Addis Ababa, Ethiopia. The study is being conducted by Mr. Tsegaye Ababiya from Addis Ababa University, school of

Pharmacy, department of clinical pharmacy and pharmacology, post graduate program.

The aim of this study was

- To determine the prevalence of drug therapy adults admitted to medical ward in TBGH
- To identify the most common drugs and drug classes involved in drug therapy problems based on cippole's classifications of DTPs.
- To identify potential risk factors for the occurrence of drug therapy problems among adults admitted to medical ward of TBGH

This is prospective cross-sectional study so I request you to take part in this study. Your cooperation and willingness is greatly helpful in assessing drug therapy problems in TBGH.

The study will be conducted through recording medical findings from your medical chart and interviewing (if needed). Intervention will be given to correct any drug related problem as fast as possible. Your name will not be written in this form and will never be used in connection with any information we take from the chart and you tell us.

There is no possible risk associated with taking part in this study except the time spent to deliver information for us. All information taken from your medical chart or given by you will be kept

strictly confidential. Your participation is voluntary and you are not obligated to participate in the study. If you feel discomfort with the study, it is your right to drop it. If you have questions about this study or would like to be informed of the results after its completion, please feel free to contact the principal investigator.

Address of the principal investigator:

Tsegaye Ababiya

Cell phone: +251- 913814339

E-mail: tsegabiya@gmail.com

Are you willing to take part in this study?

1. Yes - Continue 2. No - Skip to the next participant

Annex II: Participants' Scio demographic Characteristics and disease related questions

No	Questions	Response
1.	Patient's sex	<input type="checkbox"/> Male <input type="checkbox"/> Female
2.	Age (in years)	1. 18-35 2. 35-64 3. ≥ 65
3.	Marital status	1. Single <input type="checkbox"/> 2. Married <input type="checkbox"/> 3. Divorced <input type="checkbox"/> 4. Widowed <input type="checkbox"/>
4.	Religion	1.Orthodo <input type="checkbox"/> 2.Protestant <input type="checkbox"/> 3.Muslim <input type="checkbox"/> 4.Others-----
5.	Educational status	1. Can't read and write <input type="checkbox"/> 2. Non-formal education <input type="checkbox"/> 3. Primary education (1-8 grade) <input type="checkbox"/> 4. Secondary education (9-12 grade) <input type="checkbox"/> 5. Tertiary education (diploma and above) <input type="checkbox"/>
6.	Occupation	1.Farmers 2. Merchant 3. Employed 4. Unemployed 5. House wife 5. Student 6. Students 7. Retried 8.Others
7.	Monthly income in Ethiopian Birr?	1.Very low (≤ 860) 2. Low (861-1500) 3.Medium (3001-5000) 4. High (≥ 5001)
8.	Alcohol consumption	<input type="checkbox"/> Yes: <input type="checkbox"/> No:
9.	Cigarette smoking status	<input type="checkbox"/> Yes: <input type="checkbox"/> No:
10.	Khat chewing status	<input type="checkbox"/> Yes: <input type="checkbox"/> No:
11.	Traditional and herbal medicine use	<input type="checkbox"/> Yes: <input type="checkbox"/> No:
12.	Living status:	1. living with family 2. living with friends 3.Lives alone 4.Others--

13.	Residence	<input type="checkbox"/> rural <input type="checkbox"/> urban
14.	Number of hospitalizations since the last one year	1. Never 2. One times 3. Two times 4. More than three times
15	Duration on treatment	1. <7days 2. ≥7days
16	Number of diagnosed diagnosis	1.One 2.Two and above
17.	Number drugs taken per day	1. <5 2. ≥5

Annex III: Data abstraction format

Ward _____ chart code _____

Current working Diagnosis _____

Patient Name (initials) _____ card no. _____ Age (yrs.) _____ Sex _____

Wt. (kg) _____ if female Pregnancy Status: _____ Date of admission _____ Date the data taken _____

S. no	Disease condition	Treatme nt	Dosage regime n	Start date	Stop date	Response /effectiveness/s afety	Length of therapy	Commen t (DTP)
--------------	--------------------------	-------------------	------------------------	-------------------	------------------	--	--------------------------	-----------------------

1								
2								

3								
4								
5								

Pertinent laboratory values and investigations/radiology findings

Drug interaction

1. Is there any drug interaction Yes No.....

2. If yes , specify it

Recent vital sign chart

Date	PR	RR	BP	T₀C	S₀2	Input	Output	Balance	Comment

Annex IV: Evaluations of DTPs

Prevalence of DTPs

Did the patient experience any DTPs? Yes No
 If yes, classify

Classification of DTPs	Reason for DTPs	Drugs involved on DTPs	Possible intervention
Unnecessary drug therapy	No valid medical indication for the drug therapy		
	Duplicate therapy		
	Non drug therapy is more appropriate		
	Treating avoidable adverse reaction		
	Drug abuse, alcohol use, or smoking is causing the problem		
Needs Additional Drug Therapy	A medical condition requires the initiation of drug therapy		
	Preventive drug therapy is required		
	Synergistic or additive therapy		
Ineffective Drug therapy	More effective drug available		
	Condition is refractory to drug effect		
	Dosage form inappropriate		
	Drug is contraindicated for the condition		
	Drug product is not an effective product for the indication		
Inappropriate dose	Dose is too low		
	Dosage interval is too infrequent to produce the desired response		

	Duration of drug therapy is too short to produce the desired response		
	Dose is too high		
	The dosing frequency is too short		
	The duration of drug therapy is too long		
Adverse Drug Reaction	The drug product causes an undesirable reaction that is not dose-related		
	A Safer drug product is required due to risk factors		
	A drug interaction causes an undesirable reaction that is not dose-related		
	The dosage regimen was administered or changed too rapidly		
	The drug product causes an allergic reaction		
	Safer drug product is required due to patient risk factors		
Non compliance	The patient does not understand the instructions		
	The patient prefers not to take the medication		
	The patient forgets to take the medication		
	The drug product is too expensive for the patient.		
	The patient cannot swallow or self-administer the drug product appropriately		
	The drug product is not available for the patient.		

NB: Dear data collectors don't forget to sign on each of filled questionnaire after rechecked as all questions are answered.

Data collector, Name and signature: -----, Date: ----/----/---

Tell Phone number of data collector: +2519-----

Data Quality Checked by: Name and signature: -----, Date: ----/----/---

Annex V: Amharic Version Questionnaire

ቅፅ አንድ: የአማርኛ ቋንቋ ቃለ መጠይቅ

በአዲስ አበባ ዩኒቨርሲቲ ጤና ሳይንስ ኮሌጅ፣ከፋርማሲ ት/ቤት ጥናቱን በተመለከተ ለታካሚ የሚሰጥ መረጃ የፈቃድ መጠየቂያና መቀበያ ፎርም። አዲስ አበባ ዩኒቨርሲቲ የፋርማሲ ት/ቤት የፋርማኮልጂ እና ክልኒካል ፋርማሲ ት/ት ክፍል በጥናቱን ቤጂንግ ሆስፒታል በአስተኝቶ ህክምና ክፍል ከመድሃኒት ጋር የተያያዙ ችግሮችን በተመለከተ ጥናታዊ ግምገማ ማድረግ።

ጤና ይስጥልኝ: ስሜ -----ይባላል። ዛሬ እዚህ የተገኘሁት በዚህ በጥናቱን ቤጂንግ ሆስፒታል አስተኝቶ ህክምና ክፍል ውስጥ በሚሰጠው ህክምና ዙፋን ከመድሃኒት ጋር የተያያዙ ችግሮች ላይ በተመለከተ ለሚደረግ ጥናት መረጃ ለመሰጠት ነው። ይህ ጥናት የሚደረገው በአዲስ አበባ ዩኒቨርሲቲ ድህረ ምረቃ ፕሮግራም በኩል የሚሰጠው የፋርማኮልጂ እና ክሊኒካል ፋርማሲ ድህረ ምረቃ ት/ት ማሟያነት ነው። የዚህ ጥናት አላማውም፡

- በአስተኝቶ ህክምና ክፍል ውስጥ በሚሰጠው ህክምና ላይ ከመድሃኒት ጋር የተያያዙ ችግሮችን መጠን ለማወቅ
- በአስተኝቶ ህክምና ክፍል ውስጥ በሚሰጠው ህክምና ላይ ችግሮችን የሚያመጡ የመድሃኒቶች አይነትና የምን ቡድን እንደሆኑ ለማወቅ
- በአስተኝቶ ህክምና ክፍል ውስጥ በሚሰጠው ህክምና ላይ ከመድሃኒት ጋር ተያይዞ ለሚመጡ ችግሮች መነሻ ወይንም መንስኤ ለማወቅ

ስለሆነም ጥናቱ ቀጣይነት ስላለው እርሶም በጥናቱ እንድሳተፉ በትህትና እጠይቆታለሁ።የእርሶ ተሳትፎ በህክምና አሰጣጡ ላይ የሚታዩ ችግሮችን ለመለየት ከፍተኛ ጠቀሜታ ይኖረዋል። ጥናቱ የሚካሄደው የህክምና ውጤቶችን ከካርደዎ በመመለከት እና ቃለመጠይቅ በማድረግ ይሆናል። ስሞት በዚህ ጥናት ውስጥ አይገለጽም።እንዲሁም ከካርደዎት ከምንወስደው መረጃ ጋርም ሆነ ከቃለመጠይቁ ጋር አይያያዝም። ለጥናቱ የሚሆን መረጃ ለመስጠት ከሚሰጡት ጊዜዎት በስተቀር ጥናቱ ምንም የሚያሰከትለው ጉዳት የለም። የሚሰጡት ማንኛውም መረጃ ሁሉ ሚስጥራዊነቱ የተጠበቀ ነው። በጥናቱ የሚሳተፉት ፈቃደኛ ከሆኑ ብቻ ስለሆነ አለመሳተፍ ወይም በጥናቱ መሳተፍ ከጀመሩም በኋላ ማቋረጥ ሙሉ መብትዎ ነው። ይህን ጥናት አስመልክቶ የሚኖሩትን ጥያቄም ሆነ የጥናቱን ውጤት ማወቅ ከፈለጉ ጥናቱን የሚያካሄደውን

ሰው በስተመጨረሻ በተገለጸው አድራሻ ማግኘት ይቻላል። ማንኛውም ጥያቄ ካልዎት ፀጋዬ አባብያ
የፋርማኮልጂ እና ክልኒካል ፋርማሲ ት/ት ክፍል፤ አዲስ አበባ ዩኒቨርሲቲ

ሞባይል:251-0913814339

ኢ-ሜይል:tsegabiya@gmail.com

ለመሳታፍ ፍቃደኛ ነዎት.....ይቀጥሉ

ፍቃደኛ አይደለሁም..... ወደ ቀጣይ ተሳታፊ

ቅፅ ሁለት: አጠቃላይ የታካሚ ቃለ-መጠይቅ

ከታካሚው ጋር አጠቃላይ ማህበራዊ፣ስነ-ፆታዊ እናም የሕክምና ባህሪያት

ተ.ቁ	ጥያቄ	መልስ
1	የታካሚ ፆታ	<input type="checkbox"/> ወ <input type="checkbox"/> ሴ እድሜ 18-34 35-65 ≥65
2	የጋቢቻ ሁኔታ	1.ያላገባ/ች <input type="checkbox"/> 2.ያገባ/ች <input type="checkbox"/> 3.አግብቶ የፈታ/ች <input type="checkbox"/> 4.ባል/ሚስት የሞተባት/ችበት <input type="checkbox"/>
3	ሀይማኖት	1.ኦርቶዶክስ <input type="checkbox"/> 2.ፕሮቴስታንት <input type="checkbox"/> 3.ሙስሊም <input type="checkbox"/> 4.ካቶሊክ 5.ሌላ-----
4	የት/ት ደረጃ	1.ማንበብና መጻፍ የማይችሉ <input type="checkbox"/> 2.ምንም ት/ት ያልተማሩ <input type="checkbox"/> 3. አንደኛ ደረጃ (1-8 grade) <input type="checkbox"/> 4. ሁለተኛ ደረጃ(9-12 grade) <input type="checkbox"/> 5.ከፍተኛ ደረጃ <input type="checkbox"/>
5.	የሥራ ሁኔታ	1.አርሰ/አርብቶ አደር <input type="checkbox"/> 2.ነጋዴ <input type="checkbox"/> 3.የቀን ሰራተኛ <input type="checkbox"/> 4.ተማሪ <input type="checkbox"/> 5. ተቀጣሪ (ወርታዊ ተከፋይ) <input type="checkbox"/> 6. የቤት እመቤት 7.ስራ አጥ <input type="checkbox"/> 8. ጡረተኛ <input type="checkbox"/>
6	የወር ገቢ መጠኖ በኢትዮጵያ ብር	1.በጣም ዝቅተኛ (≤ 860 ብር) <input checked="" type="checkbox"/> 2. ከአማካይ በላይ (3001-5000 ብር) <input checked="" type="checkbox"/> 3.ዝቅተኛ (861-1500 ብር) <input checked="" type="checkbox"/> 4. ከ ፍተኛ (≥5001 ብር)
7	የአልኮል መጠጣት	<input type="checkbox"/> አዎ: <input type="checkbox"/> አልወስድም:
8	ስጋራ ያጭሳሉ	<input type="checkbox"/> አዎ: <input type="checkbox"/> አላጭስም:
9	ጫት ይቅማሉ	<input checked="" type="checkbox"/> አዎ: <input checked="" type="checkbox"/> አልቅምም:
10	በህላዌ እፁዋቶችን ለሀክምና ይጠቀማሉ	<input type="checkbox"/> አዎ: <input type="checkbox"/> አልጠቀምም
11	የኑሮ ሁኔታ:	1.ከቤተሰብ ጋር 2.ከጎደኛቸው ጋር 3.ብቸኛ 4.ሌላ--
12	የመኖሪያ አከባቢ	<input type="checkbox"/> ገጠር <input type="checkbox"/> ከተማ

13	ከባለፈው ዓመት አንስቶ ምን ያህክል ጊዜ ሆስፒታል ተኝ	<input type="checkbox"/> ምንም <input type="checkbox"/> አንድ ጊዜ <input type="checkbox"/> ሁለት ጊዜ <input type="checkbox"/> ከሶስት ጊዜ በላይ
14	በ ሆስፒታል ውስጥ ህክምና ላይ የቆዩበት ጊዜ	ከ 7 ቀናት ያነሳከ <input type="checkbox"/> ከ 7 ቀናት በላይ <input type="checkbox"/>
15	የተመረመሩበት በሽታ አይነት ብዛት	<input type="checkbox"/> አንድ <input type="checkbox"/> ሁለትና ከዚያ በላይ <input type="checkbox"/>
1 6	በቀን የሚወስዱት መድሃኒት ብዛት	<5 <input type="checkbox"/> <input type="checkbox"/> ≥5 <input type="checkbox"/>

ጠቃሚ የላቦራቶሪ ምርመራዎች

ተ.ቁ	የላቦራቶሪ ምርመራ	ሐኬት (Unit)	የምርመራ የተደረገበት ቀን										
1	WBC												
2	Lymphocytes												
3	Neutrophils												
4	PLT count												
5	RBC												
6	Hgb												
7	Hct												
8	MCV												
9	MCHC												
10	ANC												

ምርመራ የተደረገበት ቀን

	ምርመራ	ልኬት							
ተ.ቁ	አይነት								
1	Serum K								
2	Serum Na								
3	Serum Cl								
4	BUN								
5	Serum Cr								
6	Serum iCa								
7	Albumin								
8	FBG								

የጉበት ምርመራ

1	AST								
2	ALT								
3	ALP								
4	PT								
5	INR								
6	Aptt								

7	Bilirubin								
	Total								
	Direct								

የኩላሊት ምርመራ

1	Ketone								
2	Glucose								
3	Protein								
4	WBC								
5	RBC								
6	Nitrites								

የኮሌስትሮል ምርመራ

1	TG								
2	Total cholesterol								
3	LDL								
4	HDL								

የደም ሱካር መጠን

1	FBG								
2	RBS								
3	HgA1c								

➤ ሌሎች ምርመራዎች/ራዲኦሎጂ ምርመራዎች

➤ የቅርብ ጊዜ ሽይታል ወይም ለታካሚ የሚሰጡ ምልክቶች

ቀን	PR	RR	BP	T ₀ C	So ₂	Input	Output	Balance	Comment

መድሃኒት ከመድሃኒት ጋር ያለው ግጭት

1. የመድሃኒት ግጭት አለ? አዎ የለም

2. የመድሃኒት ግጭቱ ካለ

ያብራሩ _____
