Assessment of Medication Therapy Management Service outcome among Hypertensive Patients on Follow up at Ambulatory Clinic of Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

By: Belachew Bulo (B.Pharm)

A Thesis Submitted to Department of Pharmacology and Clinical Pharmacy, School of Pharmacy, College of Health Sciences in Partial Fulfillment of the Requirements for Master of Pharmacy in Pharmacy Practice (M.Pharm)

Addis Ababa, Ethiopia

February, 2021

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This is to certify that the thesis prepared by Belachew Bulo entitled "Assessment of Medication Therapy Management Service Outcome among Hypertensive Patients on Follow up at Ambulatory Clinic of Tikur Anbessa Specialized Hospital", and submitted in partial fulfillment for the requirements of the Degree of Master of Pharmacy in Pharmacy Practice complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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Abstract

Assessment of Medication Therapy Management Service Outcome among Hypertensive patients on Follow up at Ambulatory Clinic of Tikur Anbessa Specialized Hospital

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Addis Ababa University, 2021

The high prevalence of hypertension with multiple comorbidities and use of multiple medications predisposes this group of patients to drug therapy problems (DTPs). This justifies the need for the implementation of medication therapy management (MTM) service. The aim of this study was to evaluate the impact of introducing MTM Services among patients with hypertension attending follow-up at ambulatory clinic of Tikur Ambessa Specialized Hospital (TASH).

A quasi-experimental study was performed with patients followed-up for six months at renal clinic of TASH between July 2019 and April 2020. Data was analyzed using Statistical Package for the Social Sciences (SPSS). Descriptive statistics, linear regression and logistic regressions were also performed for the purpose of data analyses.

Out of 304 enrolled patients, 279 entered in to the final analysis, with attrition rate of 7.8%. Mean age of the patients was 56.38(SD, 11.81) years and 50.5% of them were females. Data showed a decline in the prevalence of DTPs from 63.1% at baseline to 31.1% during the post-interventions phase. Using ≥ 5 drugs (AOR = 2.46; 95%CI: 1.27-4.77) and presence of complication (AOR = 0.52; 95% CI: 0.27-0.99) were significantly associated with occurrence of DTP at baseline. Intervention also brought about a decrease in mean systolic blood pressure (SBP) (5.31 95% CI of difference 3.50-7.11: $p < 0.001$) and a significant increase ($p < 0.001$) in the number of study patients whose blood pressure (BP) reached to a goal BP. About (69.5%) of participants were adherent to their medications at the end of MTM intervention. Experiencing DTP (AOR= 2.40; 95% CI: 1.33-4.334) and living outside Addis Ababa (AOR= 1.73; 95% CI: 1.38-1.88) were significantly associated with non-adherence at the end of follow-up. The overall mean score (SD) of treatment satisfaction was 86.55 ± 10.34 at the end of MTM visit. Adherent patients were found to be significantly more satisfied ($p < 0.001$) than non-adherent patients.

MTM service contributed to the resolution of DTPs and improvement of clinical outcomes. Majority of the patients were found to be adherent and high treatment satisfaction score was observed at the end of the MTM interventions.

Key words: Medication Therapy Management, Hypertension, Drug Therapy Problems, Medication Adherence, Treatment Satisfaction

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Abbreviations and Acronyms

ACEIs	Angiotensin Converting Enzyme Inhibitors
ADRs	Adverse Drug Reactions
ANOVA	Analysis of Variance
AOR	Adjusted Odds Ratio
APhA	American Pharmacists Association
ARBs	Angiotensin II Receptor Blockers
BB	Beta Blocker
BP	Blood Pressure
CCB	Calcium Channel Blocker
CI	Confidence Interval
CKD	Chronic Kidney Disease
CMR	Comprehensive Medication Review
CVD	Cardio-Vascular Disease
DDIs	Drug-Drug Interactions
DBP	Diastolic Blood Pressure
DM	Diabetes Mellitus
DTP	Drug Therapy Problem
JNC	Joint National Committee
LMICs	Low and Middle-Income Countries
MAP	Medication related Action Plan
MTM	Medication Therapy Management
MMAS	Morisky's Medication Adherence Scale
NACDS	National Association of Chain Drug Stores
OR	Odds Ratio
OTC	Over-the-counter
PC	Pharmaceutical Care

PMR	Personal Medication Record
SATMED-Q	Satisfaction with Medicines Questionnaire
SD	Standard Deviation
SBP	Systolic Blood Pressure
SPSS	Statistical Package for Social Sciences
TASH	Tikur Anbessa Specialized Hospital
WHO	World Health Organization

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1. Introduction

1.1 Background

Systemic arterial hypertension is the condition of persistent, non-physiologic elevation of systemic blood pressure (BP). It is typically defined as a resting systolic BP (SBP) of 140 mm Hg or higher or diastolic BP (DBP) of 90 mm Hg or higher following repeated examination, or receiving therapy for the indication of BP-lowering (Chobanian *et al.*, 2003). Hypertension is a leading single cause of global burden of diseases and death (James *et al.*, 2014). It is an important worldwide public health problem and the most preventable risk factor for cerebrovascular, cardiovascular, and kidney disease (Chobanian *et al.*, 2003; James *et al.*, 2014; Michael *et al.*, 2016; Unger *et al.*, 2020). Genetic, environmental as well as important gene-environment interactions and behavioral factors influence the development of hypertension (George and Matthew, 2018).

According to a report from World Health Organization (WHO), an estimated 1.13 billion people worldwide have hypertension (WHO, 2019). Different surveys of the prevalence of hypertension also indicate a growing global burden of the disease as it increases sharply with a growing pandemic of obesity, advancing age, and urbanization (Mills *et al.*, 2016). Hypertension disproportionately affects different economic regions of the world with a substantial burden of disease observed in low-and middle-income countries (LMIC) (Chow *et al.*, 2013; Mills *et al.*, 2016).

The trend in Africa shows that hypertension had risen from 55 million in 1990 to 130 million in 2010 and by 2030 expected to be 220 million (Wong *et al.*, 2018). A community based survey from nine regions of Ethiopia showed the overall prevalence of raised BP among the Ethiopian

population aged 15-69 years to be 15.8%. The prevalence is higher in the urban population (19.7 %) than rural (14.8 %) (Gebreyes *et al.*, 2018).

Hypertension is a chronic condition that usually is treated with different anti-hypertensive drugs and life style changes (James *et al.*, 2014; Michael *et al.*, 2016; Colantonio *et al.*, 2018; Unger *et al.*, 2020). Despite abundant evidence about the effectiveness of antihypertensive drug therapy in reducing BP level and bringing important health outcomes in persons with hypertension (Wright *et al.*, 2002; Machado *et al.*, 2017) hypertension control remains poor both at global (Mills *et al.*, 2020) and national levels (Yazie *et al.*, 2018; Amare *et al.*, 2020).

Patients with hypertension often receive multiple medications (Munger, 2010; Al-Azzam *et al.*, 2016) and have different co-morbid chronic diseases that can lead to the occurrence of drug therapy problems (DTPs**)** (Redzuan *et al.*, 2017). DTPs are undesirable events experienced by the patient involving drug therapy that impedes progress toward achieving desired goals of therapy (Law *et al.*, 2004). It includes unnecessary drug therapy, the need for additional drug therapy, ineffective drug therapy, adverse drug reaction, inappropriate dosing, and non-adherence (Law *et al.*, 2004; Cipolle *et al.*, 2012). In studies related to the determination of DTPs, the prevalence of DTPs has been reported to be high in patients with hypertension (Hussein *et al.*, 2014; Farha *et al.*, 2016; Yimama *et al.*, 2018; Kefale *et al.*, 2020).

The asymptomatic nature of hypertension and the need for indefinite treatment duration makes medication non-adherence to be a significant challenge among these patients and constitutes a barrier to adequate BP control and prevention of cardiovascular events (Mazzaglia *et al.*, 2009). DTPs among hypertensive patients could be the major contributors to poor health outcome (Hussein *et al.*, 2014; Redzuan *et al.*, 2017), lower health-related quality of life (Farha *et al.*,

2016), increase healthcare costs and erodes public confidence in healthcare systems (Weldegebreal *et al.*, 2019b).

Therefore, to counteract such problem there should be an implementation of a program that targets prevention, identification, and resolution of DTPs to enhance patients' health-related quality of life, decrease health care costs and increase patient treatment satisfaction. Medication therapy management (MTM) service is a distinct service or group of services embodied in the philosophy of pharmaceutical care which aims to ensure the best therapeutic outcomes for the patient by identifying, preventing, and resolving drug therapy problems (Bluml, 2005; Burns, 2008b).

The service involves a multifaceted approach that includes five core elements: comprehensive medication therapy review, a personal medication record, a medication-related action plan, intervention or referral, and documentation and follow-up. MTM services also involve providing disease state management, self-management education, addressing medication adherence issues, and considering preventative health strategies that aim to optimize drug therapy and improve clinical outcomes of patients (Burns, 2008a). Recent studies found that the delivery of MTM services can impact hypertension control (Bunting *et al.*, 2008), prevent the incidence of new DTPs, and decline the prevalence of DTPs (Isetts *et al.*, 2008; Neves *et al.*, 2019), improves health-related quality of life (Wal *et al.*, 2013) , improve adherence (McKenney *et al.*, 1973) and decrease healthcare costs (Rupp, 1992) in patients with hypertension.

1.2 Statement of the Problem

Research has firmly established the efficacy of anti-hypertensive medications to decrease BP to the recommended targets and to prevent the occurrence of disabling cardiovascular events (Johnson *et al.*, 2018). The main objective of the pharmacotherapy of hypertension is to prescribe patients a treatment that is appropriately indicated, effective in achieving target BP, well-tolerated, economically affordable, and simple to take thus supporting long term compliance (James *et al.*, 2014; Michael *et al.*, 2016; Colantonio *et al.*, 2018; Unger *et al.*, 2020).

A large number of existing studies in the broader literature have also examined the impact of effective life style modifications that incorporates weight reduction, physical activity, smoking cessation, alcohol moderation, salt restriction, and dietary pattern to be a potent approach in controlling hypertension (Chobanian *et al.*, 2003; Colantonio *et al.*, 2018). As of emerging data, in addition to controlling BP, lifestyle changes are useful and effective to reduce global cardiovascular risk (Dickinson *et al.*, 2006). Despite a large body of scientific evidences and different scientific guidelines recommendations; that life style modification should be started early and continued indefinitely for hypertension control, this approach is neglected frequently (Buda *et al.*, 2017).

Patients with hypertension take multiple medications that are necessary to treat concurrent comorbidity and hypertension related complications (Long and Dagogo-Jack, 2011). The prevalence of poly-pharmacy which can also arise as a result of combining traditional medicines with allopathic medicines contributes to the irrational use of drugs. The public health consequences of this kind of haphazard drug utilization results in lethal effects due to inappropriate self-medications (Pande *et al.*, 2013).

Drug-drug interactions (DDI) are a major but preventable cause of adverse drug reactions (ADR) which were frequently observed among patients treated with anti-hypertensive drugs (Chelkeba *et al.*, 2013; Kothari and Ganguly, 2014). A study by Subramanian *et al.* (Subramanian *et al.*, 2018) demonstrated that up to 48% of hypertensive patients were vulnerable to DDI. Olowofela and Isah reported 18% of hypertensive patients experienced ADR while on treatment from their medications (Olowofela and Isah, 2017) while studies in Ethiopia showed even higher magnitude of this problem (42.7%) (Hussein *et al.*, 2014).

Low health and medication literacy is also common in this group of patients (Ma *et al.*, 2020) which is recognized as a major risk factor in blood pressure control and has an adverse effect on health outcomes (Pandit *et al.*, 2009) . Lack of optimization of drug therapy that may arise as a result of drug choice problems, dosing problems, lack of treatment modification, and intensification consistently with guidelines recommendation lead to the occurrence of DTPs (Heagerty, 2006) . The efficacy of antihypertensive medications can also be compromised if they are not appropriately taken or if patients' behavior in taking medication does not correspond with agreed recommendations from a health care provider (WHO, 2003).

Studies have demonstrated that the prevalence of DTPs among hypertensive patients following pharmacotherapy is high (Yimama *et al.*, 2018; Neves *et al.*, 2019). A study done in Malaysia found a high prevalence of DTPs among hypertensive patients which was up to 88.8% (Redzuan *et al.*, 2017). Another study done in Ethiopia similarly reported a higher prevalence of up 80.7% (Hussein *et al.*, 2014). With this huge prevalence, DTPs continue to impose a significant clinical, economic and humanistic burden among hypertensive patients and erodes public confidence in health systems (Weldegebreal *et al.*, 2019b).

The occurrence of DTPs potentially interferes with desired clinical outcomes (Farha *et al.*, 2015) and result in increased drug related morbidity and mortality (Redzuan *et al.*, 2017). Studies found that drug related hospital admissions have significantly increased over the past few decades. It was estimated that around 8% of hospital admissions were due to DTPs, in which 50% of them were avoidable (Nivya *et al.*, 2015). DTPs could also independently be associated with length of hospital stay. A study done in cardiology inpatient in Spain reported a significant difference in patients' mean length of hospital stay between patients who experienced DTPs and those without it. The study found mean length of hospital stay was 9.58 days in patients with at least one DTP versus 5.03 days in those without DTP ($P<0.001$) (Urbina *et al.*, 2015).

In the US an estimated 100,000 deaths occur annually due to DTPs. The economic burden associated with DTPs was estimated as $76.6 billion, in 1995 (Johnson and Bootman, 1995) and this has increased to more than double with an estimated annual average of $177.4 billion by the year 2000 (Ernst and Grizzle, 2001). The largest component of this total cost was associated with drug-related hospitalizations (WHO, 1997).

Findings showed that medication non-adherence was the major challenge for hypertensive patients (Wood *et al.*, 2005) . Sub-optimal adherence to Antihypertensive therapy affects 10-80% of hypertensive patients as demonstrated in several studies (Morisky *et al.*, 2008; Mazzaglia *et al.*, 2009; Ashna *et al.*, 2011b) . The factors that contribute to low levels of adherence include complex treatment regimens, medication side effects, asymptomatic nature of the disease, low treatment satisfaction, poor patient-provider communication, patient financial resources, patient beliefs, and low literacy level (Baroletti and Dell'Orfano, 2010).

Treatment satisfaction is defined as the individual's rating of important attributes of the process and outcomes of his/her treatment experience (Weaver, 1997) . Failure to realize adequate treatment satisfaction may result from treatment side effects, lack of effectiveness, or difficulties with treatment application. Low treatment satisfaction may in turn cause poor compliance (Saarti *et al.*, 2016). So far in Ethiopia, one study confirmed a significant negative association between treatment satisfaction and ADR among ambulatory patients with hypertension (Berhe *et al.*, 2017).

Appropriate management of hypertension; including proper use of medications, can lead to better disease control, decrease disease-related complications, and improve overall health (James *et al.*, 2014). In developed countries pharmacists have been shown to positively impact chronic disease outcomes through medication therapy management (MTM), which involves a multifaceted approach of reviewing medications, identifying and remedying DTPs, providing disease state management and self-management education, addressing medication adherence issues, and considering preventative health strategies to optimize medication-related health (Bunting *et al.*, 2008; Rodis *et al.*, 2017). However, pharmacists are under-utilized for patient care in low- and middle-income countries (LMIC); and the importance of their role as healthcare professionals in hospitals, community pharmacies, and healthcare teams has not been well recognized (Anderson, 2002).

Because of high magnitude and impact of DTPs it is necessary to examine the impact of pharmacists' clinical patient care interventions in developing countries like Ethiopia. Although there is a limited number of studies in other countries there is no study done to assess the impact of MTM service in Ethiopia, especially in hypertensive patients.

In light of this, this project aims to evaluate the impact of introducing MTM service among ambulatory hypertensive patients at TASH. Therefore, this study could highlight the benefits of MTM services in the identification and prevention of DTPs as well as patient treatment satisfaction that could influence patient adherence and treatment outcomes. The work may be useful to other researchers as a baseline while conducting further studies on related topics. The findings of this study could also help health policy makers, insurers, and other stake holders in developing policies and guidelines for the prevention and management of DTPs to improve the quality of care, patient treatment satisfaction, and treatment outcomes for patients with hypertension.

1.3 Literature Review

1.3.1 Medication Therapy Management

The concept of pharmaceutical care (PC) service was first described in 1975 as the care that a given patient requires and receives which assures safe and rational drug use (Mikeal *et al.*, 1975). Over the past three decades, the role of pharmacists has expanded beyond dispensing pharmaceuticals and showed a paradigm shift towards patient care. Pharmacists are responsible for providing PC to improve patients' quality of life; which involves identifying potential and actual drug therapy problems (DTPs), resolving actual DTPs, and preventing potential DTPs (Hepler and Strand, 1990). Increased health demand, an increasingly complex range of medicine uses, and poor adherence to prescribed medication have provided additional opportunities for pharmacists to deliver patient targeted services (Law *et al.*, 2004).

MTM represents the delivery of PC services in which a practitioner takes responsibility for all of a patient's drug-related needs and is held accountable for this commitment (Bluml, 2005) through collaboration between physicians, pharmacists, and patient to address drug-related morbidity and achieve therapeutic goals (Isetts *et al.*, 2003). The value of the service was demonstrated by the magnitude of the cost associated with drug-related morbidity and mortality which has continued to rise from $76 billion in 1995 to approximately $200 billion (Mikeal *et al.*, 1975; Johnson and Bootman, 1995; Ernst and Grizzle, 2001).

The first serious discussions and analyses of MTM service emerged during 2004 when the American Pharmacists Association (APhA) and the National Association of Chain Drug Stores (NACDS) foundation developed the first model framework for implementing effective MTM services in a community pharmacy setting (Bluml, 2005). Since then, another evolutionary

model that focuses on the provision of MTM services in diverse practice settings where patients and their caregivers can be actively involved in managing their medications was developed. This service model was designed to facilitate collaboration among the pharmacist, patient, physician, and other health care professionals to promote safe and effective medication use and achieve optimal patient outcomes. The model involves several components aimed at improving and optimizing therapeutic outcomes for patients. These components usually include comprehensive medication therapy reviews (MTRs), generating a personal medication records (PMRs) and medication-related action plans (MAPs) for the patient, and interventions and/or referrals by the pharmacist (Burns, 2008a) (Figure 1).

MTM is especially effective for patients with multiple chronic conditions, complex medication therapies, high prescription costs, and multiple prescribers (CDC, 2020). Studies over time demonstrated that MTM services can improve clinical outcomes (Shareef, 2015), improve patient medication adherence (Planas *et al.*, 2009; Robinson *et al.*, 2010; Sobieraj, 2011), enhance medication safety (Mckenney *et al.*, 1973), and reduce health expenditures in diverse chronic disease conditions (Bunting *et al.*, 2008).

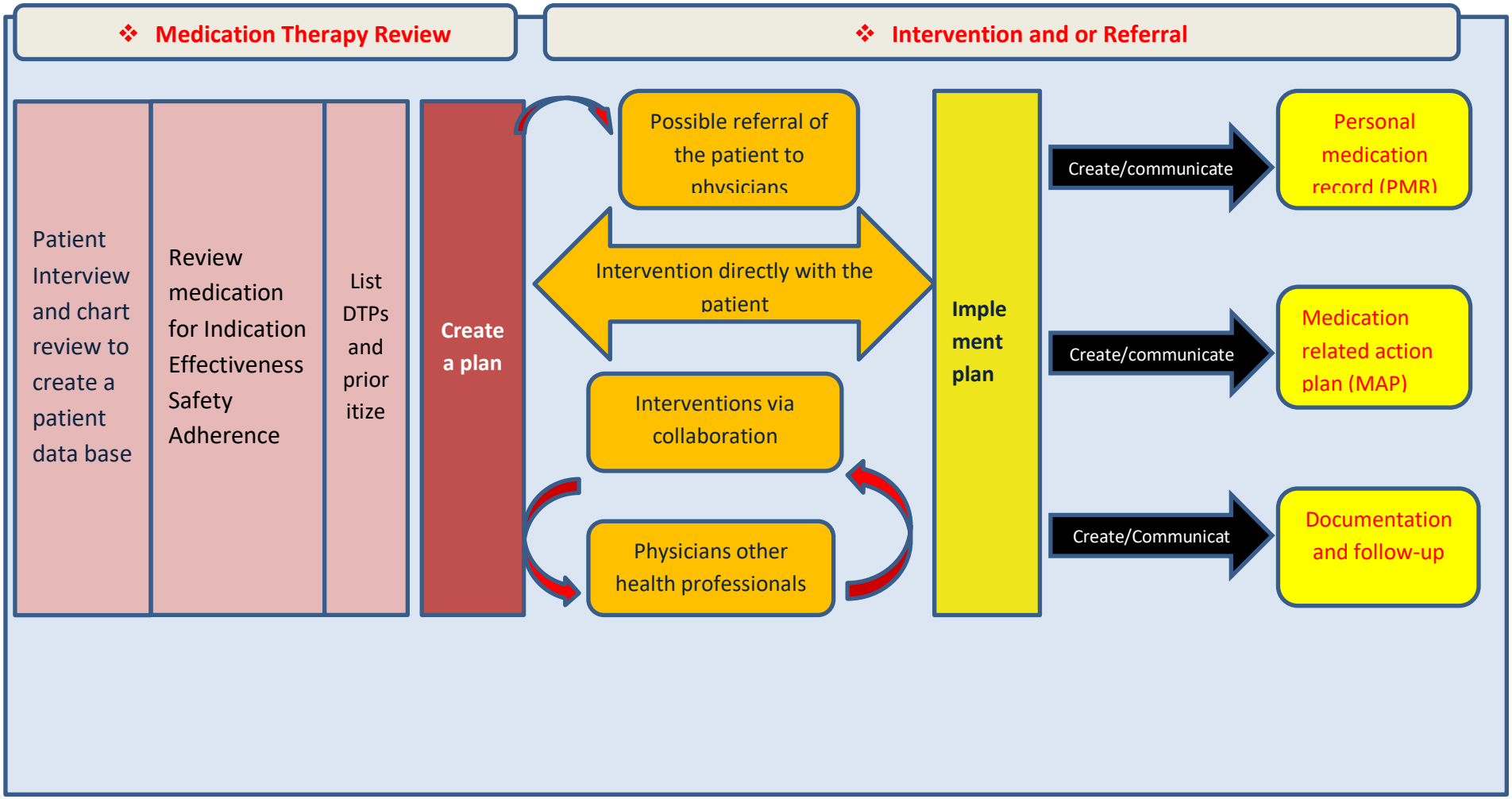


Figure 1: Core elements of MTM service model

1.3.2 Impact of MTM Interventions on Hypertension Management

The effectiveness of clinical pharmacy services in hypertension management has been documented in the literature as far back as over four decades ago. A small pilot study in 1973 evaluated the effect of clinical pharmacy services on hypertension control, comparing 25 patients with high blood pressure who received the intervention to 25 usual care patients. The results showed that significantly more patients in the pharmacist care group achieved blood pressure control during and throughout the study period. Furthermore, patients' knowledge of hypertension and its treatment improved significantly, and the pharmacists were able to identify several adverse drug reactions that were previously not addressed. Adherence to prescribed medications was also positively impacted in the intervention group after the pharmacist provides education to patient participants (McKenney *et al.*, 1973).

Another earlier study that comes up with evidence supporting the effectiveness of MTM services among hypertensive patients was the Ashville project which employed a quasi-experimental study design and was done over a 6-years period from 2000 through 2005. The study found that patients with hypertension and/or dyslipidemia receiving education and long- term MTM services achieved significant clinical improvements that were sustained for as long as 6 years. The proportion of patients achieving hypertension control increased from 40.2% to 67.4% and the mean systolic blood pressure (SBP) was decreased from 137.3 to 126.3 mm Hg; mean diastolic blood pressure (DBP) from 82.6 to 77.8 mm Hg at the end of the study. This study used JNC-7 with 130/80-mm Hg threshold blood pressure (BP) goal for patients with diabetes mellitus (DM) and chronic kidney disease (CKD) and a less relaxed goal of 140/90 mmHg in patients greater than 60 years old (Bunting *et al.*, 2008).

A prospective cluster- randomized, multicenter clinical trial the CAPTION study which included 32 medical offices from 15 U.S. states evaluated the effect of pharmacist interventions on patients with uncontrolled hypertension and DM and/or CKD compared to usual care. There were 335 patients included in this study; 242 had DM, 43 had CKD, and 50 had both. The pharmacist-intervention group, after receiving MTM services achieved a model-adjusted SBP and DBP reduction of 8.64 (95% CI= -12.8, -4.49, p<0.001) and 2.90 (95% CI= -5.55, -0.25, p=0.0323) mmHg greater than that of the control group, respectively. The CAPTION investigators conducted a sensitivity analysis using the definitions from the newer 2014 evidence-based guidelines for the management of high BP in adults (JNC-8), which recommended higher BP goals (140/90 mm Hg) for patients who are older than 60 years of age and for patients who suffer from DM or CKD. Their finding showed that when the higher BP goals were used, BP control was achieved in 61% of intervention patients and 45% of controls at 9 months (AOR= 2.03:95% CI 1.29-3.22, p=0.003) (Anderegg *et al.*, 2018).

A study conducted by Morgado *et al*. was a prospective randomized controlled trial conducted at the outpatient clinic in the university teaching hospital of Portugal. The main interventions were pharmacist-led educational interventions and counseling tips directed to the patient taking anti-hypertensive medications. Significantly lower SBP (-6.8 mmHg, P = 0.006) and DBP (-2.9 mmHg, P = 0.020) levels were observed in the intervention group. The medication adherence rate was also significantly higher in the intervention group at the end of the study (74.5% vs. 57.6%, P = 0.012) (Morgado *et al.*, 2011). In the clinical study of comprehensive medication management services conducted in Brazil that employed a quasi-experimental study design with patient follow up over two years, it has been demonstrated that pharmacist resolved 59.6% of the cases among a total of 346 DTPs identified in the initial assessment and 441 DTP in all

consultations. The most prevalent DTPs identified in this study were related to non-adherence followed by the need for additional drug therapy and dose too low (Neves *et al.*, 2019).

Other investigators have examined the impact of team-based care in the management of hypertensive patients that incorporated clinical pharmacists in the medical care team. An interventional study conducted by undertaking comprehensive drug therapy review, identification and resolution of DTPs in hospitalized diabetes mellitus patients with hypertension at Justice K S Hegde Charitable Hospital, Mangalore demonstrated improper drug selection (22.44%) and drug use without indication (19.04 %) were the most observed DTPs out of a total of 147 DTPs that were identified from 111 patient case records. The most frequent suggestions by the clinical pharmacist were on cessation of drug (25.17%). The acceptance rate of suggestions and the changes in drug therapy was found to be high (52.38%) (Shareef *et al.*, 2015).

A prospective study done in six ambulatory clinics in Minnesota among 285 patients with hypertension and hyperlipidemia received MTM services provided by pharmacists. In this study, 637 DTPs were resolved among 285 intervention patients, and the percentage of patients' goals of therapy achieved increased from 76% to 90%. The need for additional drug therapy and the dose too low were the two most frequently reported DTPs (Isetts *et al.*, 2008). In another study which was a multicenter prospective study with diabetes and hypertensive patient populations, pharmacists have been shown to positively affect chronic disease outcomes through MTM service. The study enrolled 422 patients with uncontrolled diabetes, 434 with uncontrolled hypertension, and 150 with both uncontrolled diabetes and hypertension. Non-compliance, the need for additional drug therapy, and insufficient dose were the most frequent DTPs identified. Although the study enrolled both vulnerable populations who were underserved and other

patients with better services the impact of MTM services on each of these groups was not specifically explained for both in the report (Rodis *et al.,* 2017).

Despite a positive impact of clinical pharmacist service in a wave of studies among hypertensive patients to enhance adherence, the majority of the studies lack an objective measure of medication adherence (Wang *et al.*, 2011a; Saleem *et al.*, 2015; Bajorek *et al.*, 2016; Hovland *et al.,* 2020). A randomized controlled trial study that was undertaken in Norwegian community pharmacies has demonstrated that a short, structured pharmacist-led intervention may increase medication adherence for patients starting on chronic cardiovascular medication as measured by the 8-item Morisky Medication Adherence Scale (MMAS-8) at 7 and 18 weeks after filling the prescription (Hovland *et al.*, 2020).

Pharmacist intervention was also found to impact hypertensive patient treatment satisfaction in positive direction. A prospective study done in India among 200 hypertensive patients with low adherence to their medications demonstrated that clinical pharmacist interventions had positive impact in improving the medication adherence and treatment satisfaction. In this study, the treatment satisfaction questionaries' with medicines (TSQM) baseline mean scores for 45 patients were recorded as Effectiveness 68.2, Side Effects 89.3, Convenience 75.9 and Global Satisfaction 76.3. The mean MMAS-8 score was 5.3 at baseline. After one month patient follow-up there was a significant improvement in their satisfaction domains. The TSQM mean scores after one month were Effectiveness 76.3 ($p = 0.031$), Side Effects 80.3, Convenience 78.6 ($p = 0.022$) and Global Satisfaction 79.4 ($p = 0.012$). There was a significant change in the three satisfaction domains. The MMAS mean score was recorded as 7.2 at the end of the study (Mathew *et al.,* 2016).

In summary, although there is extensive and credible research concerning the impact of MTM service on BP outcomes with consistent results in hypertensive patients, there is still lack of research on footprint of this service on DTP especially in resource limited setting. This may contribute to the lack of understanding of complex nature of the problem and ways to address it. There is also much research on the impact of pharmacist interventions on medication non-adherence while only few researchers have taken patient treatment satisfaction into considerations.

2. Objectives

2.1 General objective

- The aim of this study was to assess the impact of introduction of Medication Therapy Management (MTM) service among ambulatory hypertensive patients at TASH.

2.2 Specific objectives

- To assess the prevalence and pattern of drug therapy problem at baseline and during post MTM interventions.
- To determine the impact of introducing MTM service on rates of BP control and change in mean BP.
- To assess the patients' level of adherence to antihypertensive medication after implementation of MTM program.
- To assess the patients' level of treatment satisfaction after implementation of MTM program.

3. Materials and Methods

3.1 Study setting

The study was conducted at renal ambulatory clinic of TASH, Addis Ababa, Ethiopia. TASH is a tertiary care specialized hospital which is the largest referral teaching hospital for the nation. The hospital has 51 specialty, sub-specialty and super specialty out-patient clinics serving for 500,000 patients annually. The renal out-patient clinic functions three times per week serving 60 to 80 patients per session. Hypertensive patients account the majority of them (AAU, 2020).

3.2 Study type and period

A one group pre-post, quasi experimental study was conducted in two phases from July 2019-April 2020. The first phase lasted six months of intervention period and the second phase was post intervention study, which lasted for four months.

3.3 Study population

The source population includes all patients with hypertension who were on follow up at the renal ambulatory clinic of TASH. The study population involves all hypertensive patients visiting the renal ambulatory clinic of TASH during the study period and who fulfilled the inclusion criteria.

3.4 Eligibility Criteria

3.4.1 Inclusion criteria

- Patients who were ≥ 18 years of age
- Those patients who were on antihypertensive drug treatment for at least 1year.

3.4.2 Exclusion criteria

- Those patients with any evidence of hypertensive urgency or emergency

- Serious renal, cardiac or hepatic disease
- Pregnancy
- Dementia or cognitive impairment
- Those who refused to give informed consent.

3.5 Sampling method and sample size determination

The sample size was calculated using a single proportion formula with the assumption of 5% margin of error, 95% confidence interval, and 55.6% prevalence of drug related problems (DRPs) in patients with hypertension from prior study (Weldegebreal *et al.*, 2019b). The sample size was determined using an estimated population size of 1010 adult hypertensive patients based on the previous hypertensive patients' attendance records at the renal ambulatory Clinic of TASH.

Using a single proportion formula;

$$n = \frac{z^2\, p\,(1-p)}{d^2} = \frac{(1.96)^2\,(0.55)\,(1-0.55)}{(0.05)^2} = 379$$

n= sample size, p= prevalence, d= margin of error

The expected number of source population during the study period (N) was 1010 based on the average number of patients coming to the clinic three days in a week with a total of 12 weeks.

The corrected sample size was calculated as:

$$n_{corr} = \frac{n \times N}{n + N} = 276.$$

Adding a 10% contingency on 276 the final sample size was determined to be 304 patients.

A systematic random sampling method was used to recruit samples for the study on each day of the data collection process. The actual sampling fraction (K) varied in the different days of data collection as the total number of study population varied in different days. Hence, it was calculated by dividing the number of study population available at each day by the maximum possible number of patients' that could be interviewed the same day. Then, every K^{th} patient who gave written and affirmative consent was recruited to participate in the study.

3.6 Intervention Development and Implementation

The MTM service was launched by creating a patient database after reviewing the patient medical record and collecting socio-demographic and clinical patient data; laboratory results, co-morbidities, relevant previous medical and medication histories by data collectors. After the patient visited the physician, he/she met with the MTM pharmacist face to face for comprehensive medication therapy review (CMTR); which involved collecting information regarding current medications, supplements, and herbal and over the counter (OTC) drug use and information on medication adherence issues and reason for non-adherence, if any. Drug interaction was also checked for all medications and documented in the MTM patient database.

The clinical pharmacists identified medication related needs of patients including indication, effectiveness, safety, and adherence. This was followed by evaluation of the appropriateness of pharmacotherapy using various references and current practice guidelines (James *et al.*, 2014; Michael *et al.*, 2016). Micromedex drug interaction checker were used to identify drug-drug interactions. Adverse drug reactions were identified from the patient medical record and through

interviews. Eventually, drug related problems (DTPs) were listed and prioritized leading to the development of pharmaceutical care plan. If any of the patient experienced DTP pharmacist identified it's' cause, classified it in to different categories, and prioritized DTPs for interventions. The MTM Pharmacist then created a pharmaceutical care plan to resolve the problem. The care plan might have necessitated the participation of patients, physicians or both. If a pharmaceutical care plan involved patient participation to resolve DTP the pharmacist created a medication action plan (MAP) and directly communicated with the patient to resolve the identified problem. When the identified DTPs need the participation of prescribing physician pharmaceutical care plan that involve physicians was prepared and communicated with them.

After communicating with physicians and patients to resolve DTPs and all necessary modifications were made to optimize drug therapy, reconciled medication list was written and provided to the patient as a personal medication record (PMR). The status of the identified DTP was then recorded. Evidence based brochure that was prepared in Amharic language to increase patients' knowledge of drug use and disease management was provided after counseling all important issues related to therapy.

After each visit, patients were interviewed for progress, any new DTP and counseled on their disease state and medications use. Unresolved issues from the prior sessions were also discussed. The pharmacist assessed the treatment care plan to monitor the patient's adherence to the medication action plan and to establish new therapy goals when required. Finally, after six months' follow-up, outcomes of the pharmaceutical care (PC) provided for each patient were assessed. The assessment included DTP identification, medication adherence, and patient treatment satisfaction.

3.7 Study variables

3.7.1 Dependent variables

- DTP
- BP control
- Patient adherence to their medication and
- Patient treatment satisfactions

3.7.2 Independent variables

- Socio-demographic variables (age, gender, educational status, marital status, residency, health care cost coverage, salt restriction, physical activity, and alcohol use)
- Clinical characteristics (comorbidity, complication, number of medications, duration of treatment, and number of MTM visits).

3.8 Data collection and management

3.8.1 Data collection instruments and procedures

Socio-demographic data, health information and lifestyle factors, clinical characteristics, medication history, current medication with dose and frequency and duration including OTC drugs and herbal medication were collected using questionaries' and data abstraction format **(Annex: I).** Height was measured in meters (m) using a height scale while the subject was standing upright and with a normal straight posture. Weight was measured in kilogram (kg) using a weight scale. Body Mass Index (BMI) was calculated as the ratio of weight (kg) to the square of height (m). Blood pressure was measured using a sphygmomanometer at base line and during each visit to monitor for the efficacy of medication and goal of therapy achieved.

DTPs were identified and classified according to the Cipolle DTP classification tool which specifies four categories of DTP (indication, effectiveness, safety, and compliance) and seven types of DTPs (unnecessary drug therapy, needs additional drug therapy, in effective drug therapy, dose too low, adverse drug reactions, dose too high and noncompliance) and specific cause for each DTPs (Cipolle *et al.*, 2012). The identification of DTP was based on a review of patients' medical and medication records, assessment of laboratory investigations, and patients' interview for additional information when sought.

Modified Morisky Medication Adherence Scale (MMAS-8) assessment questionnaire was used to assess the self-reported adherence after the intervention was given to see the impact of MTM intervention **(Annex: II)**. MMAS-8 is an 8-item self-report measure of adherence. Items 1 through 7 have response choices "Yes" or "No", whereas item 8 has a 5-point Likert scale. Each 'No' response was rated as '1' and each 'yes' was rated as '0' except for item 5, in which each

response ‘Yes’ was rated as ‘1’ and ‘No’ was rated as ‘0’. Item 8 concerning the difficulty to remember taking medications was scored as “Never/Rarely = 0, Once in a while = 1, sometimes = 2, usually = 3 and all the time = 4. The higher scores the higher adherence. The total scores ranged from 0 to 8 and were grouped into three levels: high adherence (score = 8), medium adherence (score of 6 to < 8), and low adherence, score< 6 (Morisky *et al.*, 2008; Okello *et al.*, 2016).

A self-administered Treatment Satisfaction with Medicines Questionnaire (SATMED-Q) 17 was used to measure patients’ treatment satisfaction after MTM service **(Annex: III)**. It is a brief, feasible and easy to self-administer multidimensional generic questionnaire with good metric properties of reliability and validity. The SATMED-Q is designed to assess treatment satisfaction in persons with any chronic disease treated with medicines. The SATMED-Q has 17 items, assessing six treatment satisfaction domains; undesirable side effects (3 items), treatment effectiveness (3 items), convenience of use (3 items), impact on daily activities (3 items), medical care (2 items) and global satisfaction (3 items), each of which was computed as a score. In addition, a total satisfaction score was computed. Each item in the scale uses a five-point Likert scale; overall and domain scores ranged from zero to 68 or zero to 100 (after transformation), with higher scores indicating greater levels of treatment satisfaction (Ruiz *et al.*, 2008).

3.8.2 Data collector’s recruitment and training

Three nurses and one clinical pharmacist were recruited as data collectors. Training was given to the data collectors; to familiarize them with the study protocol, how to request informed consent from eligible participants, how to conduct the patient interview, uniform interpretation of

questions, implementation of sampling techniques, the confidentiality of the collected data, and activities of the intervention process.

3.8.3 Data quality management

Pre-test was carried out on 5% of hypertensive patients at the outpatient department of Tirunesh Beijing General Hospital before commencing patient recruitment process and data collection in order to check the completeness of the instruments. Based on the results obtained from pre-test, amendment was made on the assessment tools and ways of assessment. At the end of each data collection day, the principal investigator checked the completeness of filled questionnaire and recorded information to ensure quality.

3.9 Data Analysis

Data coded and entered into SPSS version-25 statistical software for management and analysis. Descriptive analysis was computed as mean and standard deviation (SD) for continuous and frequency, percent for categorical variables data. Tables, graphs and boxplots were used to present results. To examine the influences of different variables on DTPs and medication adherence as well as to control potential confounders both binary and multivariate logistic regression analyses were performed. Independent variables having a p-value <0.20 in the bivariate logistic regression analysis were entered into multivariable logistic regression analysis. McNemars test was used to know if there was a significant change in the proportion of overall DTPs and each type of DTPs from baseline to the end of the study.

Paired sample t-test was used to ascertain the significance of differences between the mean value of base-line and post-MTM SBP and DBP. The Relationship between treatment satisfaction (mean scores of SATMED-Q) and socio-demographic and clinical characteristics of the patient

were also examined. Statistical significance of treatment satisfaction was determined using an independent t-test for mean values of two continuous variables and one-way analysis of variance (ANOVA) with post hoc analysis for mean values of more than two continuous variables. A 95% CI and p-value of <0.05 was considered statistically significant for all data analysis.

3.10 Ethical considerations

Ethical clearance and approval of the study protocol was obtained from the Ethical Review Board of School of Pharmacy, Addis Ababa University (ERB/SOP/114/07/2019). In addition, permission was sought from the respective heads of the Department of Internal Medicine and Renal Clinic to conduct the study in the clinic. Prior to data collection individuals were informed about the study and written consent was obtained from the study participants. They were also informed that they had full right to withdraw from the study at any time. Privacy and confidentiality were maintained by avoiding the use of identifiers and restriction of data access.

3.11 Operational definitions

Adverse drug reaction (ADR): Any response to a drug which is noxious and unintended, and which occurs at doses normally used in man for prophylaxis, diagnosis, or therapy of disease, or the modification of physiological function (Edwards and Aronson, 2000; Adusumilli and Adepu, 2014).

Controlled hypertension: BP <150/90 mmHg in those participants greater than 60 years old and BP < 140/90 mmHg in all other patients (James *et al.*, 2014; Michael *et al.*, 2016).

Comorbidity: The presence of one or more additional diseases co-occurring with hypertension.

Drug-therapy problem: Any undesirable event experienced by the patient that involves or is suspected to involve drug therapy and that actually or potentially interferes with desired health outcomes.

Non-adherent: Those participants who score <8 based on Morisky Medication Adherence Scale-8.

Alcohol use: Drinks any alcoholic beverage for women, more than one drink per day; for men, more than two drinks per day(one drink is equal to a 12-oz beer(350ml), 5-oz glass of wine(150ml), or 1.5-oz distilled spirits(45ml)).

Informal education: A person not certified with any grade level of education but can read and write.

Third party coverage: When the cost of medication and other health care services was covered by insurance, government credit or other companies.

Physical activity: All movement that increases energy use by the individual- including activities undertaken while working, playing, carrying out household chores, travelling and engaging in recreational pursuits.

Unemployed: Participants who do not have a job that provides money.

Poly-pharmacy: The daily consumption of 5 or more medications.

Salt restriction: Patients consume less than 5 g (just under a teaspoon) of table salt per day (WHO, 2012).

Chat chewing: The patient chews chat on a regular basis which is at least ones in a week for 1 year.

4. Results

4.1 Flow of Study Participants

A total of 304 patients meeting the previously described inclusion criteria were referred and recruited to the HTN MTM service using systematic random sampling after patients gave informed consent from July2019 - April 2020. Out of this, 279 (92.7%) study participants completed the study and entered in to the final analysis. Thus, the attrition rate was found to be 7.8% (Figure1).

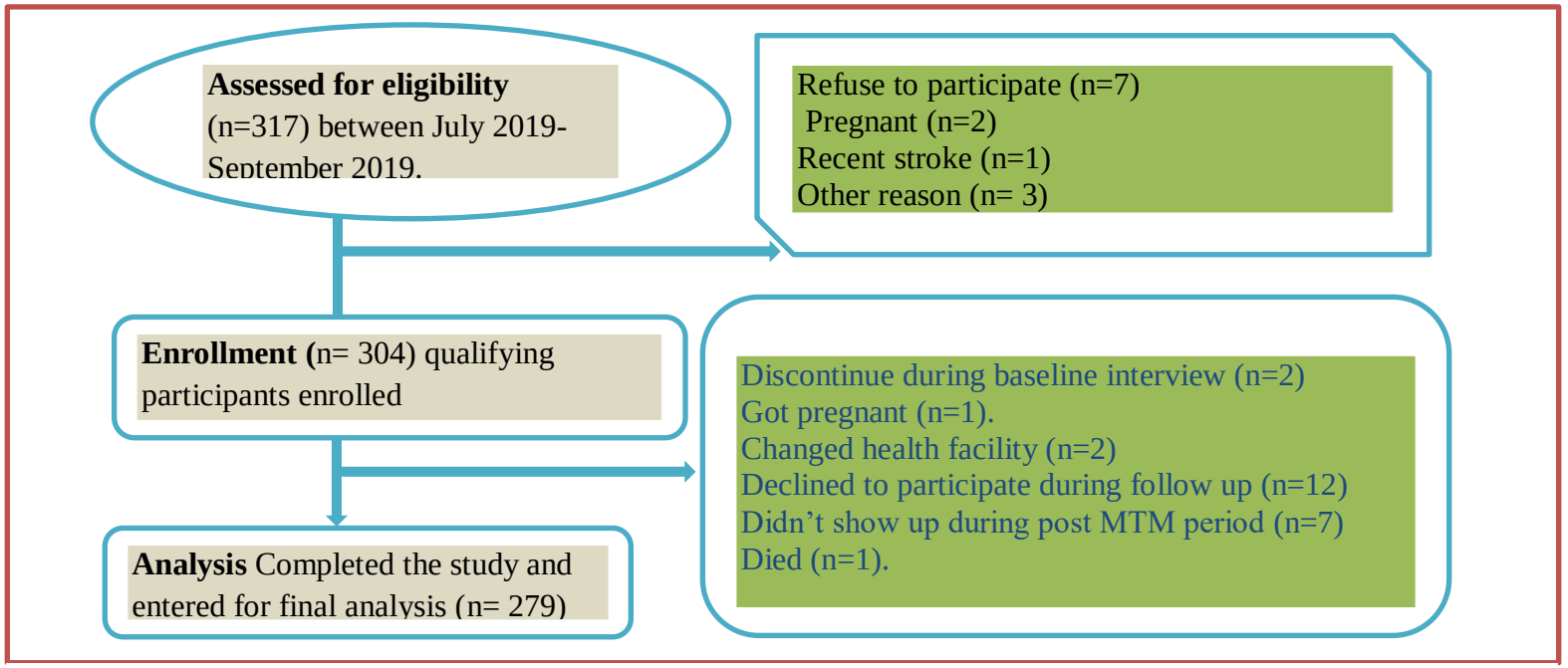


Figure 2: Flow diagram of patients with hypertension participating in MTM service study at ambulatory clinic of TASH, July 2019 - April 2020

4.2 Socio-demographic characteristics

Males and females were equally represented (50.5% females). The mean (SD) age of the study participants was 56.26 ±11.75 years and 23.7% of them were ≥ 65 elders. Most of the study participants were married (82.8%) and majority of them were living in Addis Ababa (89.6%). Almost a quarter of the study participants had a tertiary level education (26.2%) and employed (24.4%). Half (53.8%) of the study participants were found to get their medication through third party coverage (Table 1).

Table 1: Socio-demographic characteristics of ambulatory hypertensive patients on follow up clinic at TASH, Addis Ababa, Ethiopia, July 1, 2019 – September 30,2020 (n=279).

Variables	**Categories**	**Study participants**	
		Frequency	**Percent**
Age (years)	Mean ± SD	56.26 ±11.75	
	18-24	1	0.4
	25-39	25	9.0
	40-64	187	67.0
	≥ 65	66	23.7
Gender	Male	138	49.5
	Female	141	50.5
Marital status	Married	231	82.8
	Single	17	6.1
	Divorced	20	7.2
	Widowed	11	3.9
Education	No formal education	33	11.8
	Primary school	60	21.5
	Secondary school	73	26.2
	Diploma and above	113	40.5
Occupation	Employed	68	24.4
	Unemployed	62	22.2
	Private	102	36.6
	Retired	42	15.1
	Student	5	1.8
Residence	Addis Ababa	250	89.6
	Out of Addis Ababa	29	10.4
Health cost coverage	Third party coverage	150	53.8
	Out of pocket payment	129	46.2
Current smoker	Yes	7	2.5
	No	272	97.5

Chat chewing	Yes	11	3.9
	No	268	96.1
Physical activity	Yes	155	55.6
	no	124	44.4
Alcohol drinking	Yes	43	15.4
	No	236	84.6

SD: Standard Deviation

4.3 Clinical characteristics and medication profile

Most of the study participants had hypertension treatment duration of >10 years. Around 66.6% and 45.9% had experienced at least one comorbid condition and complication, respectively; with diabetic mellitus (DM) (31.2%) and nephropathy (35.4%) being the most common comorbid condition and hypertension related complication respectively. The mean (SD) number of medications was 3.70(±2.00). The majority of them were prescribed dual therapy (39.1%). Calcium channel blockers (CCBs) were the most frequently prescribed class of drugs (69.9%) followed by angiotensin converting enzymes (ACEIs) (54.1%) and diuretics (48.7%). Only 52.7% had controlled BP at baseline. Majority (73.1%) of the study participants had one to two MTM pharmacist visits and about 26.9% had three or more visits (Table 2).

Table 2: Baseline clinical characteristics of ambulatory hypertensive patients on follow up clinic at TASH, Addis Ababa, Ethiopia, July 1, 2019 – September 30,2020 (n=279).

Variables	Categories	Study participant	
		Frequency	Percent
BMI	Mean ± SD	25.45±3.45	
	<18.5	4	1.4
	18.5-24.9	131	47.0
	25-30	114	40.9
	>30	30	10.8
Blood pressure	Controlled	147	52.7
	Uncontrolled	132	47.3
Duration of HTN treatment	< 5	77	27.6
	5-10	89	31.9
	≥10	113	40.5
Hospitalization within 1 year (n,%, yes)	Yes	49	17.6
Number of Medications	Mean± SD	3.70±2.00	
	1	35	12.5
	2-4	157	56.2
	5 and above	87	31.1
Antihypertensive drug use	Mono therapy	96	34.4
	Dual therapy	109	39.1
	Triple therapy	54	19.4
	Quadruple therapy	17	6.1
	Five agents	3	1.1
Class of Anti-hypertensive drug	CCB	195	69.9
	ACEIs	151	54.1
	ARB	7	2.5
	Diuretics	136	48.7
	Beta blockers	64	22.9
Complication present	Yes	128	45.9
	No	151	54.1
Specific complications	Nephropathy	99	35.4
	HHD	39	14.0
	Stroke	24	8.6
	Retinopathy	5	1.8
Number of MTM visit	1	38	13.6
	2	166	59.5
	>=3	75	26.9
Comorbidity	No	48	17.2
	1-2	186	66.6
	>=3	45	16.1

Specific comorbidity	DM	87	31.2
	Dyslipidemia	50	17.9
	PN	36	12.9
	Gout	18	6.5
	IHD	16	5.7
	HIV/AIDS	15	5.4
	Asthma	13	4.7
	Osteoarthritis	12	4.3
	Others*	52	18.7

*Heart failure, atrial fibrillation, peptic ulcer disease, valvular heart disease, Thyroid disorders, Psychiatric and Neurological disorders, infection, obesity, cancer. BMI: Body Mass Index; CKD: Chronic kidney disease; DM: Diabetic mellitus; HIV/AIDS; Human immune-deficiency virus/acquired immune-deficiency syndrome, HTN: Hypertension; HHD: Hypertensive heart disease; IHD: Ischemic heart disease; MTM: Medication Therapy Management; PN: Peripheral neuropathy; SD: Standard deviation.

4.4 Drug Therapy Problems

4.4.1 Prevalence and Pattern

At baseline, a total of 260 DTP were identified. Additionally, 27 DTPs were identified during follow-up. The prevalence of DTP at baseline was 63.1%. At the end of the study, at least one, DTP was identified among 88 patients; which makes a prevalence of 31.1% (Figure 2).

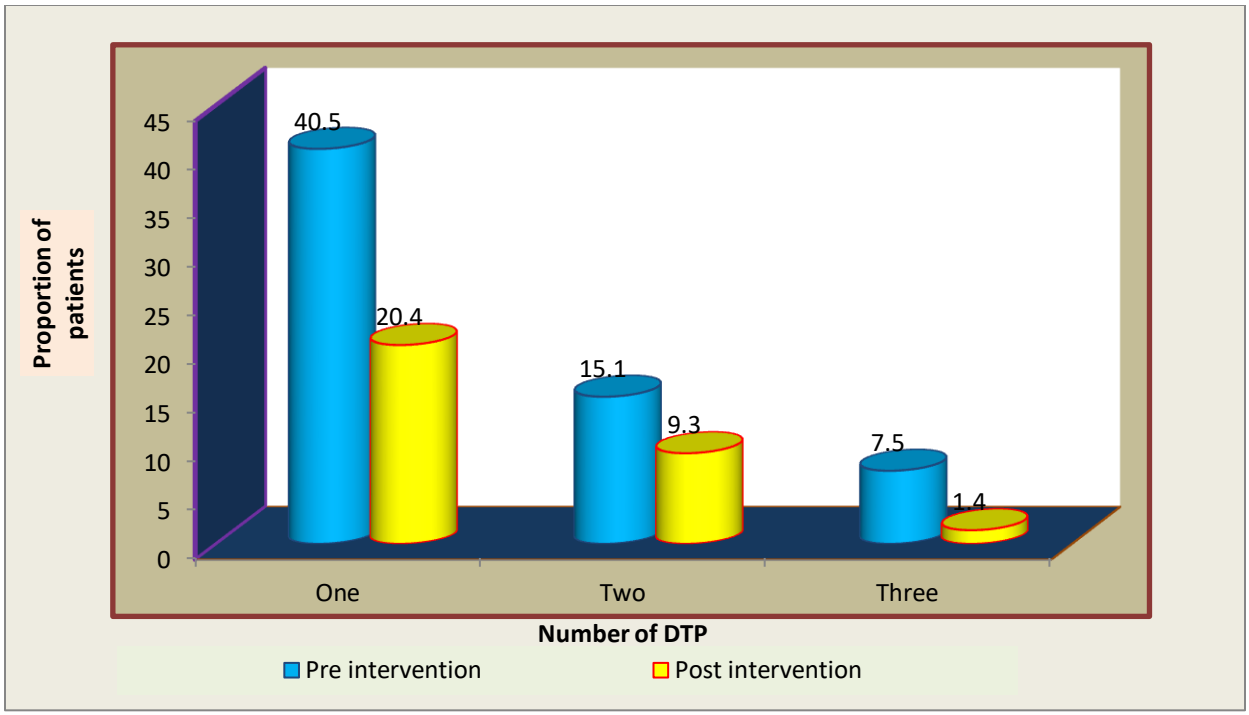


Figure 3: Pattern of DTPs among ambulatory hypertensive patients on follow up clinic at TASH, Addis Ababa, Ethiopia, July 1, 2019 - April 30 2020 (n=279).

There was significant reduction in the proportion of patients with at least one DTP from 63.1% in the pre-intervention phase to 31.1% during post-intervention phase ($p < 0.05$). The most encountered DTPs in the pre-intervention phase was non-adherence (n = 53, 20.38%) followed by adverse drug reaction (n = 48, 18.46%) and need for additional drug therapy (n = 47, 18%). On the other hand, the most encountered DTP in the post-intervention was in-effective drug therapy (n = 32, 26.66%) followed by need for additional drug therapy (n = 31, 25.83%) and non-adherence (n = 19, 15.83%). Using the McNemars test, there was a statistically significant decline in the proportion of patients with overall DTP ($p<0.01$) and each type of DTP from baseline to end of the study ($p<0.01$) except for ineffective drug therapy (Table. 3).

Table 3: Type and Proportion of DTPs among ambulatory hypertensive patients on follow up clinic at TASH, Addis Ababa, Ethiopia, July 1 –April 30,2020 (n=279)

Type of DTP	Pre MTM n (%)	Post MTM n (%)	P value[a]
Unnecessary drug therapy	23 (8.85)	8 (6.66)	0.003
Needs additional drug therapy	47 (18)	31 (25.83)	0.02
In effective drug therapy	39 (15)	32 (26.66)	0.115
Dose too low	26 (10)	5 (4.16)	0.000
Adverse drug reaction	48 (18.46)	18 (15)	0.000
Dose too high	24 (9.23)	7 (5.83)	0.000
Non-compliance	53 (20.38)	19 (15.83)	0.000

[a] McNemar chi-square test, DTP: Drug therapy problems, MTM: Medication Therapy Management

From a total of 287 identified DTPs, MTM service resolved 203 (70.73%) of them. Pharmaceutical care interventions were made for 161(56%) involving physicians. From these, 104 (64.5%) DTPs were accepted, 42 (26%) were partially accepted and 15 (9.3%) were rejected. Pharmaceutical care plan involving patient participation was 126 (43%). Ninety nine (78.50%) of these were solved with the patient. The majority of them were in relation to unnecessary OTC medication use, adherence enhancement, and ADR management.

4.4.2 Predictors of Drug Therapy Problems

Different socio-demographic and clinical characteristics were considered for binary logistic regression analysis. The variables included in the bivariate analysis were age, sex, residency, education status, marital status, alcohol use, physical activity, chat chewing, comorbidity, aspirin use, statin use, non-steroidal anti-inflammatory drug use, BP control, number of medication, duration of treatment, complication, health care cost coverage, and salt consumption. Depending on the result of binary logistic regression variables like age, sex, marital status, salt restriction, duration of treatment, presence of comorbidity, presence of complication, number of medication,

BP control status were considered for multivariate analysis to determine predictors of DTP at baseline. After provision of MTM service, level of adherence and number of MTM visits were also considered for binary and multivariate logistic analysis.

The result of multivariate logistic analysis showed that number of medications, presence of complication, and salt restriction status were significantly associated with the occurrence of DTP at baseline. Accordingly, participants who took more than five medications were 2.5 times (AOR = 2.46 CI: 1.27-4.77) more likely to develop DTPs as compared to those taking less than five medications. Patients without hypertension related complications were twice more likely to develop DTP than those who developed hypertension related complications (AOR=0.52 CI: 0.27-0.99). The status of salt restriction was also found to be associated with the occurrence of DTPs. The data showed a decreased risk of developing DTPs by half for samples who reported having restricted salt intake (AOR= 0.56 CI: 0.33-0.97) as compared to those who consume without restriction.

At the end of the study, the presence of hypertension related complication and the level of adherence to medication were found to be significantly associated with experiencing DTPs. The risk of occurrence of DTP was lower approximately by 50% (AOR = 0.43 0.23-0.80) in patients with complication as compared to those without complications. Moreover, the risk of DTPs was 70% times (AOR = 0.30, 95% CI: 0.14-0.69) lower in those patients with high adherence status as compared to participants with low adherence (Table 4).

Table 4: Multivariate analysis of factors associated with DTPs among ambulatory hypertensive patients on follow up clinic at TASH, Addis Ababa, Ethiopia, July 1, 2019 – April 30,2020 (n=279)

Variables	Categories	Baseline Odds Ratios (95% CI)		End of MTM Odds Ratios (95% CI)	
		COR	AOR	COR	AOR
Age	18-24 24-39 40-64 ≥ 65	1 1.766 (0.10-28.89) 2.94 (1.19-7.24) 0.82 (0.48-1.32)	 0.52 (0.02-10.72) 1.63 (0.54-4.94) 0.64 (0.36-1.15)	---	---
Marital status	Ever married Never married	1 0.29 (0.1-0.8)	 0.35 (0.1-1.18)	1 0.72 (0.22-2.29)	1 0.83(0.20-3.44)
Salt restriction	No Yes	1 0.59 (0.367-0.96)	 **0.56 (0.33-0.97)**	1 0.65 (0.38-1.11)	1 0.59(0.33-1.06)
Duration of treatment	1-5 5-10 >10	1 1.74 (0.95-3.18) 1.50 (0.83-2.70)	 1.12 (0.56-2.25) 1.16 (0.61-2.19)	 1.47(0.75-2.85) 0.92(0.51-1.68)	1 1.02(0.47-2.20) 0.68(0.35-1.32)
Comorbidity	Yes No	1 0.43 (0.23-0.79)	 0.66 (0.33-1.31)	 0.65(0.32-1.31)	 0.99(0.44-2.24)
Complication	No Yes	1 0.43 (0.24-0.78)	 **0.52 (0.27-0.99)**	 0.43(0.24-0.74)	1 **0.43(0.23-0.80)**
Number of Drugs	1-4 ≥ 5	1 2.99 (1.67-5.35)	 **2.46 (1.27-4.77)**	1 2.17(1.27-3.72)	 1.79(0.95-3.35)
BP (Pre and Post)	Controlled Uncontrolled	1 1.30 (0.79-2.512)	 1.18 (0.69-2.00)	 1.12(0.63-1.98)	1 1.13(0.60-2.13)
Number of MTM Visit	1 2 ≥3	--	--	1 1.26(0.56-2.84) 1.84(1.02-3.31)	1 1.15(0.47-2.80) 1.76(0.94-3.32)
Level of adherence	Low Medium High	--	--	1 0.34(0.16-0.69) 0.50(0.26-0.96)	1 0.55(0.27-1.11) **0.30(0.14-0.69)**

DTP:Drug therapy problem:COR: Crude odds ratio; AOR: Adjusted odds ratio; C.I. Confidence interval; MTM: Medication Therapy Management

4.4.3 Examples of the identified drug therapy problems

Examples and causes of the identified DTPs are depicted in Table 5

Table 5: Examples of DTPs identified from ambulatory hypertensive patients attending follow up clinic of TASH, Addis Ababa, Ethiopia, 2019/2020

No	Patient presentation	Prescribed medications	Type and cause of DTP	Pharmacist recommendations	Status of DTP
1	A 76 years old female patients with HTN, DM, CKD and DVT with Average BP of 120/70 mmHg WBC= 7.4k, Hgb/Hct= 13.2/34.4 and platelets=314k	NPH 8/8 IU, Amlodipine 10 mg po daily, Lasix 40 mg po daily, Metoprolol 25 mg po daily, Enalapril 5 mg po/d, Atorvastatin 20 mg po daily, Ferrous gluconate 300mg po tid, Warfarin 5 mg po daily.	Unnecessary drug therapy. The drug Ferrous gluconate 300mg po tid was continued irrespective of Hgb values.	Discontinue ferrous gluconate 300mg.	Accepted[A]
2	A 62 years old male patient with HTN, CKD and DM. With Average BP 140/80mmHg.	Atorvastatin 20mg po/d, Amlodipine 10mg po/d, NPH 30/20.	Non-compliant. Patient prefers not to take atorvastatin 20mg po/d.	Motivational interviewing, Counseling.	Resolved[D]
3.	A 74 years old male patient with hypertension, CKD, BPH and symptomatic gouty arthritis. BP = 130/70 mmHg. Uric acid = 7.6 mg/dl. SrCr = 1.5mg/dl	Amlodipine 5mg po daily Enalapril 5mg po bid Hydrochorthiazide 25mg po/d Asprin 81 mg po daily Pantoprazole 20mg po /d Atorvastatin 40mg po /d	ACEI induced cough	Switch enalapril to losartan 50mg po/d.	Accepted [A]
			Aspirin induced dyspepsia.	Take aspirin after meals	Resolved[D]
4	A 34 years old female with HTN, CKD, RVI, moderate anemia and dyslipidemia. BP = 140/80mmHg.	Lasix 40mg po/d Enalapril 10mg po daily Atenolol 50mg p/d ABC+3TC+NEV	In effective drugs.	Switch atenolol 50 mg to metoprolol 25mg po bid	Rejected [c]

5	A 60 years old female patient with HTN and dyslipidemia. Average BP = 150/85mmHg.	Losartan 50mg po/day Amlodipine 10mg po/day Asprin 81mg po/day Simvastatin 40mg po/day Hydrochorthiazide 25mg po/d	Dose too high due to drug interaction between amlodipine and simvastatin.	Switch to Atorvastatin 40mg po daily.	Accepted[A]
			The patient didn't understand instruction.	Take statin during evening	Resolved[D]
6	A 60 years old male patient with hypertension, DM and BPH. Average BP 150/80 on two consecutive follow up. Unstable scr between 2.1 and 2.6 mg/dl.	Mixtard 36/18IU Atrovastatin 20mg po/day Amilodpine 5mg po BID Alfuzosin 10mg po/day	Frequency in appropriate. Amlodipine was dosed 5mg po bid.	Make amlodipine 10mg po /daily.	Accepted[A]
7	A 64 years old male patient with HTN and Type 2 DM AV.BP = 1140/80 mmHg.	NPH 52/34 Metiformin 500 mg po BID Hydrochorthiazide 50 mg po BID Enalapril 5 mg po daily Asprin 81 mg po daily Atorvastatin 40 mg po daily Amitriptyline 25 mg po noct Nifedipine 20 mg po bid.	Noncompliance; The patient does not understand that the drug simvastatin was changed.	Clarify instruction through counseling.	Resolved [D]
			On Nefedipine 20 mg po bid but the patient was taking 40 mg in the evening.	Clarify the frequency of the medication through counseling.	Resolved [d]
8	A 63 years old woman with HTN, lumbar spondylitis and Somatic disorder. Average BP =130/80. Orthostatic hypotension.	Nifedipine 2O mg po daily Amitriptyline 75 mg po daily Indomethacin 50 mg suppository prn	Dose too high that leads the patient to adverse drug reaction.	Decrease the dose of amitriptyline to 50mg.	Rejected [C]
				While you are stand slowly and in stages.	Not resolved[e]
9	A 59 years old female patient with HTN and CKD BP=140/100mmHg.	Amlodipine 10mg po/d. Enalapril 10mg po/d.	Dose too low	Make enalapril 10mg po BID.	Partially accepted[B]

[A]: Physicians accepts and implements pharmacist recommendation. [B]: Physicians accepted but didn't implement pharmacist recommendation and/or seek further evidence. [C]: Physicians neither accepted nor implemented pharmaceutical opinion. [D]: Patient accepted and implemented the recommendation. [E]: Patient couldn't implement pharmacist recommendations for some reasons.

4.5 Changes in blood pressure

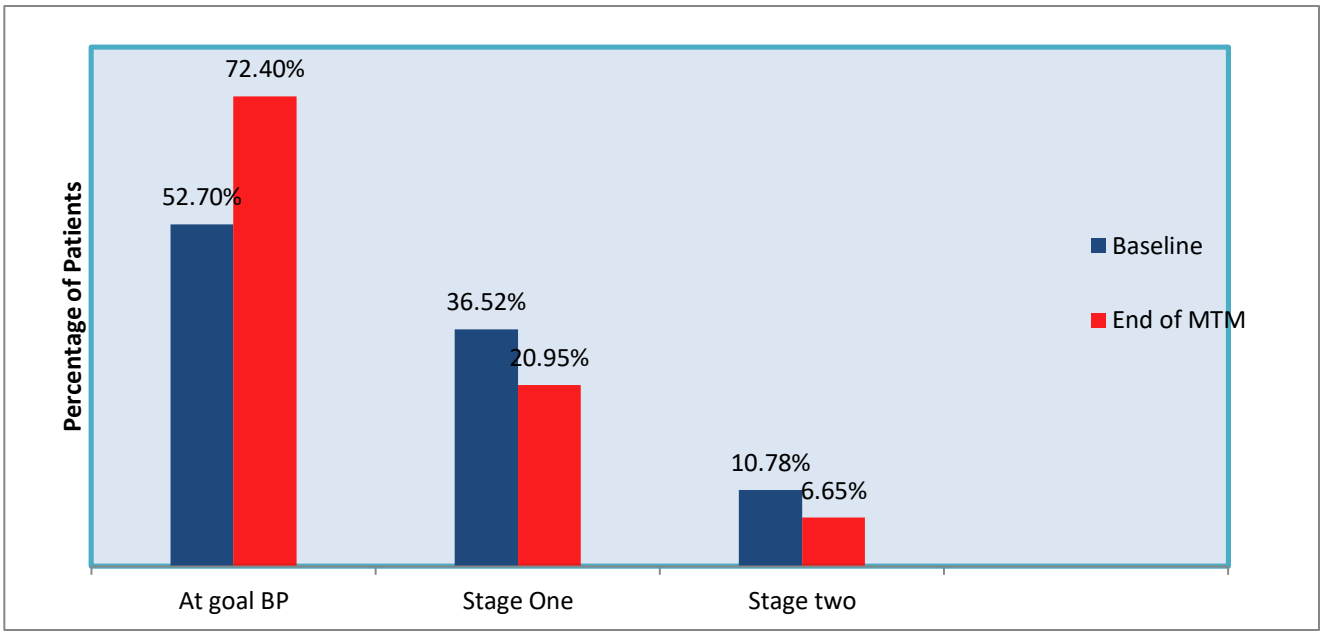
The mean SBP at baseline was 136.67 mmHg and this was decreased to 131.36mmHg at the end of the study. Using paired t-test analysis the change in SBP was found to be significant ($p < 0.001$). The difference in DBP was not found to be statically significant ($p = 0.053$) from the baseline (Table 6).

Table 6: The mean SBP and DBP of ambulatory hypertensive patients on follow up clinic at TASH, Addis Ababa, Ethiopia, July 1, 2019 – April 30,2018 (n=279).

Variable	At baseline (n=279)	Post MTM (n=279)	Model based difference 95% CI	p-value
SBP Mean (SD)	136.67 (14.84) mmHg	131.36 (14.69) mmHg	-5.31 (3.50-7.11)	0.000
DBP Mean (SD)	80.48 (9.20) mmHg	79.37 (8.67) mmHg	-1.11 (-0.01- 2.25)	0.053

BP: Blood pressure, SBP: Systolic blood pressure; DBP: Diastolic Blood pressure; CI: Confidence interval; MTM: Medication Therapy Management.

The proportion of patients with controlled BP was 52.70% at the beginning of the study and this was increased to 72.40% at the end of the study ($p < 0.01$). Likewise, we have also found the decreased proportion of patients with stage one and stage two hypertension from baseline to the end of the study. The proportion of stage one hypertension was decreased from 36.52% to 20.95% while stage-two hypertension decreased from 10.78% to 6.65% as depicted in Figure 3.



BP: Blood pressure, MTM: Medication Therapy Management

Figure 4: Blood pressure control status of ambulatory hypertensive patients on follow up clinic at TASH, Addis Ababa, Ethiopia, July 2019 - April 2020 (n=279)

4.6 Medication Adherence Status

According to the Morisky's 8 items assessment scale after implementation of MTM service 194(69.5%) of study participants were found to be adherent to their antihypertensive medications (Figure 5).

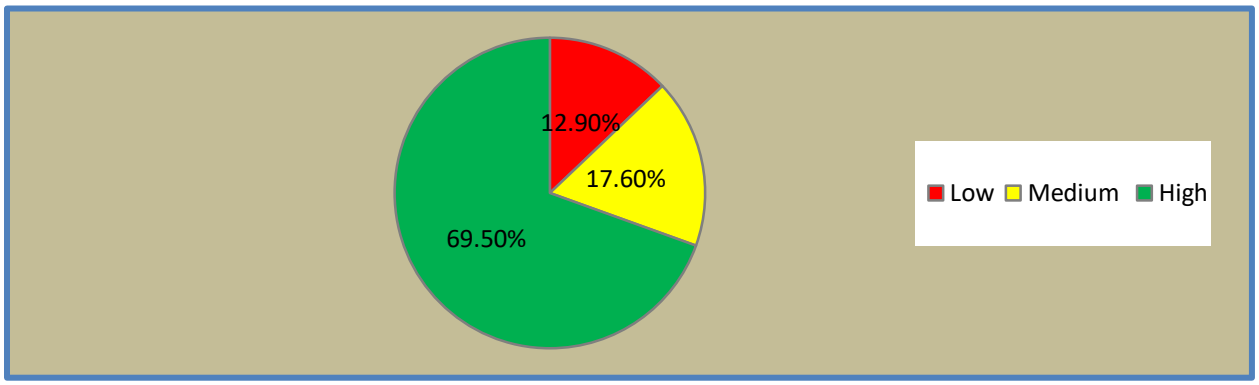


Figure 5: Adherence status of ambulatory hypertensive patients on follow up clinic at TASH, Addis Ababa January - April 2020 (n=2779)

4.6.1 Predictors of Medication Adherence

The source of medication and residency was significantly associated with medication non-adherence at the end of MTM services. Patients who got their medication through third party coverage were 90% times (AOR = 0.10; 95%CI: 0.01-0.77) less adherent than those buying their medications out of pockate. Similarly, study participants who live in Addis Ababa were 1.73 times more adherent (AOR = 1.73; 95% CI: 1.38-1.88) than those living outside Addis Ababa.

Table 7: Multivariate analysis of factors associated with medication adherence among ambulatory hypertensive patients on follow up clinic at TASH, Addis Ababa, Ethiopia, January 1 – April 30,2020 (n=279)

Variables	**Categories**	**Level of Adherence**		**Odds Ratios (95% CI)**	
		Adherent n(%)	**Non-adherent** n(%)	**COR**	**AOR**
Level of Education	No formal education	27	6	1	
	Primary	38	22	0.51(0.19-1.36)*	.56(0.19-1.61)
	Secondary	50	23	1.34(0.69-2.60)	1.48(0.69-3.15)
	College and above	79	34	1.06(0.56-2.02)	1.02(0.50-2.05)
Source of medication	Out f pocket	89	40		
	Government free	88	37	0.44(0.13-1.48)	0.38(0.10-1.39)
	Company	11	2	0.42(0.12-1.38)	0.28(0.07-1.07)
	Third party coverage	6	6	0.18(0.02-1.19)**	**0.10(0.01-0.77)****
Residency	Out of Addis Ababa	68	17	1	
	Addis Ababa	180	14	**1.69(1.34-1.86)****	**1.73(1.38-1.88)****
Comorbidity	No	37	13	1	
	1-2	129	55	0.57(0.24-1.38)*	0.76(0.26-2.23)
	≥ 3	28	17	0.70(0.35-1.38)	0.85(0.39-1.85)
Number of Medication	1	29	5	1	
	2-4	106	49	0.32(0.11-0.92)**	0.37(0.11-1.24)
	≥ 5	59	31	0.88(0.50-1.52)	1.06(0.55-2.03)
Number of MTM Visit	1	28	12	1	
	2	116	49	0.89(0.38-2.05)	1.06(0.42-2.69)
	≥3	50	24	0.88(0.48-1.58)*	1.18(0.62-2.25)
DTP	Yes	46	42	1	
	No	143	46	2.36(1.37-4.06)**	**2.40(1.33-4.33)**

Variables in bivariate analysis with p≤0.20 and ≤0.05 indicated by * and ** respectively. AOR: Adjusted odds ratio; CI: Confidence interval; COR: Crude odds ratio; DTP: Drug therapy problem; MTM: Medication Therapy Management.

4.7 Patient Treatment satisfaction

The treatment satisfaction rate for all domains is described in Figure 6. According to the SATMED-Q score tool of treatment satisfaction, the overall mean score (SD) of treatment satisfaction was 86.55 ± 10.34.

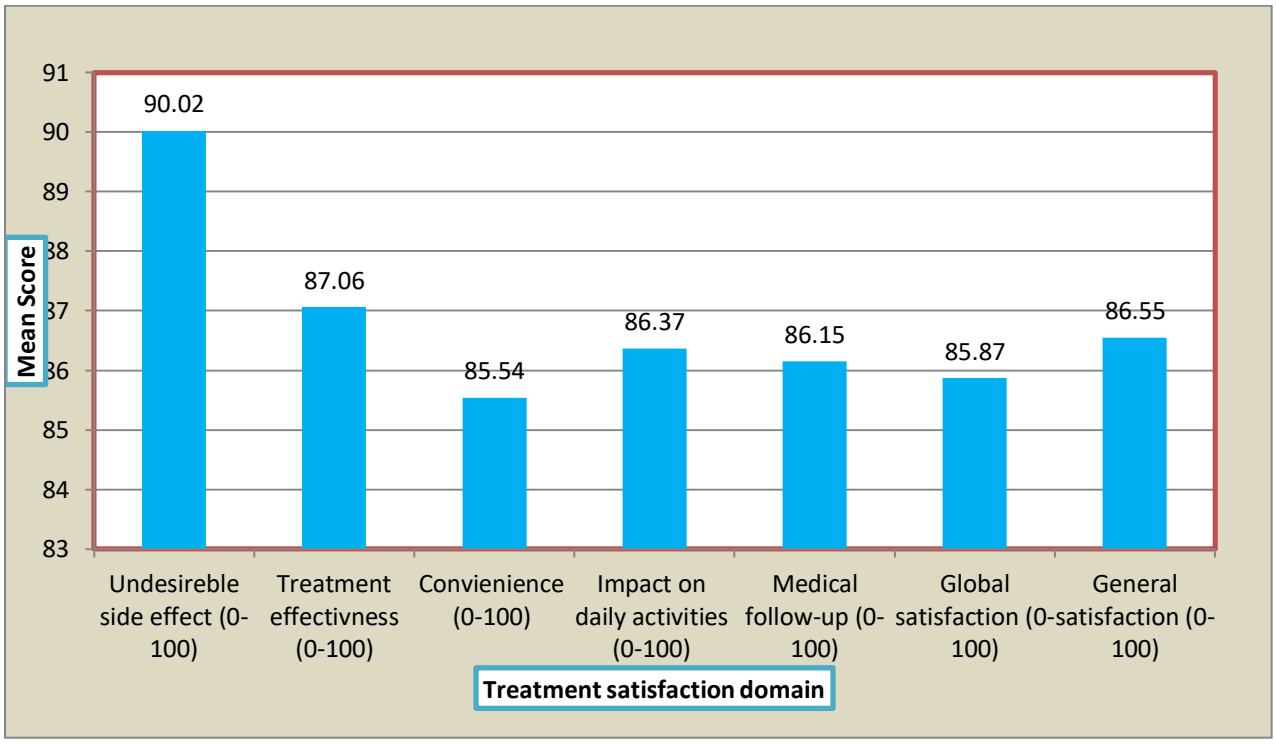


Figure 6: Treatment satisfaction level following MTM intervention among ambulatory hypertensive patients on follow up at TASH, Addis Ababa, Ethiopia, January 1 - April 30 (n=279)

4.7.1 Predictors of Patients Treatment Satisfaction

The analysis was done using independent t-test and One-Way-ANOVA to examine the relationships between different socio-demographic and clinical characteristics of participants with treatment satisfaction scores. There was no statistically significant difference in general treatment satisfaction among patients' age groups, sex, marital status, education level, and employment status, Source of medication, residence, comorbid condition, and duration of treatment. Presence of Poly-pharmacy, ADR, and complications were found to be significantly associated with treatment satisfaction (Table 8).

Table 8: Relationship between treatment satisfaction and different characteristics of ambulatory hypertensive patients on follow up clinic at TASH, Addis Ababa, Ethiopia, January 1 – April 30,2018 (n=279).

Variables	Categories	N	Mean Score ± SD	F	P
Age	Less than 65	213	86.10 ± 10.13	0.12	0.44
	≥ 65	66	87.06 ± 10.60		
Sex	Male	138	86.80 ± 9.98	0.93	0.69
	Female	141	86.31 ± 10.71		
Marital status	Ever married	262	86.57 ± 10.17	4.82	0.89
	Never married	17	86.24 ± 13.12		
Education level	No and primary	91	86.69 ± 10.35	0.21	0.87
	Secondary or above	188	86.48 ± 10.36		
Employment status	Employed	172	86.64 ± 9.97	0.15	0.84
	Unemployed	107	86.40 ± 10.96		
Source of medication	Free	150	86.00 ± 10.45	0.01	0.34
	Buying	129	87.19 ± 10.22		
Residence	Addis Ababa	248	86.60 ± 10.46	0.53	0.81
	Out of Addis Ababa	31	86.14 ± 9.51		
Duration of treatment	1-5	77	88.23 ± 9.33	2.69	0.069
	5-10	89	87.22 ± 10.42		
	≥10	113	84.88 ± 10.77		
Comorbidity	Yes	226	86.13 ± 10.65	6.32	0.16
	No	53	88.34 ± 8.77		
Complication	Yes	128	84.49 ± 10.36	0.21	0.035
	No	151	87.38 ± 10.24		
Number of drugs	1	34	91.43 ± 9.37	8.06	0.000
	2-4	155	87.18 ± 9.42		
	≥ 5	90	83.62 ± 11.38		
DTP (Post)	Yes	88	83.68 ± 11.41	4.88	0.002
	No	191	87.87 ± 9.55		

Number of MTM Visit	1	40	85.09 ± 11.01	1.07	0.344
	2	165	86.95 ± 9.86		
	≥3	74	87.60 ± 10.97		
Adherence	Low	85	82.83 ± 9.10	0.84	0.000
	High	194	88.18 ± 10.45		
ADR (Post MTM)	Yes	18	77.93 ± 10.22	0.18	0.000
	No	261	87.11 ± 10.12		

MTM: Medication Therapy Management; SD: Standard deviation

There was a significant difference in general treatment satisfaction among patients DTP experiencing status. Accordingly, patients experiencing DTPs had lower mean score as compared to those without it ($F = 4.88$; $p = 0.002$) for general treatment satisfaction. Significant statistical difference among patients with different adherence status was found as patients with low adherence were less likely to be satisfied with their treatment ($F= 0.84$; $p < 0.001$). The median general satisfaction score for those patients adherent and not adherent to antihypertensive medications was around 90 and 80, respectively (Figure 7).

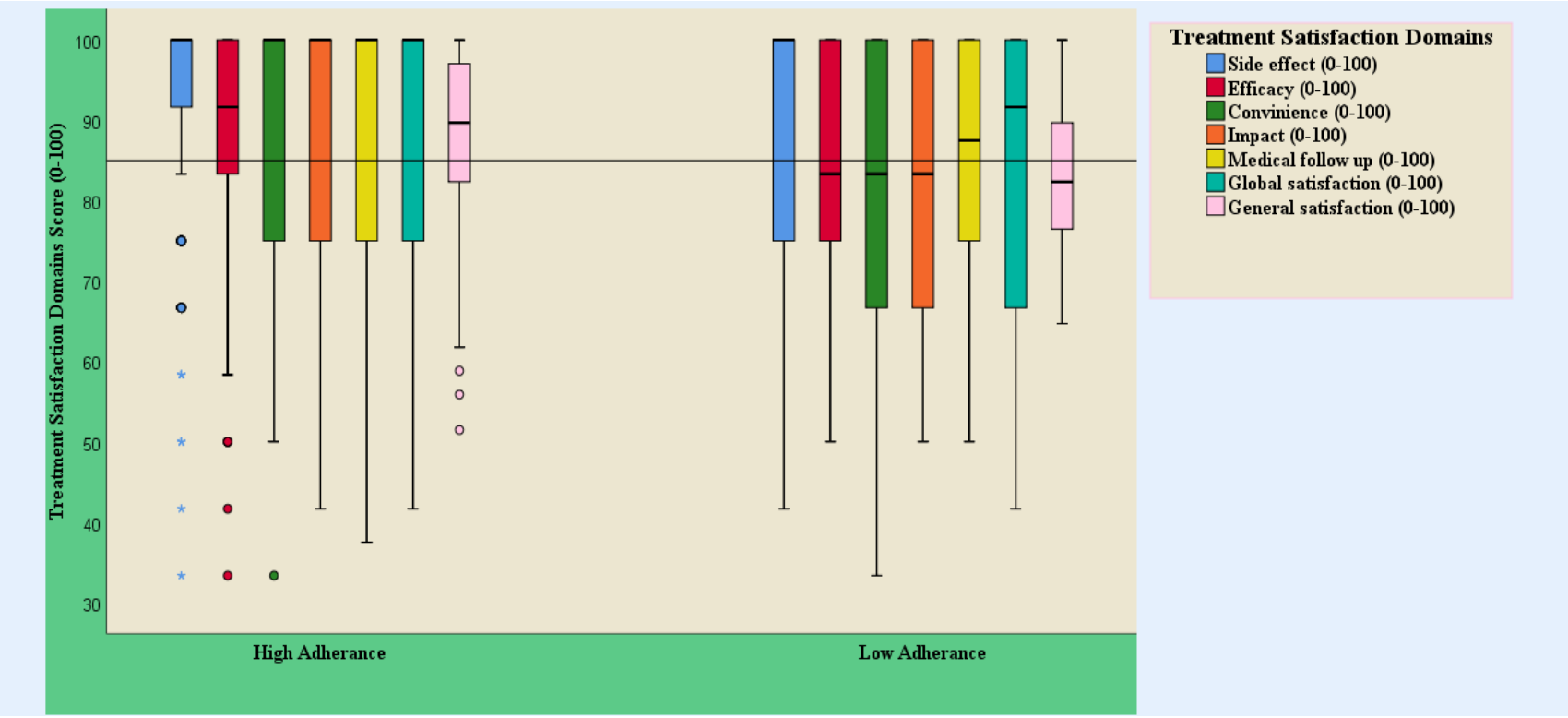


Figure 7: Box plot of association of all domains of treatment satisfaction with adherence status of ambulatory hypertensive patients on follow up at TASH, Addis Ababa, Ethiopia, January April 2020 (n=279)

5. Discussion

The primary purpose of this study was to evaluate the impact of MTM services on the prevalence of DTPs, adherence status and treatment satisfaction among patients with hypertension as these patient groups were at high risk of developing DTP due to the presence of multiple co-morbidities and poly-pharmacy (Al-Azzam *et al.*, 2016). The identification and resolution of DTP represent a critical health care contribution because each time a DTP occurs, goals of therapy are compromised and cannot be met (Adusumilli and Adepu, 2014). The significant prevalence of DTPs can contribute to greater clinical, humanistic, and economic burdens as it increases drug related hospital admission, morbidity, mortality, and lowers health related quality of life of the patients (Farha *et al.*, 2016).

The current study revealed that the implementation of MTM service resolved (70.73%) of identified DTP and decreased the prevalence of DTPs from 63.4% at baseline to 31.54% at the end of the program. This result is comparable to studies done in Brazil (59.6%) (Neves *et al.*, 2019) and Nigeria (69.23%) (Rita *et al.*, 2016) with regards to overall DTPs resolved. However, higher rates of resolved DTPs were also reported from England (86.7%) (Sobieraj *et al.*, 2011) and USA (78%) (Isetts *et al.*, 2008). In the current study physicians accepted 64.5% of pharmacist recommendations. This is in line with proportion of physicians' acceptance rate reported by (67.9%) (Neves *et al.*, 2019) but lower than that was demonstrated by Hirsch *et al.* (96%) (Hirsch *et al.*, 2014) and Morgado *et al.* (76.3%) (Morgado *et al.*, 2011). This discrepancy might be due to the differences in study method and setting, different classification systems of DTPs used, and different methods to assess DTPs. In the current study, the most frequent reasons physicians cited to reject pharmacist recommendations were when they were not sure about the

sustainable availability of recommended drugs, drug affordability, because of their clinical experience, and when the identified DTP was potential not actual DTPs.

Our finding demonstrated that the most common types of DTPs at baseline were non-adherence to medications followed by ADR and then the need for additional drug therapy. This pattern of result is consistent with previous studies (Steele *et al.*, 2016; Neves *et al.*, 2019) where the sequence was inappropriate adherence followed by ADR and then the need for additional drug therapy. On the contrary, other studies reported indication without drug therapy to be the most frequently identified DTPs (Shareef *et al.*, 2015; Nasution *et al.*, 2016). The most compelling explanation for the present set of findings might be patients' lack of access to medicines, poor knowledge about drugs, and the long-term complication of hypertension. This idea is further supported by the finding that the adherence to cardiovascular drugs was found to be suboptimal in the resource-limited setting because of the patients' poor knowledge, negative perceptions about medication, side effects, and high medication costs (Ashna *et al.*, 2011a).

Another important finding is that dose too low, dose too high and unnecessary drug therapy problems were mostly addressed DTPs by pharmacist interventions. Ineffective drug therapy followed by the need for additional drug therapy problems were less significantly changed from baseline to the end of the study. These result is in line with (Shareef *et al.*, 2015) who also found lower substitution rate for ineffective drugs after clinical pharmacist intervention in drug therapy. The reason might be the shortage of alternative effective medications, which hinder the substitution of more effective drugs in the resource limited settings (Ashna *et al.*, 2011a). Our finding showed that the most frequently used ineffective drug therapy was atenolol for the treatment of hypertension. Atenolol has no long term mortality benefits as compared to other

beta blockers when it is used to treat hypertension as evidenced by several studies (Dahlöf *et al.*, 2002; Dahlöf *et al.*, 2007; Vögele *et al.*, 2017).

Identification of risk factors for DTPs is important to identify the most susceptible patients requiring pharmaceutical care interventions. In this study, number of medications, presence of complication and salt consumption status were found to be statistically significantly associated with the occurrence of DTPs at baseline. This finding is in agreement with some studies (Hussein *et al.*, 2014; Kefale *et al.*, 2020) but different risk factors were reported in other studies (Yimama *et al.*, 2018; Weldegebreal *et al.*, 2019a) which reported age, substance use, and presence of comorbidities as independent predictors of DTPs.

The current study revealed that the presence of hypertension related complications as protective factor against the occurrence of DTPs. This result matches those observed in earlier studies (Ghembaza *et al.*, 2014; Nguyen *et al.*, 2017; Tilea *et al.*, 2018) . This can be explained partly by the fact that patients with complications would take extra caution while taking their medications and the clinicians may also lend more attention for those patients to prevent further health deterioration which in turn can reduce the incidence of DTPs. These data have some potential implications for educational interventions about the disease state management, disease complications, and medication adherence in patients with hypertension.

The frequent occurrence of ADR (18.46% at baseline and 15% at the end of follow-up) in this study may be due to the higher rate of significant DDIs of cardiovascular drugs. DDI is known to be a major factor affecting patient's clinical outcome by contributing to increased risk of adverse drug events related to hospitalization and a higher health care cost. Identifying significant DDIs and preventing unwanted health outcome through monitoring the effect of drugs is an important

issues in managing patients with hypertension as patients with cardiovascular disorders are subjected to high risk of potential DDIs (Chelkeba *et al.*, 2013) .

The present set of findings might help to suggest several courses of action in order to solve this problem. One of the issues that emerge from these findings is the possibility of hospitals utilizing pharmacists to deliver pharmaceutical care to enhance rational drug use. Clinical Pharmacists are at bridge position to solve this complex health facility related challenges which can hinder the delivery of quality health care service by being involved in decisions and activities to prevent shortage of essential drug products; the step that may also contribute in reducing the use of in-effective drug therapy (Melo and Castro, 2017). Improving patients' knowledge and awareness about their medication use, goal of therapy, and ADR through education and counseling can improve patient medication adherence (Baroletti and Dell'Orfano, 2010).

Our finding also showed a statistically significant change in mean SBP from baseline to the end of the study. Only around half (52.70%) of the study participants had controlled BP at the time they were enrolled. This was increased to 72% at the end of the study. Although this was still an undesirable result it is greater than the BP control level reported by prior studies conducted in Ethiopia (30.1%) (Yazie *et al.*, 2018) and USA (64.8%) (Angell *et al.*, 2008). This study demonstrated that MTM service improved the proportion of patients at goal BP at the end of the program. This is comparable with some studies (Robinson *et al.*, 2010; Wang *et al.*, 2011b) but different from other studies (Planas *et al.*, 2009; Anderegg *et al.*, 2018). The difference might be because of the difference in the intensity of intervention, duration of follow up and characteristics of study participants. Some differences might be also due to the use of restricted BP goal in prior studies. The current study applied relaxed BP goal for those group of patients as

stated in Ethiopian national guideline for non- communicable disease (Michael *et al.*, 2016) and JNC-8 guidelines (James *et al.*, 2014).

Our finding showed significant change in mean SBP (- 5.31mmHg, P = 0.00) from baseline to the 6-month visit. However, the mean DBP level change (- 1.11, P = 0.053) was not statistically significant. This is in line with similar studies done in Portugal (-6.8 mmHg SBP and -2.9 mmHg DBP) (Morgado *et al.*, 2011), China (-8.5 mmHg SBP and -4.8 mmHg DBP) (Wang *et al.*, 2011a) and Nigeria (-9.8 mmHg SBP and – 3.5 DBP) (Rita *et al.*, 2016). However, a greater reduction in SBP was also reported from USA (-17.32 mmHg SBP) (Planas *et al.*, 2009) and Canada (-11.6 mmHg SBP) (Santschi *et al.*, 2011). The difference could be attributed to baseline characteristics of the study participants as most patients in our study have controlled DBP at baseline.

The sensitivity of SBP to the interventions can also be explained partly by the higher proportion of CKD and DM comorbidities in the current study, because hypertension in this patient group is mostly systolic than diastolic. Some components of interventions might also contribute to this set of findings. Considering higher prevalence of salt sensitivity in black patients, pharmacist strongly motivated the patients to restrict salt consumption which might also affect SBP than DBP. Notwithstanding the evidence not statistically significant change was observed for DBP, the practical importance of the treatment effect is clinically significant considering ADR of anti-hypertensive medications and the J-Curve phenomenon that might follow after aggressive BP reductions (Farnett *et al.*, 1991).

The current study demonstrated 69.5% of patients were adherent to their anti-hypertensive medications as measured by MMAS-8 after six months of MTM interventions. This is

comparable with similar studies done in China (72.41%) (Wang *et al.*, 2011a) and Portugal (74.5%) (Morgado et al., 2011). However, it was lower than rates reported from Thailand (56.48%) (Sookaneknun *et al.*, 2004), Portugal (77.7%) (Planas *et al.*, 2009) and USA (91%) (Steele *et al.*, 2016). Variation in the study setting, disease severity, adherence assessment tools used, and analysis method employed could explain the discordance.

The results of this study indicate that the overall mean score (±SD) of treatment satisfaction among the study participants was 86.55 (± 10.34) after introducing MTM services. The yields in this investigation were higher compared to those of other studies done in Palestine (72.1 (± 23.1)) (Sa'ed *et al.*, 2013) and Ethiopia (51(±14)) (Berhe *et al.*, 2017). The difference may be due to increased patient health literacy, higher rate of adherence, reduced ADRs, and other DTPs after interventions in the current study. In the current study, positive statistically significant association was observed between the mean score of patient treatment satisfaction and medication adherence while statistically significant negative association was observed between experiencing ADR and general treatment satisfaction. These results corroborate the findings of a great deal of the previous studies carried out in Beirut (Saarti *et al.*, 2016), Palestine (Sa'ed *et al.*, 2013), Nigeria (Ajayi *et al.*, 2018), and Ethiopia (Berhe *et al.*, 2017).

It is interesting to note that all treatment satisfaction domains in this study were positively associated with the level of adherence. Patients with high adherence status showed higher mean score for each domain of treatment satisfaction as compared to participants with low adherence status. To our knowledge, this is the first study to investigate the association of each domain of treatment satisfaction with adherence status. This relationship points out the importance of addressing treatment satisfaction and drug safety issues during patient consultations in order to enhance patient adherence with antihypertensive medications because low treatment satisfaction

may be an important barrier to affect patients' health behaviors like adherence (Morisky *et al.*, 2008). This finding, while preliminary, has important implications for developing targeted interventions in an effort to improve treatment satisfaction in patients with hypertension (Rita *et al.*, 2016).

Thus, the overall finding of our study showed provision of MTM services could identify DTPs and resolve a higher proportion of identified DTPs and some reasons for non-adherence and patients' lack of treatment satisfaction. The proper pharmacist intervention enhanced better patient care in selected group of patients and improved indicators of BP. Furthermore, the study highlighted the nature of identified DTPs and helped discussing this in relation to strategies to resolve DTPs and factors that impeded addressing it.

6. Limitation of the study

This study has some limitations. A relatively small sample size was used and there was a short duration of follow-up. In addition, the extent of generalizability may be limited, since it was a single centered study conducted in a tertiary care hospital. Because of the nature of study design which lacks randomization and control group the simple longitudinal analysis of the patient characteristics may lead to the possibility of regression to the mean, affected by maturation and history during intervention and such type of study couldn't establish the cause. Thus, other factors may have influenced the reported results and only associations can be implied. Self-reporting was used to measure adherence, which might lead to recall bias.

Nevertheless, the use of well characterized sample, systematic random sampling techniques, and standardized procedure of DTP identification and BP measurement methods could offset these limitations.

7. Conclusions

In summary, the provision of MTM service that aim optimizing drug therapy by employing strategies including identification and resolution of DTPs, patient education, and motivational interviewing demonstrated decreased prevalence of DTPs after six months of follow-up. Additionally, modest improvement in clinical outcomes such as average SBP and DBP with an increased proportion of patients who are at goal BP from the baseline to the end of the study was found. Furthermore, higher medication adherence rate and patient treatment satisfaction were reported by study participants after introducing the MTM services. Conjointly, this result will be valuable in the management of hypertension and could serve as a framework for further research on a similar topic.

8. Recommendations

Future studies should focus on conducting studies with longer duration as evaluation of the long term impact of such a program on BP control and prevention of complication would be of great value. Designing an MTM program which involves expanded sample size, which uses multi-site intervention with a control group may enhance the generalizability of the finding and increase the robustness of the study. The physician-pharmacist collaborative practice agreement is also important to increase cooperation among clinicians while undertaking such interventions.

Based on findings from this study, we recommend hospitals implement clinical pharmacy service for timely detection, prevention, and resolution of DTPs. For effective management of hypertension, hospitals should ensure the availability of effective medicines at affordable costs. Our recommendation also calls for timely revision of formularies and guidelines both at the national and hospital level to incorporate the most effective drug alternatives for better patient outcomes.

References

AAU, A. A. U. (2020) *Background of Tikur Anbessa HospitaL*. Available at: http://www.aau.edu.et/chs/tikur-anbessa-specialized-hospital/background-of-tikur-anbessa-hospital/ (Accessed: January,30 2019).

Adusumilli, P. K. and Adepu, R. (2014) 'Drug related problems: an over view of various classification systems', *Asian J Pharm Clin Res,* 7(4), pp. 7-10.

Ajayi, D. T., Adedokun, B. O., Owoeye, D. O. and Akpa, O. M. (2018) 'Treatment Satisfaction and Medication Adherence Among Hypertensive Patients Seeking Care in Selected Hospitals in Ibadan, Nigeria', *Arch Basic Appl Med,* 6(1), pp. 67-72.

Al-Azzam, S. I., Alzoubi, K. H., AbuRuz, S. and Alefan, Q. (2016) 'Drug-related problems in a sample of outpatients with chronic diseases: a cross-sectional study from Jordan', *Ther Clin Risk Manag,* 12, pp. 233-9.

Amare, F., Nedi, T., Berhe, D. F. and Nedi, T. (2020) 'Blood pressure control practice and determinants among ambulatory hypertensive patients attending primary health care facilities in Addis Ababa', *SAGE Open Med.,* 8, pp. 2050312120946521.

Anderegg, M. D., Gums, T. H., Uribe, L., MacLaughlin, E. J., Hoehns, J., Bazaldua, O. V., Ives, T. J., Hahn, D. L., Coffey, C. S. and Carter, B. L. (2018) 'Pharmacist Intervention for Blood Pressure Control in Patients with Diabetes and/or Chronic Kidney Disease', *Pharmacotherapy,* 38(3), pp. 309-318.

Anderson, S. (2002) 'The state of the world's pharmacy: a portrait of the pharmacy profession', *J Interprof Care,* 16(4), pp. 391-404.

Angell, S. Y., Garg, R. K., Gwynn, R. C., Bash, L., Thorpe, L. E. and Frieden, T. R. (2008) 'Prevalence, awareness, treatment, and predictors of control of hypertension in New York City', *Circ Cardiovasc Qual Outcomes,* 1(1), pp. 46-53.

Ashna, D., Shrank, W. H., Lee, J. L. and Choudhry, N. K. (2011a) 'A Systematic Review of Adherence to Cardiovascular Medications in Resource-Limited Settings', *Journal of General Internal Medicine,* 26(12), pp. 1479.

Ashna, D., Shrank, W. H., Lee, J. L. and Choudhry, N. K. (2011b) 'A Systematic Review of Adherence to Cardiovascular Medications in Resource-Limited Settings', *J Gen Intern Med.,* 26(12), pp. 1479.

Bajorek, B., Lemay, K. S., Magin, P., Roberts, C., Krass, I. and Armour, C. L. (2016) 'Implementation and evaluation of a pharmacist-led hypertension management service in primary care: outcomes and methodological challenges', *Pharm Pract (Granada),* 14(2), pp. 723.

Baroletti, S. and Dell'Orfano, H. (2010) 'Medication adherence in cardiovascular disease', *Circulation,* 121(12), pp. 1455-1458.

Berhe, D. F., Taxis, K., Haaijer-Ruskamp, F. M., Mulugeta, A., Mengistu, Y. T., Burgerhof, J. G. M. and Mol, P. G. M. (2017) 'Impact of adverse drug events and treatment satisfaction on patient adherence with antihypertensive medication - a study in ambulatory patients', *Br J Clin Pharmacol,* 83(9), pp. 2107-2117.

Bluml, B. M. (2005) 'Definition of medication therapy management: development of professionwide consensus', *J Am Pharm Assoc (2003),* 45(5), pp. 566-72.

Buda, E. S., Hanfore, L. K., Fite, R. O. and Buda, A. S. (2017) 'Lifestyle modification practice and associated factors among diagnosed hypertensive patients in selected hospitals, South Ethiopia', *Clinical hypertension,* 23(1), pp. 26.

Bunting, B. A., Smith, B. H., Sutherland, S. E. and Smith, B. H. (2008) 'The Asheville Project: clinical and economic outcomes of a community-based long-term medication therapy management program for hypertension and dyslipidemia', *J Am Pharm Assoc (2003),* 48(1), pp. 23-31.

Burns, A. (2008a) 'Medication therapy management in pharmacy practice: core elements of an MTM service model (version 2.0)', *Journal of the American Pharmacists Association,* 48(3), pp. 341-353.

Burns, A. (2008b) 'Medication therapy management in pharmacy practice: core elements of an MTM service model (version 2.0)', *J Am Pharm Assoc (2003),* 48(3), pp. 341-353.

CDC, C. f. D. C. a. P. (2020) *Community Pharmacists and Medication Therapy Management*. Available at: https://www.cdc.gov/dhdsp/pubs/guides/best-practices/pharmacist-mtm.htm (Accessed: July, 4 2020).

Chelkeba, L., Alemseged, F., Alemsege, F. a. and Bedada, W. (2013) 'Assessment of potential drug-drug interactions among outpatients receiving cardiovascular medications at Jimma University specialized hospital, South West Ethiopia', *Int J Basic Clin Pharmacol,* 2(2), pp. 144-52.

Chobanian, A. V., Bakris, G. L., Black, H. R., Cushman, W. C., Green, L. A., Izzo, J. L., Jr., Jones, D. W., Materson, B. J., Oparil, S., Wright, J. T., Jr. and Roccella, E. J. (2003) 'Seventh

report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure', *Hypertension,* 42(6), pp. 1206-52.

Chow, C. K., Teo, K. K., Rangarajan, S., Islam, S., Gupta, R., Avezum, A., Bahonar, A., Chifamba, J., Dagenais, G., Diaz, R., Kazmi, K., Lanas, F., Wei, L., Lopez-Jaramillo, P., Fanghong, L., Ismail, N. H., Puoane, T., Rosengren, A., Szuba, A., Temizhan, A., Wielgosz, A., Yusuf, R., Yusufali, A., McKee, M., Liu, L., Mony, P. and Yusuf, S. (2013) 'Prevalence, awareness, treatment, and control of hypertension in rural and urban communities in high-, middle-, and low-income countries', *Jama,* 310(9), pp. 959-68.

Cipolle, R. J., Strand, L. M., Morley, P. C. and Strand, L. M. (2012) *Pharmaceutical care practice: the patient-centered approach to medication management.* McGraw Hill Professional.

Colantonio, L. D., Booth, J. N., 3rd, Bress, A. P., Whelton, P. K., Shimbo, D., Levitan, E. B., Howard, G., Safford, M. M. and Muntner, P. (2018) '2017 ACC/AHA Blood Pressure Treatment Guideline Recommendations and Cardiovascular Risk', *J Am Coll Cardiol,* 72(11), pp. 1187-1197.

Dahlöf, B., Devereux, R. B., Kjeldsen, S. E., Julius, S., Beevers, G., de Faire, U., Fyhrquist, F., Ibsen, H., Kristiansson, K. and Lederballe-Pedersen, O. (2002) 'Cardiovascular morbidity and mortality in the Losartan Intervention For Endpoint reduction in hypertension study (LIFE): a randomised trial against atenolol', *The Lancet,* 359(9311), pp. 995-1003.

Dahlöf, B., Devereux, R. B., Kjeldsen, S. E., Lyle, P. A., Zhang, Z. and Edelman, J. M. (2007) 'Atenolol as a comparator in outcome trials in hypertension: A correct choice in the past, but not for the future?', *Blood pressure,* 16(1), pp. 6-12.

Dickinson, H. O., Mason, J. M., Nicolson, D. J., Campbell, F., Beyer, F. R., Cook, J. V., Williams, B. and Ford, G. A. (2006) 'Lifestyle interventions to reduce raised blood pressure: a systematic review of randomized controlled trials', *Journal of hypertension,* 24(2), pp. 215-233.

Edwards, I. R. and Aronson, J. K. (2000) 'Adverse drug reactions: definitions, diagnosis, and management', *Lancet,* 356(9237), pp. 1255-9.

Ernst, F. R. and Grizzle, A. J. (2001) 'Drug-related morbidity and mortality: updating the cost-of-illness model', *J Am Pharm Assoc (Wash),* 41(2), pp. 192-9.

Farha, A. R., Basheti, I., Abu Al Ruz, H., Alsaleh, A. and AbuRuz, S. (2016) 'Assessment of drug-related problems and their impact on blood pressure control in patients with hypertension', *Eur J Hosp Pharm,* 23(3), pp. 126-130.

Farnett, L. L., Mulrow, C. D., Linn, W. D., Lucey, C. R. and Tuley, M. R. (1991) 'The J-curve phenomenon and the treatment of hypertension. Is there a point beyond which pressure reduction is dangerous?', *JAMA*, 265(4), pp. 489-95.

Gebreyes, Y. F., Goshu, D. Y., Geletew, T. K., Argefa, T. G., Zemedu, T. G., Lemu, K. A., Waka, F. C., Mengesha, A. B., Degefu, F. S. and Deghebo, A. D. (2018) 'Prevalence of high bloodpressure, hyperglycemia, dyslipidemia, metabolic syndrome and their determinants in Ethiopia: Evidences from the National NCDs STEPS Survey, 2015', *PloS one*, 13(5), pp. e0194819.

George, L. B. and Matthew, S. M. (2018) *Hypertension: A Companion to Braunwald's Heart Disease.* Third edition edn., p. 3-4.

Ghembaza, M. A., Senoussaoui, Y., Kendouci Tani, M. and Meguenni, K. (2014) 'Impact of patient knowledge of hypertension complications on adherence to antihypertensive therapy', *Current hypertension reviews*, 10(1), pp. 41-48.

Heagerty, A. (2006) 'Optimizing hypertension management in clinical practice', *J Hum Hypertens*, 20(11), pp. 841-9.

Hepler, C. D. and Strand, L. M. (1990) 'Opportunities and responsibilities in pharmaceutical care', *Am J Hosp Pharm*, 47(3), pp. 533-43.

Hirsch, J. D., Steir, S. N., Adler, D. S., Wood, Y. Y., Kaplan, R. M. and Mangiome, C. M. (2014) 'Primary Care–based, Pharmacist–physician Collaborative Medication-therapy Management of Hypertension: A Randomized, Pragmatic Trial', *Clinical Therapeutics*, 36(9), pp. 1244-1254.

Hovland, R., Bremer, S., Frigaard, C., Henjum, S., Faksvåg, P. K., Saether, E. M. and Kristiansen, I. S. (2020) 'Effect of a pharmacist-led intervention on adherence among patients with a first-time prescription for a cardiovascular medicine: a randomized controlled trial in Norwegian pharmacies', *Int J Pharm Pract*, 28(4), pp. 337-345.

Hussein, M., Lenjisa, J., Woldu, M., Tegegne, G., Umeta, G. and Dins, H. (2014) 'Assessment of drug related problems among hypertensive patients on follow up in Adama Hospital Medical College, East Ethiopia', *Clinic Pharmacol Biopharmaceut*, 3(122), pp. 2.

Isetts, B. J., Brown, L. M., Schondelmeyer, S. W. and Lenarz, L. A. (2003) 'Quality assessment of a collaborative approach for decreasing drug-related morbidity and achieving therapeutic goals', *Archives of internal medicine*, 163(15), pp. 1813-1820.

Isetts, B. J., Schondelmeyer, S. W., Artz, M. B., Lenarz, L. A., Heaton, A. H., Wadd, W. B., Brown, L. M. and Cipolle, R. J. (2008) 'Clinical and economic outcomes of medication therapy

management services: the Minnesota experience', *Journal of the American Pharmacists Association,* 48(2), pp. 203-214.

James, P. A., Oparil, S., Carter, B. L., Cushman, W. C., Dennison-Himmelfarb, C., Handler, J., Lackland, D. T., LeFevre, M. L., MacKenzie, T. D. and Ogedegbe, O. (2014) '2014 evidence-based guideline for the management of high blood pressure in adults: report from the panel members appointed to the Eighth Joint National Committee (JNC 8)', *Jama,* 311(5), pp. 507-520.

Johnson, J. A. and Bootman, J. L. (1995) 'Drug-related morbidity and mortality. A cost-of-illness model', *Arch Intern Med,* 155(18), pp. 1949-56.

Johnson, K. C., Whelton, P. K., Cushman, W. C., Cutler, J. A., Evans, G. W., Snyder, J. K., Ambrosius, W. T., Beddhu, S., Cheung, A. K., Fine, L. J., Lewis, C. E., Rahman, M., Reboussin, D. M., Rocco, M. V., Oparil, S. and Wright, J. T., Jr. (2018) 'Blood Pressure Measurement in SPRINT (Systolic Blood Pressure Intervention Trial)', *Hypertension,* 71(5), pp. 848-857.

Kefale, B., Tegegne, G. T., Kefale, Y., Molla, M., Ewunetei, A. and Degu, A. (2020) 'Magnitude and determinants of drug therapy problems among type 2 diabetes mellitus patients with hypertension in Ethiopia', *SAGE Open Med,* 8, pp. 2050312120954695.

Kothari, N. and Ganguly, B. (2014) 'Potential Drug - Drug Interactions among Medications Prescribed to Hypertensive Patients', *J Clin Diagn Res,* 8(11), pp. Hc01-4.

Law, A. M., Kelton, W. D., Strand, L. M. and Morley, P. C. (2004) *Pharmaceutical Care Practice: The Clinicians Guide.* McGraw-Hill.

Long, A. N. and Dagogo-Jack, S. (2011) 'Comorbidities of diabetes and hypertension: mechanisms and approach to target organ protection', *J Clin Hypertens (Greenwich),* 13(4), pp. 244-51.

Ma, G., Luo, A., Shen, Z., Duan, Y., Shi, S. and Zhong, Z. (2020) 'The status of medication literacy and associated factors of hypertensive patients in China: a cross-sectional study', *Intern Emerg Med,* 15(3), pp. 409-419.

Machado, M., de Moura, C. S., Wang, Y., Danieli, C., Abrahamowicz, M., Bernatsky, S., Behlouli, H. and Pilote, L. (2017) 'Comparative effectiveness of antihypertensive drugs in nondiabetic patients with hypertension: A population-based study', *J Clin Hypertens (Greenwich),* 19(10), pp. 999-1009.

Mathew, Arun, Paluri, Venkates, waramurthy, N. and Paluri, A. (2016) 'A Study on Impact of Clinical Pharmacist Interventions on Relationship between Treatment Satisfaction and Medication Adherence in Hypertensive Patients', ***J. Pharm. Sci. Res.***, 8(4), pp. 190.

Mazzaglia, G., Ambrosioni, E., Alacqua, M., Filippi, A., Sessa, E., Immordino, V., Borghi, C., Brignoli, O., Caputi, A. P., Cricelli, C. and Mantovani, L. G. (2009) 'Adherence to antihypertensive medications and cardiovascular morbidity among newly diagnosed hypertensive patients', *Circulation*, 120(16), pp. 1598-605.

McKenney, J. M., Slining, J. M., Henderson, H. R., Devins, D. and Barr, M. (1973) 'The effect of clinical pharmacy services on patients with essential hypertension', *Circulation*, 48(5), pp. 1104-11.

Melo, D. O. d. and Castro, L. L. C. d. (2017) 'Pharmacist's contribution to the promotion of access and rational use of essential medicines in SUS', *Ciencia & saude coletiva*, 22, pp. 235-244.

Michael, G., Dagnaw, W., Yadeta, D., Feleke, Y., Fantaye, A., Kebede, T., Mamo, Y., Amare, H., Mathewos, A. and Binegdie, A. (2016) 'Ethiopian National Guideline on Major NCDs 2016', *Federal Democratic Republic of Ethiopia, Ministry of Health*.

Mikeal, R. L., Brown, T. R., Lazarus, H. L. and Vinson, M. C. (1975) 'Quality of pharmaceutical care in hospitals', *Am J Hosp Pharm*, 32(6), pp. 567-74.

Mills, K. T., Bundy, J. D., Kelly, T. N., Reed, J. E., Kearney, P. M., Reynolds, K., Chen, J. and He, J. (2016) 'Global Disparities of Hypertension Prevalence and Control: A Systematic Analysis of Population-Based Studies From 90 Countries', *Circulation*, 134(6), pp. 441-50.

Mills, K. T., Stefanescu, A., He, J. and Stefanescu, A. (2020) 'The global epidemiology of hypertension', *Nat Rev Nephrol*, 16(4), pp. 223-237.

Morgado, M., Rolo, S. B., Castelo, Y. and Branco, M. (2011) 'Pharmacist intervention program to enhance hypertension control: a randomised controlled trial', *Int J Clin Pharm*, 33(1), pp. 132-40.

Morisky, D. E., Ang, A., Krousel-Wood, M. and Ward, H. J. (2008) 'Predictive validity of a medication adherence measure in an outpatient setting', *J Clin Hypertens (Greenwich)*, 10(5), pp. 348-54.

Munger, M. A. (2010) 'Polypharmacy and combination therapy in the management of hypertension in elderly patients with co-morbid diabetes mellitus', *Drugs Aging*, 27(11), pp. 871-83.

Nasution, Azizah, Tanjung, Hari Ronaldo, Azizah and Tanjung (2016) 'Drug Therapy Problems In Management Of Hypertensive Outpatients Admitted To Four Indonesian Primary Health Centers', *Asian J Pharm Clin Res*, 9, pp. 82-87.

Neves, C. d. M., Nascimento, M. M. G. d., Silva, D. Á. M. and Ramalho-de-Oliveira, D. (2019) 'Clinical Results of Comprehensive Medication Management Services in Primary Care in Belo Horizonte', *Pharmacy,* 7(2), pp. 58.

Nguyen, T. P., Schuiling-Veninga, C. C., Nguyen, T. B., Vu, T. H., Wright, E. P. and Postma, M. J. (2017) 'Adherence to hypertension medication: Quantitative and qualitative investigations in a rural Northern Vietnamese community', *PLoS One,* 12(2), pp. e0171203.

Nivya, K., Sri Sai Kiran, V., Ragoo, N., Jayaprakash, B. and Sonal Sekhar, M. (2015) 'Systemic review on drug related hospital admissions - A pubmed based search', *Saudi Pharm J,* 23(1), pp. 1-8.

Okello, S., Nasasira, B., Muiru, A. N. and Muyingo, A. (2016) 'Validity and Reliability of a Self-Reported Measure of Antihypertensive Medication Adherence in Uganda', *PLoS One,* 11(7), pp. e0158499.

Olowofela, A. O. and Isah, A. O. (2017) 'A profile of adverse effects of antihypertensive medicines in a tertiary care clinic in Nigeria', *Annals of African Medicine,* 16(3), pp. 114.

Pande, S., Hiller, J. E., Nkansah, N. and Bero, L. (2013) 'The effect of pharmacist-provided non-dispensing services on patient outcomes, health service utilisation and costs in low- and middle-income countries', *Cochrane Database Syst Rev,* (2), pp. Cd010398.

Pandit, A. U., Tang, J. W., Bailey, S. C., Davis, T. C., Bocchini, M. V., Persell, S. D., Federman, A. D. and Wolf, M. S. (2009) 'Education, literacy, and health: Mediating effects on hypertension knowledge and control', *Patient education and counseling,* 75(3), pp. 381-385.

Planas, L. G., Crosby, K. M., Mitchell, K. D. and Farmer, K. C. (2009) 'Evaluation of a hypertension medication therapy management program in patients with diabetes', *J Am Pharm Assoc (2003),* 49(2), pp. 164-70.

Redzuan, A. M., Ramli, A. R., Pheng, M. T. H. a. and Ramili, A. R. (2017) 'Drug-Related Problems in Hypertensive Patients with Multiple Comorbidities', *J Pharm Res,* 1(3), pp. 1-8.

Rita, A., John, A., Akpevwe, A. and John, A. (2016) 'Impact of Pharmaceutical Care Interventions on the Quality of Life of Group of Hypertensive Patients ', *UKJPB,* 4(4), pp. 19-28.

Robinson, J. D., Segal, R., Lopez, L. M. and Doty, R. E. (2010) 'Impact of a pharmaceutical care intervention on blood pressure control in a chain pharmacy practice', *Ann Pharmacother,* 44(1), pp. 88-96.

Rodis, J. L., Sevin, A., Awad, M. H., Porter, B., Glasgow, K., Hornbeck Fox, C. and Pryor, B. (2017) 'Improving Chronic Disease Outcomes Through Medication Therapy Management in Federally Qualified Health Centers', *J Prim Care Community Health,* 8(4), pp. 324-331.

Ruiz, M. A., Pardo, A., Rejas, J., Soto, J., Villasante, F. and Aranguren, J. L. (2008) 'Development and Validation of the "Treatment Satisfaction with Medicines Questionnaire"(SATMED-Q)©', *Value in Health,* 11(5), pp. 913-926.

Rupp, M. T. (1992) 'Value of community pharmacists' interventions to correct prescribing errors', *Ann Pharmacother,* 26(12), pp. 1580-4.

Saarti, S., Hajj, A., Karam, L., Jabbour, H., Sarkis, A., El Osta, N. and Khabbaz, L. R. (2016) 'Association between adherence, treatment satisfaction and illness perception in hypertensive patients', *Journal of human hypertension,* 30(5), pp. 341-345.

Saleem, F., Hassali, M. A., Shafie, A. A., Ul Haq, N., Farooqui, M., Aljadhay, H. and Ahmad, F. U. D. (2015) 'Pharmacist intervention in improving hypertension-related knowledge, treatment medication adherence and health-related quality of life: a non-clinical randomized controlled trial', *Health Expectations,* 18(5), pp. 1270-1281.

Santschi, V., Lord, A., Berbiche, D., Lamarre, D., Corneille, L., Prud'homme, L., Normandeau, M. and Lalonde, L. (2011) 'Impact of collaborative and multidisciplinary care on management of hypertension in chronic kidney disease outpatients', *Journal of Pharmaceutical Health Services Research,* 2(2), pp. 79-87.

Sa'ed, H. Z., Al-Jabi, S. W., Sweileh, W. M. and Morisky, D. E. (2013) 'Relationship of treatment satisfaction to medication adherence: findings from a cross-sectional survey among hypertensive patients in Palestine', *Health and quality of life outcomes,* 11(1), pp. 191.

Shareef, J., Fernandes, J., Samaga, L. N. and Fernandes, J. (2015) 'Clinical pharmacist interventions in drug therapy in patients with diabetes mellitus and hypertension in a university teaching hospital', *Int. j. pharm.,* 6(10), pp. 4424.

Sobieraj, D. M., Nigro, S. C., Olayiwola, N. O. and Nigro, S. C. (2011) 'Targeted hypertension medication therapy management in federally qualified health center', *PJNE,* 8(1), pp. 16-23.

Sookaneknun, P., Richards, R. M. E., Sanguansermsri, J. and Teerasut, C. (2004) 'Pharmacist involvement in primary care improves hypertensive patient clinical outcomes', *Annals of Pharmacotherapy,* 38(12), pp. 2023-2028.

Steele, K. M., Ruisinger, J. F., Bates, J., Prohaska, E. S., Melton, B. L. and Hipp, S. (2016) 'Home-Based Comprehensive Medication Reviews: Pharmacist's Impact on Drug Therapy Problems in Geriatric Patients', *Consult Pharm,* 31(10), pp. 598-605.

Subramanian, A., Adhimoolam, M., Kannan, S. a. and Kanan, S. (2018) 'Study of drug-Drug interactions among the hypertensive patients in a tertiary care teaching hospital', *Perspect Clin Res*, 9(1), pp. 9-14.

Tilea, I., Petra, D., Voidazan, S., Ardeleanu, E. and Varga, A. (2018) 'Treatment adherence among adult hypertensive patients: a cross-sectional retrospective study in primary care in Romania', *Patient Prefer. Adherence.*, 12, pp. 625.

Unger, T., Borghi, C., Charchar, F., Khan, N. A., Poulter, N. R., Prabhakaran, D., Ramirez, A., Schlaich, M., Stergiou, G. S. and Tomaszewski, M. (2020) '2020 International Society of Hypertension global hypertension practice guidelines', *Hypertension*, 75(6), pp. 1334-1357.

Urbina, O., Ferrández, O., Luque, S., Grau, S., Mojal, S., Pellicer, R., Riu, M., Salas, E. and Comin-Colet, J. (2015) 'Patient risk factors for developing a drug-related problem in a cardiology ward', *Therapeutics and clinical risk management*, 11, pp. 9.

Vögele, A., Johansson, T., Renom-Guiteras, A., Reeves, D., Rieckert, A., Schlender, L., Teichmann, A.-L., Sönnichsen, A. and Martinez, Y. V. (2017) 'Effectiveness and safety of beta blockers in the management of hypertension in older adults: a systematic review to help reduce inappropriate prescribing', *BMC geriatrics*, 17(1), pp. 224.

Wal, P., Wal, A., Bhandari, A., Pandey, U. and Rai, A. K. (2013) 'Pharmacist involvement in the patient care improves outcome in hypertension patients', *Journal of research in pharmacy practice*, 2(3), pp. 123.

Wang, J., Wu, J., Yang, J., Zhuang, Y., Chen, J., Qian, W., Tian, J., Chen, X., She, D. and Peng, F. (2011a) 'Effects of pharmaceutical care interventions on blood pressure and medication adherence of patients with primary hypertension in China', *Clinical Research and Regulatory Affairs*, 28(1), pp. 1-6.

Wang, J., Wu, J., Yang, J., Zhuang, Y., Chen, J., Qian, W., Tian, J., Chen, X., She, D. and Peng, F. (2011b) 'Effects of pharmaceutical care interventions on blood pressure and medication adherence of patients with primary hypertension in China', *Clin Res Regul Aff*, 28(1), pp. 1-6.

Weaver, D. L. P., L E. Markson, D S. Martin, I. Frederic, M B. (1997) 'Issues in the measurement of satisfaction with treatment', *Am J Manag Care*, 3(4), pp. 579-94.

Weldegebreal, A. S., Tezeta, F., Mehari, A. T., Gashaw, W., Dessale, K. T. and Legesse, N. Y. (2019a) 'Assessment of drug therapy problem and associated factors among adult hypertensive patients at Ayder comprehensive specialized hospital, Northern Ethiopia', *Afr. Health Sci.*, 19(3), pp. 2571-2579.

Weldegebreal, A. S., Tezeta, F., Mehari, A. T., Gashaw, W., Dessale, K. T. and Legesse, N. Y. (2019b) 'Assessment of drug therapy problem and associated factors among adult hypertensive patients at Ayder comprehensive specialized hospital, Northern Ethiopia', *African Health Sciences,* 19(3), pp. 2571-2579.

WHO, W. H. O. (1997) *Drug related morbidity and mortality impact of pharmaceutical care*. Available at: http://archives.who.int/icium/icium1997/posters/4f1_Text.html May, 2019).

WHO, W. H. O. (2003) *Adherence to long therm therapies: Evidence for action*. Available at: https://www.who.int/chp/knowledge/publications/adherence_report/en/.

WHO, W. H. O. (2012) *Guideline: Sodium Intake for Adults and Children*. Available at: https://www.who.int/publications/i/item/9789241504836 (Accessed: May, 2019 2019).

WHO, W. H. O. (2019) *Hypertension*. Available at: https://www.who.int/health-topics/hypertension/#tab=tab_1 (Accessed: January, 2019 January, 2019).

Wong, N. D., Moran, A., Narula, J. and Moran, A. (2018) 'Hypertension Control in Africa: A Call to Action', *Glob Heart,* 13(1), pp. 1-2.

Wood, M., Hyre, A., Muntner, P. and Morisky, D. (2005) 'Methods to improve medication adherence in patients with hypertension: current status and future directions', *Curr. Opin. Cardiol.,* 20(4), pp. 296-300.

Wright, T., J. j., Bakris, G., Greene, T., Agodoa, L. Y., Appel, L. J., Charleston, J., Cheek, D., Douglas-Baltimore, J. G., Gassman, J. and Glassock, R. (2002) 'Effect of blood pressure lowering and antihypertensive drug class on progression of hypertensive kidney disease: results from the AASK trial', *JAMA,* 288(19), pp. 2421-2431.

Yazie, D., Shibeshi, W., Alebachew, M. and Berha, A. (2018) 'Assessment of Blood pressure control among hypertensive patients in Zewditu memorial hospital, Addis Ababa, Ethiopia: a cross-sectional study', *J Bioanal Biomed,* 10(03), pp. 80-87.

Yimama, M., Jarso, H., Desse, T. A. a. and Dese, T. A. (2018) 'Determinants of drug-related problems among ambulatory type 2 diabetes patients with hypertension comorbidity in Southwest Ethiopia: a prospective cross sectional study', *BMC Res Notes,* 11(1), pp. 679.

Annexes

Annex I: Pharmacotherapy Patient Assessment Form

Pharmacy Contact Information Here Pharmacist: _____

Patient code no. _____

Card No: _____ Phone _____ Date data taken _____

Section 1: Patient Socio-Demographic Data

a. Age (yr.): ⬭ Sex: ⬭ pregnancy Y⬭ N⬭ Trimester ____ breast feeding Y N
b. Marital status: Single ⬭ Married ⬭ Divorced ⬭ Widowed ⬭
c. Educational status: Unable to write and read ⬭ Informal education ⬭ ____ primary school ⬭ Secondary school ⬭ secondary school ⬭ college diploma and above ⬭
d. Occupation: Employed ⬭ Unemployed ⬭ private⬭ Student ⬭others specify _____
e. Monthly family income: ≤1500 ⬭, 1500_3000 ⬭ , 3000-5000 ⬭, ≥5000 ⬭
f. How do you get your medication Buying ⬭ free ⬭ Company ⬭ Third party coverage ⬭ ?
g. Residence(current): _____

Treating physician _____

Care giver (if applicable) _____ Phone no. _____

Pharmacist completing review _____

Section 2: Health Information and Lifestyle Factors

Inquiry	Yes/No	Details/ Comments
a. Allergies	⬭ Y ⬭ N	Reaction
b. Smoking	⬭ Y ⬭ N	Cigarettes/Day:
c. Chat chewing	⬭ Y ⬭ N	Comments
d. Alcohol consumption	⬭ Y ⬭ N	Drinks/week:
e. Caffeine in take	⬭ Y ⬭ N	Cups/day:
f. DASH type eating	⬭ Y ⬭ N	Specify:
g. Physical activity	⬭ Y ⬭ N	Type of activity Hours/ week
h. Salt restriction	⬭ Y ⬭ N	Spoon/per servings
i. BMI (kg/m^2)	⬭ Normal ⬭ Overweight ⬭ Underweight ⬭ Obese ⬭ Morbid obese	Heights (m): ___ Weight (kg) __
j. Do you have person assist you in medication use	⬭ Y ⬭ N	
k. Aids, alerts, Devices, etc.	Others	

Past medical history (Relevant illness, Hospitalizations, surgical procedures, injuries, pregnancies)

_____
_____
_____
_____

Past Medications

_____
_____
_____
_____
_____

Family History (FH):

_____
_____
_____
_____

Functional History (If relevant – i.e. geriatrics, stroke patient, homeless, etc.):

_____
_____
_____

Section 3: Physical examination (PE)/ Vital signs

Parameters	Date (dd/mm/yy)									
BP										
PR										
RR										
T^{O}										

Section 4: Relevant laboratory series results (lab findings of at least for three consecutive results)

Parameters	Date (dd/mm/yy)									
Lipid profiles	LDL									
	TG									
	HDL									
	Total C									
	ALT									
	AST									
	ALP									
Renal function test	Date									
	BUN									
	SCR									
	GFR									
Blood glucose	Date									
	HbA1c									
	FBC									
	RBC									
Electrolytes	Date									

	Na			
	K			
	Mg			
	Ca			
	Cl			
CBC	Date			
	WBC			
	RBC			
	HMG			
	HMC			
	MCV			
	MCH			
	MCHC			
	PLT			
	PT			
	PTT			
	Aptt			
	INR			
	Date			

	Echo			
	ECG			
	MRI			

Section 5: Current medical conditions

1.	2.	3.	4.
5.	6.	7.	8.

Head to toe Assessment regarding other complaints/concerns/bothersome symptoms:

Complaints/Concerns:

Bothersome symptoms:

Do any ever require self-treatment?

Section 6: Medications (Prescription, Non- Prescription, Herbal products)

Medication name, strength	**How taken** Dose, route, time of day, special instruction	**Purpose for use**	**Starting date**	**Stopped date**	**Who stopped it? Reason for stopping**	**Issues identified**		**Additional comments**
						Yes: Proceed to DTPs identified	**No:** Verify to continue as per	
						⬭	⬭	
						⬭	⬭	
						⬭	⬭	
						⬭	⬭	
						⬭	⬭	
						⬭	⬭	
						⬭	⬭	

Section 7: Drug Therapy Problems Identified

- No drug therapy problems were identified

Priority Number **Drug Therapy Problem (DTP)**

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

For those drug therapy problems above which can be corrected with immediate action and no further research or consultation, document your plan below:

DTP ≠	Proposed solution	Discussed with patient	Follow-up plan

For those drug therapy problems requiring *further research, contact with other health care providers* and *care plan development*, utilize the **pharmacy care plan** worksheet.

_____ _____

Pharmacist signature Date of Review

Drug therapy problems identified and addressed by MTM Pharmacists.

DTP type	Categories of DTP	Drug therapy problem cause
Indication	1. Unnecessary drug therapy	▪ Duplicate therapy ▪ No medical indication at this time ▪ Nondrug therapy more appropriate ▪ Addiction /recreational drug use ▪ Treating avoidable adverse drug reaction
	2. Needs additional drug therapy	▪ Preventive therapy ▪ Untreated condition ▪ Synergistic therapy
Effectiveness	3. Ineffective drug	▪ More effective drug available ▪ Conditions refractory to drug ▪ Dosage form inappropriate ▪ Contraindication present ▪ Drug not indicated for condition
	4. Dosage too low	▪ Ineffective dose ▪ Needs additional monitoring ▪ Frequency inappropriate ▪ Incorrect administration ▪ Drug interaction ▪ Incorrect storage ▪ Duration inappropriate
Safety	5. Adverse drug reaction	▪ Undesirable effect ▪ Unsafe drug for the patient ▪ Drug interaction ▪ Incorrect administration ▪ Allergic reactions ▪ Dosage increase/ decrease too fast

	6. Dosage too high	▪ Dose too high ▪ Needs additional monitoring ▪ Frequency too short ▪ Duration too long ▪ Drug interaction
Compliance	7. None adherent	▪ Does not understand instructions ▪ Cannot afford drug product ▪ Patient prefers not to take ▪ Patient forgets to take ▪ Drug product not available ▪ Cannot swallow/administer drug

Pharmacy care plan

Data: Subjective information provided by the patient and/or objective data that you have collected.

Assessment: State the drug therapy problem.

Plan: For each alternative, consider *treatment efficacy, safety and drug interactions, adherence, cost, drug coverage, and non-pharmacological interventions*.

Alternative 1

Alternative 2

Monitoring

Planned date of follow-up: _____

_____ _____

Pharmacist signature Date of Review

Patient action plan

Date of comprehensive medication review: _____

As a result of comprehensive medication review, I will do the following:

1.
2.
3.
4.

Patient follow-up record

Date follow up	Reason for follow up	Results	Pharmacist comments and plan
		Any new concerns?	Intervention complete ☐ Yes ☐ no
		Any new concerns?	☐ yes ☐ no
		Any new concerns	☐ yes ☐ no

Health care practitioner communication form

Date _____

Health care practitioner	Re: (Patients Name)
Address	Address
Phone number	Age Phone number

Dear Dr. _____

Your patient had a comprehensive medication review completed on ---------- Listed below are my assessments(s) and recommendation(s). Please provide a response below (if indicated) at your earliest opportunity. Should you like to discuss any of the information contained don't hesitate to contact me.

<table>
<tr><td>Drug Therapy Problem</td><td colspan="2">Pharmacist Recommendation</td><td>Make Changes as Recommended</td><td>Prescribe Comments/ Revisions</td></tr>
<tr><td rowspan="2"></td><td>Information only</td><td>Action required</td><td rowspan="2">☐ yes ☐ no</td><td rowspan="2"></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td>Information only</td><td>Action required</td><td>☐ yes ☐ no</td><td></td></tr>
<tr><td colspan="3">Pharmacist name:</td><td colspan="2">Prescriber signature:
Date:</td></tr>
</table>

Personal Medication Record Form

My Medication Record

Name: ———————————————————————

You can include all of your medications on this record: prescription medications, nonprescription medications, and other dietary supplements.

Always carry your medication record with you during your appointment date and show it

to your pharmacists.

Drugs			When to take				Start date	Stop date	Special Instructions
Name	Dose	Take for	Morning	Noon	Evening	Bed time			

Annex II: Morisky Medication Adherence Scale-8 (MMAS-8).

You indicated that you are taking medication(s) for your high blood pressure. Individuals have identified several issues regarding their medication-taking behavior and we are interested in your experiences. There is no right or wrong answer. Please answer each question based on your personal experience with your hypertension medication. Please mark your response below.

No	**Items**	**Yes (1)**	**No (0)**
1	Do you sometimes forget to take your pills?	1	0
2	People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not take your medicine?	1	0
3	Have you ever cut back or stopped taking your medicine without telling your doctor because you felt worse when you took it?	1	0
4	When you travel or leave home, do you sometimes forget to bring along your medicine?	1	1
5	Did you take all your medicine yesterday?	0	0
6	When you feel like your symptoms are under control, do you sometimes stop taking your medicine?	1	0
7	Taking medicine every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your treatment plan?	1	0
8	How often do you have difficulty remembering to take all your medicine? 0. Never 1. Rarely 2. Once in a while 3. Sometimes 4. Usually 5. All the time	-/5	
	Total score	-/8	

Annex III: SATMED-Q® Questionnaire

0 Not at all 1 A little bit 2 some-what 3 Quite a bit 4 Very much

≠	SATMED-Q® Patient satisfaction assessment Questionnaire	0	1	2	3	4
1	The side effects of the medicine interfere with my physical activities.					
2	The side effects of the medicine interfere with my leisure and free time activities					
3	The side effects of the medicine interfere with my daily activities					
4	The medicine I am taking relieves my symptoms					
5	I am satisfied with the time it takes for the medicine to start to work					
6	I feel better now than I did before I start the treatment					
7	I find that taking my medicine is practical for me					
8	I find it easy to use/ take medicine in its present form (taste, size, etc).					
9	The time table for taking medicine suites me.					
10	Thanks to the medicine I am taking, it is easier for me to do my leisure and free time activities					
11	Thanks to my medicine, it is easier for me to take care of my personal hygiene.					
12	Thanks to my medicine, it is easier for me to to perform my daily activities.					
13	My doctor has informed me in detail about my medical condition					
14	My doctor has informed me about the right way to treat my medical condition					
15	I intend to continue this using this treatment					
16	I feel comfortable with my treatment					
17	In general, I feel satisfied with the treatment					
	Total score					

Annex IV: Information sheet to study participants

Card number_____ Code number---------- date----------

Dear Participant,

My name is _____, and I am a member in research conducted under the title assessment of medication therapy management service in patients with Hypertension visiting ambulatory renal clinic at Tikur Anbessa Specialized Hospital (TASH). **Principal investigator:** The study conducted by Belachew Bulo, under supervision professor Efrem Engidawork, Alemseged Beyene and Dr. Dr Desalew Mekonen for the purposes of obtaining a Master's Degree in Pharmacy practice at AAU CHS SOP.

Objective of the study: My area of focus is to assess impact of introduction of MTM service at ambulatory DM clinic of TASH with post exposure assessment of patient satisfaction and adherence.

Benefit: Your participation in this study helps to identify medication therapy problems and provide appropriate intervention with appropriate education concerning disease condition and medication. This helps to improve medication adherence in order to achieve blood presure target that reduce further complications of the disease.

Risks: For this purpose the study conducted by assessment of your medical card and through face to face interview. The interview may take 20-30 min so you are kindly asked to provide important information as honestly as you can.

Rights: Participation in the study is voluntary. If you do not wish to participate or withdraw at any time during the study, your wishes will be complied with, and nothing will be held against you. The information gathered during this study will remain confidential and will be protected by the use of initial names and all data will be secured and available only to researcher.

Annex V: Informed consent form

You are welcome to ask the researchers any questions that occur to you during the survey or interview. If you have further questions once the interview is completed, you are encouraged to contact the principal researcher using the contact information given below.

Name _____ Phone no._____ Email_____

I, _____, have read the above information stated in the information sheet and freely decide and agree to participate in this study. I also understand that I am free to refuse to answer any question and to withdraw from the study at any time. I understand that my responses will be kept anonymous. Participant

Signature_____ Date _____

Thank you for your participation.

ቅጽ 1: የመድሃኒት ህክምና ማናጅሜንት የታካሚ መረጃ

ክፍል አንድ ፡ የታካሚ ማህበረሰባዊ ባህርያቶች መረጃ በተመለከተ

(መመርያ፡ ለመረጡት ምላሽ የ √ ምልክትን ያድርጉ)

1. **እድሜ**፤ _____ 2. **ፆታ**፤ ወንድ ☐ ሴት ☐ 3. **እርጉዝ** አዎ ☐ አይደለም ☐

4.**የጋብቻ ሁኔታ**፤ያላገባ/ች ☐ ያገባ/ች ☐ አግብቶ/ታ የፈታ/ች☐ ሚስቱ/በሏየሞተችበት/ባት ☐

5. **የትምህርት ሁኔታ**፤ መደበኛ ትምህርት የለኝም ☐ ከ1ኛ-8ኛ ክፍል ☐ ከ9ኛ-12ኛ ክፍል ☐ ኮሌጅ ዲፕሎማ ☐ ዩኒቨርስቲ ዲግሪ እና ከዚ ያበላይ ☐

6. **የስራ ሁኔታ**፤ የመንግስት ☐ የግል ☐ ተማሪ ☐ ስራ የለምኝ ☐ ሌላ (ይግለጹ).....

7. **አሁን የሚኖሩበት ቦታ** ፤ ከተማ ☐ ገጠር ☐ ቦታ (ይግለጹ) .....

8. **መድሃኒት የሚያገኙት በምን መልኩ ነዉ ?** በግዢ ☐ በነጻ ☐ ካምፓ ☐ ሶስተኛ ወገን☐

9. **የወር የቤተሰብ ገቢ** <1500 ☐ 1500-3000 ☐ 3001-5000 ☐ >5000 ☐

ክፍል ሁለት፡ የታካሚ የጤና እና ማህበራዊ ሂወት ሁኔታ

መጠየቅ	አዎ/አይደለም	ገለጻ/ አስተያየት
l. የመድሃንት አለረጂ አለቦት?	አዎ ⬭ አይደለም ⬭	
m. ቡና ይጠጣሉ?	አዎ ⬭ አይደለም ⬭	በቀን ስንት ስኒ:
n. የአመጋገብ መመርያ ተግባራዊ ያደርጋሉ?	አዎ ⬭ አይደለም ⬭	
o. ጨዉ በምግብ ይጠቀማሉ?	አዎ ⬭ አይደለም ⬭	ለአንድ ገበታ ስንት ማንካ
p. ጭማቅ ይጠቀማሉ?	አዎ ⬭ አይደለም ⬭	ምን ዓይነት:
q. አካላዊ እንቅስቃሴ ያደረጋሉ?	አዎ ⬭ አይደለም ⬭	በሳምንት ስንት ሰአት
r. ሲጋራ ያጨሳሉ ?	አዎ ⬭ አይደለም ⬭	በቀን ስንት ስጋራ
s. አልኮል ይጠጣሉ?	አዎ ⬭ አይደለም ⬭	በቀን ምን ያክል
t. ጫት ይቅማሉ?	አዎ ⬭ አይደለም⬭	
u. ክትባት ተከትቦ ያዉቃሉ	አዎ ⬭ አይደለም⬭	
v. BMI (kg/m^2)		ክብደት---------- ቁመት ------
w. የወገብ ሰርከምፍራንስ (cm)		
x. ከሃክም ትህዛዝ ዉጭ የምወስዱት ማድሃንት አለ?	⬭አዎ ⬭ የለም	
y. መድሃንትዎን ስወስዱ አጋዥ ሰዉ አለ?	⬭ አዎ ⬭የለም	
z. ስለ መድሃንትዎ የምያሳስቦ ነገር አለ?	⬭ አዎ ⬭ የለም	

Pharmacy Contact Information lokonkeet@gmail.com Phone No. 0911263931

ቅጽ 2: ሞሪስኪ መዴኃኒትን በታዘዘው መሰረት በአግባቡ ስለመውሰድ (መለኪያ- 8)

ሞሪስኪ" መድኃኒትን በታዘዘው መሰረት በአግባቡ ስለመውሰድ" መለለኪያ- 8			
	ጥያቄዎች	አዎ 1	አይደለም
1	አንዳንድ ጊዜ መድኃኒትዎን ረስተው ሳይወሰዱ ቀርተው ያውቃሉ?	1	0
2	ሰዎች አንዳንድ ጊዜ ከመርሳት በተጨማሪ ባሉት የተለያዩ ምክንያቶች መድኃኒታቸውን ሳይወስዱ ይቀራሉ። ባለፈት ሁለት ሳምንታት፣ መድኃኒትዎን ሳይወስዱ የቀሩበት ቀናቶች ነበሩ?	1	0
3	መድኃኒትዎን እየወሰዱ ህመምዎ ባለመቆሙ ሐኪምዎን ሳያማክሩ መድኃኒትዎን አቋርጠው ያውቃለ?	1	0
4	በጉዞ ወይም በሌላ ምክንያት ከቤትዎ አርቀው ሲጓዙ አንዳንድ ጊዜ መድኃኒትዎን ረስተውት ሳይወስዱት ያውቃሉ?	1	0
5	በትሊንትናው ዕለት ሁሉንም መድኃኒትዎን ውጠዋለ?	0	1
6	ህመምዎ ጋብ ሲሊሎት (የህመምዎ ስሜቶች ሲጠፈ) አንዳንድ ጊዜ መዴኃኒትዎን አቋርጠው ያውቃሉ?	1	0
7	በየቀኑ መድኃኒት መዋጥ፣ ለአንድ አንድ ሰዎች አይመችም። እርስዎ በየቀኑ እንድሁም አንድም ሰዓት ሳያዛንፉ መድኃኒትዎን መዋጥ የመሰላቸት ስሜት ተሰምቶት ያውቃሌ?	1	0
8	መድኃኒትዎን አስታውሰው ለመዋጥ ምንያክሌ ይቸገራለ? ○ ጭራሽ አይቸግረኝም ○ በጣም አልፎ አልፎ ከስንት አንድ ጊዜ ይቸግረኛል ○ አንዳንድ ጊዜ ይቸግረኛል ○ አብዛኛው ጊዜ ይቸግረኛል ○ ሁሌ ጊዜ ይቸግረኛል	-/5	
	Total	-/8	

ቅጽ 3: የ ሳት ሜድ ኪው (SATMED-Q) መጠይቅ

ህመሞን ለማከም የሚሰጠውን ህክምና በተመለከተ የሚከተሉትን ጥያቄዎች ይመልሱ። ከቀረቡት መልሶች መካከል በህክምናው ግኙትን እርካታ ልክ የሚያሳዩ አማራጮች ቀርበዋል፤ እያንዳንዱን መልስ እላዩ ላይ በማክበብ መልሱን መስጠት ይችላሉ።

0 በጭራሽ 1 በትንሹ 2 በመጠኑ 3 በጣም 4 እጅግ በጣም

≠	SATMED-Q® Patient satisfaction assessment Questionnaire	0	1	2	3	4
1	የመድሃኒቱ የጎንዮሽ ጉዳት በአካላዊ እንቅስቃሴዎ ላይ ተጽእኖ አለዉ?					
2	የመድሃኒቱ የጎንዮሽ ጉዳት በ እረፍት እና በትርፍ ጊዜዎ ላይ ተጽእኖ አለዉ?					
3	የመድሃኒቱ የጎንዮሽ ጉዳት በ እለት ተእለት የ ህይወት እንቅስቃሴዎ ላይ ተጽእኖ አለዉ?					
4	የሚወስዱት መድሃኒት የህመም ስሜቶን አስታግሶሎታል?					
5	መድሀኒቱ ስራውን ለመስራት በሚወስደዉ ጊዜ ረክተዋል?					
6	ህክምና ከ ጀመሩ በኃላ ከ በፊቱ ጥሩ ስሜት እየተሰማዎት ነዉ?					
7	እለት ተለት መድሃኒቶን የመዉሰድ ላምድ አዳብረዋል?					
8	መድሃኒቱ አሁን ባለዉ ይዘት (ጣዕም፣መጠን፣) መዉሰድ ለእርሶ ቀላል ነዉ?					
9	እየወሰዱ ያሉት መድሃኒት የሚወስዱበት ሰዓት ና ድግግሞሽ ተስማምቶታል?					
10	እየወሰዱ ያሉት መድሃኒት የእረፍትና የትርፍ ጊዜዎን ቀላል አድርጎሎታል?					
11	እየወሰዱ ያሉት መድሃኒት የግል ንጽህናዎን ለመጠበቅ ቀላል አድርጎሎታል?					
12	እየወሰዱ ያሉት መድሃኒት የእለት ተእለት እንቅስቃሴዎን ለማከናወን ቀላል አድርጎሎታል?					
13	ሀኪሞ ስለ ህመሞ በተመለከተ ዝርዝር መረጃ ይሰጡታል?					
14	ሀኪሞ ህመሞን ለማከም ትክክለኛወን መንገድ ይነግሮታል?					
15	ይህንን መድሀኒት ለመቀጠል አስበዋል?					
16	በህክምናዎ ምኞት ይሰማዎታል?					
17	በአጠቃላይ በሚወስዱት መድሃኒት ምኞት ተሰምቶታል?					
	Total score					

ቅጽ 4: ጥናቱን በተመለከተ ለታካሚ የሚሰጥ መረጃ

Card number_____ Code number---------- date----------

አዲስ አበባ ዩኒቨርሲቲ፣ ጤና ሳይንስ ኮሌጅ፤ ፋርማሲ ት/ቤት፤ ፋርማኮልጅና ክሊኒካሌ ፋርማሲ ትምህርት ክፍል

ውድ የቃለ መጠይቅ ተሳታፊ፤ እንደምን አደሩ/ዋሉ? ስሜ _____ይባላል ፤

ጥናቱ የሚካሄድበት ቦታ፡ በጥቁር አንበሳ ስፔሻላይዝድ ሆስፒታል

የጥናቱ ዋና ሀሳብ፡ የደም ግፊት ህመም ታካሚዎች ላይ የመድሃኒት ህክምና አገልግሎት በተሰኘ የድህረ ምረቃ ጥናት።

የተመራማሪው ስም፡ ጥናቱ የሚካሄውም በ አቶ በላቸዉ ቡሎ ና በጥናቱ አማካሪዎች

የዚህ ጥናት ዋና አለማው፡ ከመድሀኒት ህክምና ጋር ተያያዥነት ያለቸው ችግሮችን በመለየት፣ በታዘዘው መሰረት በአግባቡ እንድወሰድ ማድረግ፣ የመፍትሄ ሀሳቦችን በማቅረብ የህሙማን የጤና ሁኔታ እንዲሻሽል ማድረግ ነው።

የ ጥናቱ ሂደት፡ በዚህ ጥናት ላይ የመድሃኒት ህክምና አገልግሎት ከተሰጣ በኋለ በመድኃኒት ህክምናዎ ሊይ የሚከሰቱ ችግሮች ፤ በታዘዘው መሰረት በአግባቡ የአወሳሰዴና የአጠቃቀም ክህሎትና የእርስዎን የመድሃኒት ህክምና እርካታን ይጠናል።

ጉዳት: ጥናቱ የተወሰነ ጊዜን ከመሻማቱ በስተቀር የሚስከትለዉ ጉዳት የለም

የተሳታፊው መብት: ተሳታፊው ቃለ መጠይቁን በፈለገው ሰዓት ማቋረጥ እንዲሁም ያልፈለገውን ጥያቄ ያለመመለስ መብት አለዉ።.

ጥቅም: የጥናቱ ዉጤት ለወደፊቱ የተሻለና ጥራት ያለው አገልግሎት ለመስጠት ይረዳ ዘንድ ግብዐት ሆኖ ያገለግላል. ጥናቱ የሚካሄደው የህክምና ካርዶዎን በመከለስና በገጽ ለገጽ ቃለ መጠይቅ ነው። ስለዚህ የእርስዎ ቅንና ሓቀኛ መረጃ ለጥናቱ እጅግ በጣም ወሳኝ ነው። የተከበረ ጊዜዎን ስለሰጡን እጅግ በጣም እናመሰግንዎታለን።

ቅጽ 5፡ በቃለ መጠይቅ ለመሳተፍ የፊቃድኝነት ቃል መቀበያ ቅጽ

በዚህ ጥናት የእርስዎ መረጃ ሙሉ በሙሉ በምስጥር የተጠበቀና ለምርምሩ አላማ ብቻ የሚዉል ነው። በተጨማሪም የእርስዎ ተሳታፊነት በፊቃደኝነት ላይ የተመሠረተ ነው። የጥናቱ አላማውን ተረድተውና ጊዜዎን ሰውተው፤ ከ 20-30 ደቂቃዎች ለሚፈጅ ቃለ-መጠይቅ እውተኛው መረጃ በመስጠት ፍቃደኛ በመሆንዎ በቅድሚያ አመሰግናለሁ። በየትኛውም ጊዜ ጥያቄ ካለዎት በላቸዉ ቡሎ በስ.ቁ +2511263931 በኢ-ሜይሌ፡ lokonkeet@gmail.com ይጠይቁን። _____

_____ የቃለ መጠይቅ የቀረበለት ሰው ፊርማ

የቃለ መጠይቅ አቅራቢ ፊርማ

የተከበረ ጊዜዎን ስለሰጡን እጅግ በጣም እናመሰግንዎታለን። ዋና አጥኚ።