



St. PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE
DEPARTMENT OF PUBLIC HEALTH

**MAGNITUDE OF MEDICATION ADHERENCE AND ITS ASSOCIATED FACTORS
AMONG POST KIDNEY TRANSPLANT PATIENTS IN ST. PAUL HOSPITAL
MILLENNIUM MEDICAL COLLEGE, ETHIOPIA.**

BY: MESKEREM NIMANI, MD

A THESIS SUBMITTED TO THE DEPARTMENT OF PUBLIC HEALTH, IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER'S OF
PUBLIC HEALTH IN GENERAL MPH.

FEBRUARY, 2022
SPHMMC, GMPH
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Epidemiology

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Contents

ACRONYMS AND ABBREVIATIONS	V
LIST OF TABLES	VI
LIST OF FIGURES	VI
Abstract.....	VII
1. INTRODUCTION	1
1.1. Background	1
1.2. Statement of the problem	2
1.3. Rationale of the study	3
2. LITERATURE REVIEW	4
2.1. The concept of kidney transplant and medication adherence	4
2.2 Medication adherence and health outcome	6
2.3. Medication adherence measurements	7
2.4. Factors associated with medication adherence in kidney transplant patients	9
2.5. Conceptual framework.....	11
3. OBJECTIVE	12
3.1. General objective	12
3.2. Specific objective.....	12
4. METHODS AND MATERIALS.....	13
4.1. Study area and period.....	13
4.2. Study Design.....	13
4.3. Population of the study	13
4.3.1. Source population	13
4.3.2. Study Population.....	14
4.3.3. Eligibility criteria	14
4.4. Sample size determination and sampling procedure.....	14
4.5. Study variable	15
4.5.1. Dependent variables.....	15
4.5.2. Independent variables (five WHO dimensions).....	15
4.6. Operational and Terms of Definitions	16
4.7. Data Collection tools and procedures	16
4.7.1. Data collection tool	16
4.7.2. Data collection procedure	17
4.8. Data quality management.....	17
4.9. Data processing and analysis	17
4.10. Ethical Consideration.....	19

5. Result	20
5.1. Socio-demographic and disease related characteristics	20
5.2. Adherence level measurement scores: SMAQ and BAASIS	20
5.3. Binary logistic regression model: analysis of the associated factors in the five dimensions of the WHO model: sociodemographic, medication, service area, patient and health care provider related factors.....	27
6. Discussion	30
7. Conclusion	31
8. Recommendations	31
9. Reference	33
10. ANNEXES.....	36
Annex I: Consent Statement	36
ANNEX II. Patients' questionnaire	38

ACRONYMS AND ABBREVIATIONS

ARMS	Adherence to Refills and Medication Scale
BAASIS	Basel Assessment of Adherence to Immunosuppressant Medication Scale
BMQ	Brief Medication Questionnaire
CKD	Chronic Kidney Disease
EMD	Electronic Medication Packaging
ESRD	End Stage Renal Disease
IS	Immuno-Suppressant
KT	Kidney Transplant
MAQ	Morisky Adherence Questionnaire
MAS:	Medication Adherence Scale
MedMaIDE	Medication Management Instrument for Deficiencies in the Elderly
MEMS	Medication Event Monitoring System
NCD	Non-Communicable Disease
RRT	Renal Replacement Therapy
SMAQ	Simplified Medication Adherence Questionnaire
SPHMMC	Saint Paul Hospital Millennium Medical College
TxEQ	Transplant Effect Questionnaire
WHO	World Health Organization

LIST OF TABLES

TABLE 1: SOCIODEMOGRAPHIC CHARACTERISTICS OF POST KIDNEY TRANSPLANT PATIENTS IN (N=270) SPHMMC, AA, ETHIOPIA, 2022.	20
TABLE 2: DISEASE, PATIENT, TREATMENT AND HEALTH SETUP RELATED CHARACTERISTICS OF POST KIDNEY TRANSPLANT PATIENTS (N=270) IN SPHMMC, AA, ETHIOPIA, 2022.	22
TABLE 3: MEDICATION ADHERENCE LEVEL MEASUREMENT IN POST KIDNEY TRANSPLANT PATIENTS USING SIMPLIFIED MEDICATION ADHERENCE QUESTIONNAIRE (SMAQ) AND BASEL ADHERENCE ASSESSMENT SCALE IN IMMUNOSUPPRESSANT (BAASIS).	25
TABLE 4: BIVARIATE AND MULTIVARIABLE ANALYSIS OF FACTORS ASSOCIATED WITH MEDICATION ADHERENCE AMONG POST KIDNEY TRANSPLANT PATIENTS (N=270) IN SPHMMC, AA, ETHIOPIA, 2022.....	29

LIST OF FIGURES

FIGURE 1: CONCEPTUAL FRAMEWORK OF MEDICATION AND FOLLOW UP ADHERENCE AND RELATED FACTORS. (ADOPTED FROM WHO)	11
FIGURE 2: MEASURED ADHERENCE LEVEL BY THE SMAQ AND BAASIS MEASURING TOOLS, AMONG POST KIDNEY TRANSPLANT PATIENTS IN SPHMMC, AA, ETHIOPIA, 2022.....	24

Abstract

Background: Kidney transplantation is the treatment of choice for chronic kidney disease and end stage renal disease which requires lifelong treatment with immunosuppressive medications. Strict adherence to immunosuppressant medicine regimens is key to prevent kidney rejection; however, evidence suggests that adherence is sub-optimal especially in low-income countries like Ethiopia. The aim of this study was to determine the level of medication adherence and the associated factors among post-kidney transplant patients at St. Paul's Hospital, Addis Ababa, Ethiopia.

Methods: An institution based cross sectional study was conducted among 270 post-kidney transplant patients at St. Paul's Hospital Renal Transplant Unit from October 12th, 2021 to January 4th, 2022. A structured questionnaire was used for data collection. Data were entered using EpiInfo7 and analyzed using SPSS version 26 software. The prevalence of medication adherence was computed, and then binary Logistic regression model was fitted to estimate the measure of association between the outcome and explanatory variables. With COR and AOR, 95% confidence interval and p-value <0.05 statistical significance was used.

Result: More than two-third (71.5%) of the patients were males. The median age of the kidney transplant patients was 37 (IQR, 28-45) years of age; and the median duration after transplant was 3.12 (IQR=1.2-5.0) years. The prevalence of medication adherence in post kidney transplant patients was 81.9% (CI=76.7-86.3). The significant associated factors for a decreased medication adherence were missing follow up visit, above five years post-transplant duration and being forgetfulness. Missing follow up visits more than two times had a 91.2% decreased adherence level as compared to those who had never missed (AOR=0.088, CI=0.028-0.278, p-value<0.0001). In patients with above five years post-transplant duration, adherence was 92.6% less as compared to one year and below (AOR=0.074, CI=0.007-0.78, p-value=0.031). Being forgetful was associated with 89.6% lowered adherence level as compared to drug unavailability as a reason for decreased adherence (AOR=0.104, CI=0.021-0.523, p-value= 0.006).

Conclusion and recommendation: The prevalence of medication adherence among kidney transplant patients in Ethiopia was higher as compared to the WHO measured adherence level and other studies. The negatively associated factors with medication adherence were missing follow up visit, post-transplant duration above five years and being forgetfulness. The recommendation to health care providers working on kidney transplant patients is that to persuade patients with setting reminder/alarm, regular call notification of appointment dates. For the institution, to build a system for tracking patients and regular reminding using contact address; with special attention to patients with above five years of post-transplant.

Keywords: medication adherence, associated factors, post kidney transplant, Addis Ababa, Ethiopia.

1. INTRODUCTION

1.1. Background

Chronic non communicable diseases are becoming the major public health problems of developing countries. One of the major NCDs that alarms the public and clinicians is chronic kidney disease with prevalence of 29% globally and the magnitude is comparable in the low-income countries (LICs) with 26% to 30% (1). As the incidence of CKD is increasing from time to time, the demand for kidney transplant has become extreme(1). For example, in the U.S. there are over 100,000 wait for kidney transplants. Kidney transplantation, (KT) is the treatment of choice for end stage renal disease (ESRD), in terms of survival, quality of life and cost effectiveness compared with other replacement therapies (2).

The global observatory on donation and transplantation in collaboration with WHO states that organ transplantation is the only available treatment for persons with end stage failure of solid organs. KT requires lifelong treatment with immunosuppression medications to prevent rejection of the transplanted graft. The WHO reports that graft rejection rate in the first year varies from 7% to 36 % in different settings. The increasing prevalence of CKD and ESRD, as opposed to the relative shortage of kidney donors, limited transplantation service and setup, and the health-related costs of kidney transplant rejection, make the prevention of adverse outcomes following transplantation is vital (3)(4)(5). To prevent graft failure and life-threatening, costly complications, transplant recipients must closely adhere to their medication regimens that require constant monitoring of therapeutic levels (6).

Even though, strict adherence to immunosuppressant medicine regimens is key to preventing kidney rejection, evidence suggests that adherence is sub-optimal at 50 to 78% for the high income countries, (HICs) and rate is much lower for low and middle income countries (LMICs) (5) (7). However, medication non-adherence in kidney transplantation increases the risk of rejection, kidney loss, and costly treatments which poses challenge in resource limited settings (8). Studies also shows non-adherence to health care appointments is a significant and independent risk factor for graft loss (5).

HIC countries have advanced medical care in the kidney transplantation services, easy access to medication and availability of strong health insurance. However, most LMIC countries KT

services areas are very limited with a challenge due to shortages of nephrologists and transplant centers and high cost of immunosuppressive medications (9).

The management of patients with kidney transplant in most LMICs is very challenging due to many financial, intellectual and infrastructural challenges (3)(9). Because patient must take immunosuppressive medication indefinitely, the need for consistent supply of medication is very important for transplantation to survive. However, availability and affordability of immunosuppression medication is a significant barrier to developing a successful transplant program (10).

Ethiopia is one of the few countries in Africa where KT service is provided. The kidney transplant center was established in 2015 at SPHMMC and is giving KT service since then. There are 148 patients who received KT service in the center. There are a few studies done regarding post kidney transplant outcome, cost comparison with dialysis but there is a gap in knowledge about medicine adherence among KT patient. This research will attempt to determine patient adherence status and perhaps will generate new information to be used as a reference and will stimulate further investigation. And perhaps it will achieve possible interventions and strategies needed to be developed to help transplant recipients adhere to their prescribed medicines.

1.2. Statement of the problem

Currently, Ethiopia is facing one of the major deadly chronic NCD i.e. chronic kidney disease (CKD) and end stage renal disease (ESRD) with prevalence of 26% (1). Even though, kidney transplantation is the best treatment for CKD and ESRD in terms of cost effectiveness, quality of life and five-year survival as compared to dialysis (12), it requires lifelong treatment with immunosuppression medications to prevent rejection of the transplanted graft. In order to prevent graft failure and life-threatening, costly complications, transplant recipients must closely adhere to medication regimens.(6) Even though, strict adherence to immunosuppressant medicine regimens is key to preventing kidney rejection, evidence suggests that adherence is sub-optimal. As WHO stated the level of medication adherence for developed countries is around 50% to 78 % and the rate is even lower for the developing countries (5). A study done in Tikur Anbessa Hospital about medication adherence in CKD patients is 61%. Forgetfulness with a rate of non-adherence 78%, low income 6 times less adherent and complexity of prescribed drugs are associated with medication non-adherence by 54/% (1).

There are a number of interventions implemented to increase medication adherence level among post kidney transplant individuals in different countries. The WHO states that medication adherence is a dynamic process that needs to be followed up and there is no single intervention strategy or a package of strategies that has shown to be effective across all patients, conditions and settings. Medication adherence rates were greatly enhanced when multidimensional interventions targeting behavioral risk factors or a combination of behavioral, educational and emotional changes. (2) Some of the interventions that were implemented are one-off feedback from a nurse and financial assistance programs offered little improvement. Dose administration aids when used in conjunction with self- monitoring also improved adherence.(2)

However, the increasing prevalence of CKD and ESRD, as opposed to the relative shortage of kidney donors, limited transplantation service and setup, and the health-related costs of kidney transplant rejection, make the service provision challenging specially for LICs (3)(4)(5).

In Ethiopia, where there is a single transplant service available, there are a number of barriers to medication adherence and hence this will cost undesirable consequences. Availability and affordability of immunosuppression medication, inadequate and poor setup of transplant service and health illiteracy in the country are significant challenges to developing a successful transplant program (10).

Therefore, this study aims to determine the magnitude of medication adherence and its associated factors on post kidney transplant patients following at SPHMMC renal transplant unit.

1.3. Rationale of the study

This study aims to determine the medication adherence for kidney transplant patients of SPHMMC in the renal transplant unit. After measuring the adherence level, it will identify the factors that are associated with medication adherence. The finding of this study will be contributed to for the stakeholders.

In the renal transplant unit of SPHMMC, the study will provide a valuable information about their patient's status on medication adherence. It will also provide knowledge about the factors that are significant to medication adherence. It will be used as a baseline assessment and guidance for clinicians for the better health outcome of patients. It will provide possible intervention tools to improve the adherence level in general.

For the patients, it will create awareness and improve their knowledge on health literacy about their medication in details and to acknowledge the importance of adherence and persistence towards their medication. And for the policy makers, it will be used as a ground for future planning in terms of improving the transplant service capacity of the country and policy making. For researchers and non-governmental organizations (NGOs), it will be used as a reference for other researchers and NGOs whom has an interest in the area.

2. LITERATURE REVIEW

2.1. The concept of kidney transplant and medication adherence

The incidence of chronic kidney disease is increasing significantly both in HICs and LMICs, which has risen the demand for kidney transplantation. Kidney transplantation, (KT) is the management of choice for end stage renal disease (ESRD), because it improves patient's quality of life and survival rate as compared to other treatment modalities(2). Kidney transplantation (KT) requires lifelong treatment with immunosuppression medications to prevent rejection of the transplanted graft. Kidney graft loss in the first 10 years following transplantation is a significant problem despite scientific advances in treating rejection. To avoid medical complications, transplant patients must closely adhere to medications provided. (6).

Inappropriate intake of medication as oppose to the prescribed regimen; especially immunosuppressive drugs is associated with high risk of kidney transplant failure. Adherence to medication is a crucial part of patient care and indispensable for reaching clinical goals (2).

In order to have a common understanding lets define medication adherence in a way universally accepted term. As WHO defined adherence as;

“Adherence is defined as the extent to which a person's behavior – taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider.”(7)

Poor adherence to treatment of chronic diseases is a worldwide problem of striking magnitude, with adherence level of 50% to 78% in HICs, the rate is even lower in the LMICs (7). It is undeniable that many patients experience difficulty in following treatment instructions and recommendations. On top of that, transplant recipients' medication regimens are exceedingly complex and dynamic, involving frequent physician visits, laboratory tests, and lifestyle and

dietary modifications (6). According to research done in US on medication understanding and adherence in KT patients, most patients take on average of 10 medications per person. Among them nearly one-third had frequent medication changes. Most of the patients knew the indication of all their medications, both immunosuppressive (IS) and non-immunosuppressive(non-IS) medication. Among them around one third of patients self-reported as non-adherent (6).

And a study done in Asia, Iran, medication non-adherence to immunosuppressive medication is 54.5%. About 19.5% of the non-adherent participants did not take their prescribed medication at least once during the past 4 weeks. About 10.5% of patients forgot to take several continuous doses of their immunosuppressive medications at least one time during the past 4 weeks. And, 40% of the non-adherent participants had taken their immunosuppressive medications with a 2-hr delay from the exact consumption time at least one time during the past 4 weeks. Finally, 11% of these patients reduced their immunosuppressive medications at least one time during the previous 4 weeks (11). Medication adherence in Slovak post kidney transplant patients is fully adherent by 67.4% (12).

There is limited study done about kidney transplant medication adherence level or kidney transplant in general in African countries including Ethiopia, because there are few countries with kidney transplant centers in the region. But studies show medication adherence is lower in chronic medical conditions like Diabetes Mellitus, Chronic kidney disease, Hypertension and the likes. A study done in Tikur Anbessa Hospital about medication adherence in CKD patients is 61%. Forgetfulness with a rate of non-adherence 78%, low income 6 times less adherent and complexity of prescribed drugs are associated with medication non-adherence by 54/% (1).

In addition to adherence to medication prescribed, follow up adherence to medical appointment is very important in improving graft survival and health outcome. As the American journal of nephrology reported that appointment non-adherence is a significant and independent predictor of negative outcome beyond medication non-adherence (13). This is particularly significant as the domains of requisite adherence for kidney transplant patients have not been clearly delineated, and certainly the minimum requisite compliance for prevention of deleterious consequences has not been determined (13).

2.2 Medication and follow up adherence and health outcome

Medication non-adherence is associated with higher rate of post-transplant hospitalization, costly and life-threatening complication and graft rejection(6). About 33–69% of hospital admissions are related to non-adherence(1) (4).

In a standard setup and resources available countries, long term graft survival for kidney transplant patients is around 95% with a slight decrement in subsequent years(14) (15). According to WHO 2017 report, the 1year graft survival ranges at its best 99% to worst 82%. And most countries have a range between 90 to 94%.

Poor adherence was associated with higher risk of graft loss and mortality over 12 years. Female sex, higher education, higher perceived side effects of corticosteroids, better perceived cardiac and renal function and higher perceived family social support in the first year post transplantation were associated with full adherence to immunosuppressive treatment (12).

Appointment and medication non-adherence were highly correlated and both were significant independent predictors of graft outcomes. Those with appointment non-adherence had 1.5 times the risk of acute rejection and a 65% higher risk of graft loss. There was a significant interaction between appointment and medication non-adherence; those with appointment and medication non-adherence were at very high risk of graft loss, compared to those with only appointment non-adherence or only medication non-adherence (5).

Developing countries have poor outcomes as compared to developed countries for many different reasons, some of which are low priority placed on renal replacement therapy, shortages of nephrologists and transplant centers, discontinuing immunosuppression due to high costs (9). The management of patients with kidney transplant in most African countries like, is very low due to many financial, intellectual and infrastructural challenges however the outcome is relatively good and comparatively better than other existing renal replacement therapy (RRT) (3). However, short term KT outcome is comparable to that of the developed countries(3) (9). There is also no significant racial difference in their outcome status (15)(14). A study done in Ethiopia at St. Paul hospital millennium medical college; the first and only national kidney transplant center, one-year death censored graft survival was 97.9%. And the Graft survival and graft function is also comparable to developed countries (4).

Despite causing a significant number of preventable mortalities, lower quality of life, poor health outcomes and health related costs, medication adherence remains a challenge for health care professional and scientists, as their efforts to improve and explain patients' adherence appear to be ineffective(16)(7). Medication non adherence for patients with chronic conditions remains an unmet challenge to health care practitioners. If it were possible to improve medication adherence by a simple but costly one-time billable procedure, such as implanting an adherence stimulator, there would be a rush to adopt this practice, but this is not the case (17).

2.3. Medication adherence measurements

Generally, measurements of medication adherence are categorized by the WHO as subjective and objective measurements. And it can also be classified as direct and indirect methods(7). Some of the methods are for example: direct measures, measures involving secondary database analysis, measures involving electronic medication packaging (EMP) devices, pill count and measures involving clinician assessments and self-report (17).

Regardless, an ideal medication adherence measure should present low cost and be user friendly, easy to carry out, highly reliable, flexible, and practical. However, there is no single measure that can meet all these gold standards since each has its own drawbacks as described above. In a broad sense, subjective and objective measures are preferred in clinical and research settings, respectively, mainly due to cost effectiveness ratios(7) (18).

However, self-report and healthcare professional assessments/ observations are the most common tools used to rate adherence to medication (7)(18). Self-report questionnaires, which have a reasonable predictive power, are more useful in a busy, resource-limited clinical setting with moderate to high literacy population, self-reports can significantly predict clinical outcomes and produce actionable information for patients and providers. They are also cheaper, noninvasive and easier to administer compared with other methods(18). Patient's interview by clinicians is preferred for low literacy population or acts as an adjunct where patients have already been predicted as low medication adherers (7)(18). With these methods, the most common drawback is that patients tend to under report non adherence to avoid disapproval from their healthcare providers as a result they tend to overestimate adherence behavior compared with other methods (18).

Self-reports include measures such as patient-kept diaries, patient interviews and questionnaires and scales (18). Some examples of self-report questionnaires and scales for general use include: Adherence Estimator, Adherence to Refills and Medication Scale (ARMS), Brief Medication Questionnaire (BMQ), Medical Outcomes Study (MOS), Medication Adherence Scale (MAS), Medication Management Instrument for Deficiencies in the Elderly (MedMaIDE), Medical Adherence Measure, Morisky Adherence Questionnaire four item (MAQ) and the Morisky Adherence Questionnaire eight item (MAQ) (7)(17)(18)(19)(20).

There are challenges in measurement of the adherence construct even when more objective methods are used (7). The WHO report stated the challenges for medication adherence measurement includes Pill counting, medication knowledge, cost of medication event monitoring systems (MEMS) and others. The MAQ 8item has a sensitivity of 93% and specificity of 53%, measures the psychometric properties of adherence among patients (19)(21). According to the WHO, standardized multi-item scales such as simplified medication adherence questionnaire (SMAQ), that assess specific behaviors relating to medication recommendations may be better predictors of adherence than simple yes/no responses. (7) The SMAQ questionnaire was developed from the modification of the Morisky-Green questionnaire, 4- item, to measure adherence to antiretroviral treatment in patients with acquired immune deficiency syndrome (AIDS). This questionnaire consists of six-item questions that evaluate different aspects of patient compliance to treatment: forgetfulness, routine, adverse effects, and a quantification of omissions. A study done in Spain in kidney transplant patient about medication adherence, SMAQ was used and adherence was classified as non-compliant if he/she responds to any of the questions with a non-adherence answer, and in terms of quantification, if the patient has lost more than two doses during the last week or has not taken medication during more than two complete days during the last three months. (22) And for adherence measure specifically for immunosuppression medication, the modified self-report assessment measurement questionnaire like Basel assessment of adherence to immunosuppressive medication scale (BAASIS) and transplant effect questionnaire (TxEQ) are the available measurement scales. (11)(23)(24) The BAASIS consists of a four-item questionnaire measuring NA to immunosuppressive over the past four weeks period, and it assesses the crucial dimensions of drug-taking non-adherence (omission of single doses), drug holidays (omission of successive doses), timing non-adherence (timing deviations > 2 h) and dose reductions. Responses are given on a six-point Likert scale: never (0), once per month (1), every second week (2), every

week (3), more than once per week (4), and every day (5). Patients with any deviation, namely an answer different from “never” in any of the four questions, are considered as non-adherent.(25) Adherence to medical follow up for chronic diseases is around 58% in the western countries(26). Those with appointment non-adherence was associated with 1.5 times increased risk of graft rejection(5).

2.4. Factors associated with medication adherence in kidney transplant patients

Non-adherence is a challenge in all diseases; it is independent of the type of drug and whether the therapy is chronic or acute. Non-adherence is a multifaceted concept; the focus may be not only on taking drugs but also on timing and not only on discontinuation but also on persistence. Medication adherence is influenced by a number of different factors like patient perceived importance of their medication, ease of access to health facility, medication costs, wait times at pharmacy, time since transplant and presence of social/family support (2)(7). It is related not only to individual’s behavioral factors, but also to the disease itself, complexity and duration of the treatment and possible adverse drug reactions. Moreover, adherence is also affected by patient–provider relationship and/or systemic and organizational factors associated with the health care system (20).

According to the WHO, these determinants of non-adherence can be aggregated into five dimensions: social and economic, health system related, therapy related, condition related, and patient related (7). A meta-analysis of 46 studies identified poor social support, self-reported health, and nonwhite ethnicity as risk factors for medication non-adherence. However, further mechanisms such as medication knowledge (e.g., knowing the indication of their medications), dosing frequency, medication changes, and medication regimen complexity have not been investigated as risk factors for unintentional non-adherence (6).

From the multi factorial etiology of non-adherence, the American journal of nephrology states the strongest risk factors including past non-adherence and being an adolescent or young adult. Risk factors with smaller but consistently important effects include minority race/ethnicity, poor social supports, and poor perceived health (8).

A study in Iran shows on factors and barriers for non-adherence to medication are medication complexity, forgetfulness and knowledge about the prescribed medication as 72%, 87% and 83% respectively (11). Other factors emerging as important in recent studies include cognitive elements,

such as forgetting; treatment-related features, such as regimen complexity; condition-related factors, such as receipt of a living donor transplant and perceiving one's health to be better; and health care system factors, such as insurance coverage and copayments (6)(7)(8).

The first few months since transplant and limited health literacy are also associated with higher odds of medication non-adherence. In transplantation, where medication regimens are very complex and patients may have significant comorbidities, interventions to address literacy disparities could result in lower non-adherence(6). Health literacy is associated with poor medication adherence in kidney transplant recipient after successful graft function. Non-adherence rate is 14% more higher in those with limited health literacy(23). A significant and recurring barrier to transplantation and medication adherence in Africa region is high cost of transplantation and follow up care specially cost of immunosuppressive therapy for maintenance. Funding for dialysis versus transplantation is still a debate (10).

In Ethiopia, study done in CKD patients the factors associated with medication non-adherence forgetfulness with a rate of non-adherence 78%, low income 6 times less adherent and complexity of prescribed drugs are associated with medication non-adherence by 54/% (1).

Some examples of the determinants of non-adherence to medical plans aggregated into five dimensions as described in the conceptual framework, which is adopted from WHO, figure 1.

2.5. Conceptual framework



Figure 1: CONCEPTUAL FRAMEWORK OF MEDICATION AND FOLLOW UP ADHERENCE AND RELATED FACTORS. (ADOPTED FROM WHO)

3. OBJECTIVE

3.1. General objective

- To assess the magnitude of post kidney transplantation medication adherence and identify the associated factors among post kidney transplant patients in St. Paul Hospital Addis Ababa, Ethiopia, from October 12th, to January 4th, 2022.

3.2. Specific objective

- To estimate the magnitude post kidney transplantation medication adherence among post kidney transplant patients following at St. Paul's hospital, AA, Ethiopia, from October 12th, 2021 to January 4th, 2022.
- To identify the factors that are associated with medication adherence among post kidney transplant patients at St. Paul's hospital, AA, Ethiopia from October 12th, 2021 to January 4th, 2022.

4. METHODS AND MATERIALS

4.1. Study area and period

The study was conducted in SPHMMC National kidney transplant center, Addis Ababa, Ethiopia. SPHMMC is located in Gulele sub-city, Addis Ababa which is the capital of Ethiopia. The renal transplant unit of SPHMMC is the first and the only kidney transplant service available in the country. It was established in 2013 by the collaboration of the FMOH with University of Michigan by a multidisciplinary team. It has started its first transplant since 2015 and so far there are around 148 kidney transplants has been done for CKD and ESRD patients in the unit. It gives clinical follow service for indigenous KT patients and for those whom are transplanted outside of the country(abroad). According to the medical record, it had a total of 400 post KT patients following their medical care at the center since the service started. The study was conducted from October 12th, 2021 to January 4th, 2022.

4.2. Study Design

A hospital based cross sectional study was done in patients who have received kidney transplantation service at SPHMMC renal transplant unit and abroad and had a clinical follow up at SPHMMC renal transplant unit during the study period.

4.3. Population of the study

4.3.1. Source population

All CKD and ESRD patients who have undergone kidney transplant either in SPHMMC Renal transplant unit or abroad. According to the Renal transplant unit registration and report of kidney transplant there are 148 patients who have KT service. And there are also 252 post KT patients whom received the service abroad and have their clinical follow up at the renal transplant clinic. Even though, a total of 400 post KT patients had started their clinical follow up at the clinic since the service established, some had discontinued their follow up through time. According to the current renal unit medical registration, there are 296 patients who are actively following in the transplant unit over the past 3-months period.

4.3.2. Study Population

All post KT patients who have undergone kidney transplant in SPHMMC Renal transplant unit or abroad and full fill the inclusion criteria during the study period.

4.3.3. Eligibility criteria

4.3.3.1. Inclusion criteria

- All post kidney transplant patients, who have undergone kidney transplant either in SPHMMC Renal transplant unit or abroad, and whom are following at SPHMMC renal transplant unit and are willing to participate.

4.3.3.2. Exclusion criteria

- Patients who have undergone kidney transplant in SPHMMC Renal transplant unit and abroad with follow up at SPHMMC renal transplant unit but are critically ill.
- Patients who have undergone kidney transplant in SPHMMC Renal transplant unit and abroad with follow up at SPHMMC renal transplant unit but are not willing to participate in the study or inaccessible.
- Patients who have undergone kidney transplant in SPHMMC Renal transplant unit and abroad with follow up at SPHMMC renal transplant unit but are under the age of 18 years.
- Patients with failed kidney transplant or whom are already diagnosed as transplant rejected and are on dialysis.

4.4. Sample size determination and sampling procedure

The renal transplant unit of SPHMMC has only been giving kidney transplant service for the past six years since it was established. And there are only 148 number of kidney recipient patients according to the renal unit medical registration. And including the 252 post KT patients who had the transplantation outside the country and had started their follow at the renal transplant unit since it has started its service, making it a total of 400 patients.

Because of their small, well defined and unique character of source population, purposive sampling method was used for the study. Because the size of source population is manageable, a total

population sampling of all eligible patients who had their clinical follow up at the SPHMMC renal transplant unit during the study period was taken as a sample or were included in the study. Therefore, all CKD and ESRD patients who have undergone kidney transplant following at the in SPHMMC at renal transplant clinic and fulfill the inclusion criteria was taken as a sample. Among those, there are patients who were lost from follow up, diseased, and transplant rejected and were on dialysis. Excluding these patients, this made the study population or the sample size down to 296 kidney transplant patients.

And regarding sampling procedure, data was collected while patients came for their clinical follow up. The duration of appointment was different for each patients depending on the time of transplant done and their clinical condition; which was ranging from twice a week to every three-month period. Accordingly, 270 of the patients were accessed and responded with data collection period of two and half months from October 12th, 2021 to January 4th, 2022.

4.5. Study variable

4.5.1. Dependent variables

- Medication adherence in post kidney transplant Patients.

4.5.2. Independent variables (five WHO dimensions)

A. Social and economic:

- Cost (treatment cost, transportation cost): occupation or income source.
- Sociodemographic variable: age, sex, educational background and marital status.

B. Health system related: patient to health care provider interaction, and health care provider follow up and multiple health care provider.

C. Condition related: these are characteristics of the disease, disease condition/severity and patient related health literacy:

D. Patient perceived importance of medication, cognitive functioning, self-care motivation and social support

E. Therapy related: Multiple medication, Complexity of therapy and Adverse drug reactions, and duration of therapy.

4.6. Operational and Terms of Definitions

Immunosuppressive medication: medications that are prescribed for the purpose of preventing graft rejection in the kidney transplantation.

Adherence: the extent to which a person's behavior in taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider.

Adherent/ compliant: if he/she responds to all of the questions with adherent answer and in terms of quantification, if the patient has responded with adherent answer in the forgetfulness, routine, adverse effect and quantifying assessment questions by using a SMAQ questionnaire score.(22)

Non-adherent/non-compliant: if he/she responds to any of the questions with a non-adherence answer, and in terms of quantification, if the patient has lost more than two doses during the last week or has not taken medication during more than two complete days during the last three months by SMAQ questionnaire score.(22)

4.7. Data Collection tools and procedures

4.7.1. Data collection tool

There are different assessment tools for medication adherence, subjective and objective or direct and indirect methods. For the reason of the busy set up, resource-limited clinical setting with low to high literacy population, self-reports adherence can significantly predict clinical outcomes and produce actionable information for patients and health care providers. They are also cheaper, noninvasive and easier to administer compared with other methods [3]. It will be delivered as self-administered questionnaire or health care provider assisted questionnaire filling.

Structured questionnaire was used by adopting and modifying the simplified medication adherence questionnaire (SMAQ) 6 item for medication adherence measurement as a data collection method. And for the specific immunosuppressive medications the Basel assessment of adherence to immunosuppressive medication scale (BAASIS) questionnaire was used as data collection method. The questionnaire was prepared in simple English and translated into local language, Amharic, which was understandable to participants and the trained data collectors.

4.7.2. Data collection procedure

Along with each questionnaire a consent form was attached for each participant and it was signed by all willing participants. Confidentiality was maintained by making the questionnaire anonymous and the data was kept in a secure place and gathered carefully. And questionnaire filling place was as comfortable as possible.

On the 8th of October 2021, the questionnaire was tested with 10 participants prior to data collection period and all the necessary modification was done after that. Then the actual data collection was done from October 12th, 2021 to January 4th, 2022. The final draft of the questionnaire used is in the annex 2.

4.8. Data quality management

In order to assure the quality of data provided from the questionnaires, data collectors preferably were selected from the health care providers (two general practitioners), then trained and supervised on the data collection procedure and had a common understanding about the content of the questionnaire. Along with the data collection, data cleaning and management was done simultaneously by the principal investigator. And data consistency and completeness was checked before data encoding and analysis. Data entry was done by Epi info 7 software and analysis was done by SPSS version 26 to improve and assure the quality of data.

4.9. Data processing and analysis

The collected data was processed and cleaned concomitantly with the data collection till the end of January 9th, 2022. The collected data was coded and entered in to an Epiinfo version 7.2.4.0 simultaneously then cleaned, stored and exported to SPSS version 26 software. Again variables were recoded and recategorized and finally, analysis was done by SPSS version 26 software and interpretation of the analyzed result was done. The prevalence of medication adherence was scored with Simplified Medication Adherence questionnaire (SMAQ) used. According to SMAQ scale, non-adherence was classified as non-complaint/non-adherent if he/she responds to any of the questions with non-adherence answer, and in terms of quantification, if the patient has missed more than two doses during the last week or has not taken medication in more than two complete days in the past three months. That means if Patients with any deviation, namely an answer different from “never” in any of the four questions, and in terms of quantification if the patient has

lost more than two doses during last week or has not taken medication more than two complete days during the last three months were considered/ scored as non-adherent, if not, then scored as adherent. (22) The magnitude of adherence was calculated using the SMAQ scale scoring of each patient. And regarding immunosuppressant medications specific questionnaire, BAASIS was used as a tool for adherence measurement. The BAASIS consists of a four-item questionnaire measuring non-adherence to immunosuppressive over the past four weeks period, and it assesses the crucial dimensions of drug-taking non-adherence (omission of single doses), drug holidays (omission of successive doses), timing non-adherence (timing deviations > 2 h) and dose reductions. Responses are given on a six-point Likert scale: never (0), once per month (1), every second week (2), every week (3), more than once per week (4), and every day (5). Patients with any deviation, namely an answer different from “never” in any of the four questions, are considered as non-adherent if not, scored as adherent.(25) However, the medication adherence level measurement was used by SMAQ in the rest of the analysis. It is standardized multi-item scales that assess specific behaviors relating to medication recommendations may be better predictors of adherence than simple yes/no responses(WHO).

Categorical covariates were summarized using frequencies and percentages; and numerical variables were summarized with mean and median value. After the variables were recoded and re-categorized, a chi-square test was run to compare the underlying characteristics of the patients based on adherence status of the patients (using SMAQ scale) to identify the frequencies of the determinant variables with their adherence level.

Then by using binary logistic regression analysis, different factors were analyzed for medication adherence by SMAQ scale. First with bi-variate analysis measuring association between the dependent variable and each independent variable with a statistical significance of 25% were identified. Then, the identified independent variables with $P < 0.25$ were considered for fitting into multivariate analysis. Subsequently, for possible confounding, each of the independent variables were analyzed with adjusted odds ratio and 95% confidence interval to measure effect size of each independent variables by using backward logistic regression model. Finally, a statistical significance was declared by a p-value of < 0.05 for significant association measure. The goodness of model fit test was done by Hosmer and Lemeshow test of $p\text{-value} > 0.05$. At last, multicollinearity of the independent variables was tested by linear regression model with possible

association/dependence with each other with a cut off value of tolerance > 0.2 and variance of inflation factor < 5 .

Finally, Discussion of the findings and conclusions with possible interventional tools and recommendation was done.

4.10. Ethical Consideration

The proposal was submitted to SPHMMC school of public health. Ethical clearance and official letter was obtained from the institutional review board of SPHMMC for ethical approval and permission. After explanation about the whole purpose of the study, written consent was obtained from study participants. All of the study participants was informed about the purpose of the study, about their right to participate or to terminate at any time if they want and also respondents were ensured about the confidentiality of information obtained. The written consent form in English and Amharic is found in the ANNEX 1.

5. Result

5.1. Socio-demographic characteristics

From 296 patients who were still following at the renal transplant center, information was collected from 270 patients making the response rate 91.5%. The median age of the patients was 37 (IQR, 28-45) years. More than two-third of the patients 193(71.5%) were males. Most 137 (50.7%) of the patients were educated having a first degree and above. Most, 178(65.9%), of the patients were married. More than half 137(50.7%) had education of first degree and above. The summary of the frequency and chi-square test result is below in table 1.

Table 1: Sociodemographic characteristics of post kidney transplant patients in (n=270) SPHMMC, AA, Ethiopia, 2022.

Variable		Frequency(n)	Percentage(%)
Age group	≤30	90	33.3
	31-45	114	42.2
	>45	65	24.2
Sex	Male	193	71.5
	Female	77	28.5
Educational background	Primary school	21	7.8
	Secondary school	89	33.0
	Certificate and diploma	23	8.5
	First degree and above	137	50.7
Marital status	Single	90	33.3
	Married	178	65.9
	Widowed	2	0.7
Religion	Orthodox Christian	183	67.8
	Muslim	59	21.9
	Protestant	27	10.0
	Other	1	0.4
Occupation	Governmental employee	66	24.4
	Non-governmental employee	30	11.1
	Private business	118	43.7
	No job	56	20.7

5.2. Patient and treatment related characteristics of post kidney transplant patients.

The median duration of illness started was 5.6 (IQR=3.4-7.2) years; and the duration after transplant was 3.1 (IQR=1.2-5.0) years. However, the respondent's minimum duration after transplant was 1 month and the maximum duration was 18 years (Range=17.92 years).

Most patients grade the renal transplant service and interactions with their health care provider as very good with 94.8% and 95.9% respectively. Even though the majority 258(95.6%) of the patients were not cared by the same doctor in each of their visits, in 242(89.6%) of them responded it didn't affect their attitude towards medication and follow up adherence. Almost all 269(99.6%) of the patients had detailed explanations given by the health care provider about their medication and 268(98.5%) of them responded that they had the knowledge too. The average number of drugs taken by the patients was 5.21 (SD±1.81) drugs with minimum of 2 drugs and a maximum of 11 drugs and almost all 268(99.3%) were taken twice per day. The most frequent answer given for reason for non-adherence was forgetfulness 164(60.7%), followed by drug unavailability 60(22.2%). The summary of the disease, treatment, patient and health setup characteristics result is in table 2 below.

Table 2: Disease, patient, treatment and health setup related characteristics of post kidney transplant patients (n=270) in SPHMMC, AA, Ethiopia, 2022.

Variable		Mean($\pm$ SD) in years	Median(IQR) in years
Duration after transplant			3.1(1.2-5.0)
Number of drugs		5.2(1.8)	
		Frequency(n)	Percentage(%)
Duration after transplant	$\leq$ one-year	64	23.7
	>1 - 2.5 years	39	14.4
	<2.5 – 5 years	113	41.9
	>5 years	54	20
Service given	Good	5	1.9
	Very good	256	94.8
	Excellent	9	3.3
Interaction between patient and HCP	Good	2	0.7
	Very good	259	95.9
	Excellent	9	3.3
Encounter the same HCP always	Yes	258	95.6
	No	12	4.4
Having different HCP in each visit affects MA	Yes	28	10.4
	No	242	89.2
Does HCP explain the medication in details	Yes	269	99.6
	No	1	0.4
Physical limitation	Yes	8	3.0
	No	262	97.0
Time to seek care During illness	Within a day	206	76.3
	2-5 days	64	23.7
Have Social support	Yes	267	98.9
	No	3	1.1
Follow up importance	Yes	268	99.6
	No	1	0.4
Did you ever Miss follow up?	Never	146	54.1
	one time	47	17.4
	two times	41	15.2
	> two times	36	13.3
Medication prescribed importance	Importance	159	58.9
	Very importance	111	41.1
Have Knowledge about your medication	Yes	266	98.5
	No	4	1.5

Reason for non-adherence	Drug Unavailability	60	22.2
	Drug adverse effects	21	7.8
	Financial shortage	17	6.3
	Forgetfulness	164	60.7
	Other	8	3.0

5.2. Prevalence of Medication Adherence among Post Kidney Transplant patients

Among 270 participants, 221(81.9%) were found to be adherent (with CI= 0.767,0.863) by using SMAQ adherence measurement scale with six questionnaire tools, as summarized in the table for each specific answer frequency. Based on BAASIS measurement tool, which is specifically designed for immunosuppressant medication adherence measurement, about 208(77.0%) were adherent to their immunosuppressant medication (with CI= 0.816,919). All patients had a response of that immunosuppressant medications are essential or important. Most 164(60.7%) of the patients think forgetfulness is the reason for medication non-adherence. Again the specific SMAQ and BAASIS measurement is summarized in figure 1 and table 2 below.

Figure 2: Measured adherence level by the SMAQ and BAASIS measuring tools, among post kidney transplant patients in SPHMMC, AA, Ethiopia, 2022.

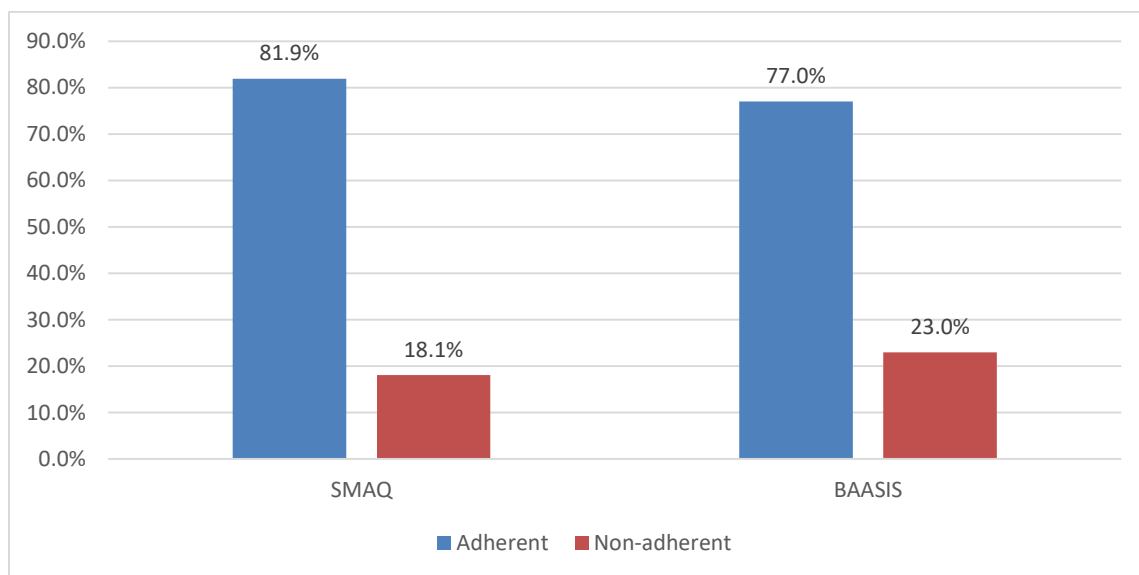


Table 3: Medication adherence level measurement in post kidney transplant patients using simplified medication adherence questionnaire (SMAQ) and Basel adherence assessment scale in immunosuppressant (BAASIS).

Variables		Category	N(%)	Adherence score	Adherence N(%)	NA N(%)
SMAQ	Do you always take your medication at the appropriate time?	Yes	221(81.9%)	A	221 (81.9%)	49 (18.1%)
		No	49(18.1%)	NA		
	When you feel worse/bad, have you ever discontinued taking your medication?	Yes	11(4.1%)	NA		
		No	259(95.9%)	A		
	Do you ever forget to take your medication?	Yes	179(66.3%)	NA		
		No	91(33.7%)	A		
	Did you not take any of your medicine over the past weekend?	Yes	37(13.7%)	NA		
		No	233(86.3%)	A		
	Thinking about the last week. How MANY TIMES did you fail to take your prescribed dose?	Never	231(85.6%)	A		
		1-2 times	32(11.9%)	A		
		> 2 times	7(2.6%)	N		
	Over the past 3 months or since your last visit (appointment), how many days have you not taken any medicine at all?	Never	96(35.6%)	A		
		1-2 times	127(47%)	A		
		>2 times	47(17.4%)	NA		
BAASIS	In the previous 4 weeks, how often have you forgot to take your immunosuppressant?	Never	246(91.1%)	A	208 (77.0%)	62 (23.0%)
		Once per month	22(8.1%)	NA		

		Once per two weeks	2(0.7%)	NA		
	In the previous 4 weeks, how often have you forgot to take several consecutive dose of your immunosuppressant medications?	Never	264(97.8%)	A		
		Once per month	6(2.2%)	NA		
	In the previous 4 weeks, how often have you made at least 2 hrs. delay in immunosuppressant intake?	Never	224(83.0%)	A		
		Once per month	35(12.9%)	NA		
		Once per two weeks	6(2.6%)	NA		
		Every week	3(1.1%)	NA		
		More than once per week	2(0.7%)	NA		
	In the previous 4 weeks, how many times did you reduce the dose of your medication?	Never	270(100%)	A		
		Once per month	0(0)	NA		

Note: A, Adherent; NA, Non-adherent

5.3. The associated factors that affect medication adherence in post kidney transplant patients.

The study shows that medication adherence was 81.9% with a 95% CI (0.767,0.863), by binary logistic regression model bi-variate analysis was used to identify the association between adherence with the candidate variables. With a level of significance below 25% for crude odds ratio analysis, the identified significant variables were: Age, marital status, duration after transplant, missed follow up and forgetfulness was associated with medication adherence. Age group above 45years had a lower medication adherence level by 67.4% (with COR= 0.326, p-value =0.12) as compared to age 37 years and below. Based on the duration of years after transplant, as the duration increases; the level of adherence decreased by 13.3% with a statistical significance (COR=0.867, p-values=0.006). The duration after transplant above five years had 93.5% less adherence level as compared to one-year and below duration after transplant years (COR= 0.065, p-value <0.0001). Missed follow up was also found to be significant factor from bi-variate analysis; those who missed follow ups more than two times were associated with 90.8% decreased adherence level as compared to those who never missed follow up visits (COR= 0.092, p-value <0.0001). There were different reasons responded by the patients for decreased medication adherence, forgetfulness was associated with decreased level of adherence by 90.7% as opposed to drug unavailability response given by the patients (COR= 0.103, p-value=0.002).

Multicollinearity was tested with linear regression model among the above independent variables and there was no collinearity or dependency detected among the independent variables from one to another with cut off value off tolerance >0.2 and VIF <5. All the explanatory variables had a VIF < 5 level.

Then a multivariable binary logistic regression was done to refine the associated factors from possible confounders among the predictor variables with p-value<0.25 level of significance in the bi-variate analysis. By using backward logistic regression model at a 5% level of significance, missing follow up, duration after transplant and forgetfulness were found to have a significant association with medication adherence. Accordingly, after adjusting for other covariates, those patients who had missed follow up visits one times had the odds of 69.9% decreased level of medication adherence as compared to who never missed follow up (AOR=0.301, a 95% CI= 0.10-0.90, p-value=0.032). And those patients who had missed follow up visits two times had the odds

of 82.4% decreased level of medication adherence as compared to who never missed follow up (AOR=0.176, 95% CI=0.06-0.513, p-value=0.001); and similarly, those patients who had missed follow up visits more than two times had the odds of 91.2% decreased level of medication adherence as compared to who never missed follow up (AOR=0.088, 95% CI=0.28-0.278, p-value<0.0001). Concomitantly, those who had duration after transplant above five years had 92.6% less adherence as compared to those with duration after transplant one year and below (AOR=0.074, 95% CI=0.007-0.780, p-value=0.031). Similarly, forgetfulness was associated with an odds of 89.6% decreased medication adherence level as compared to other reasons provided for lowered adherence (AOR=0.104, 95% CI= 0.021-0.523, p-value=0.006). But the other factors age, duration after transplant and marital condition which had an association with the crude odds ratio, didn't show a significant association with medication adherence when analyzed by multivariate analysis. The detailed summary of the logistic regression is in table 3 below.

Table 4: Bivariate and multivariable analysis of factors associated with medication adherence among post kidney transplant patients (n=270) in SPHMMC, AA, Ethiopia, 2022.

Variables		Adherence		COR (95%, CI)	AOR (95%, CI)	p-value
		A(n)	NA(n)	Bivariate	Multivariable	
Age				0.967(0.95-0.997)	1.05(0.96-1.14)	0.28
Age group	≤ 30 years	80	10	1(0)	1(0)	
	31 – 45 years	94	20	0.588(0.26-1.33)	0.442(0.109-1.78)	0.251
	> 45 years	47	18	0.333(0.14-0.77)	0.19(0.016-2.22)	0.185
Marital status	Unmarried	82	10	1(0)	1(0)	
	Married	139	39	0.435(0.21-0.92)	0.682(0.22-2.07)	0.499
Duration after transplant				0.867(0.78-0.96)	1.17(0.918-1.50)	0.201
Duration after transplant category	<= 1 year	62	2	1(0)	1(0)	
	1 – 2 ½ years	29	10	0.094(0.019-0.455)	0.303(0.048-1.902)	0.203
	2 ½ – 5years	94	19	0.16(0.036-0.709)	0.367(0.057-2.38)	0.293
	> 5years	36	18	0.065(0.014-0.294)	0.074(0.007-0.78)	0.031*
Missed follow up	Never	136	10	1 (0)	1(0)	
	Missed 1 times	37	10	0.272(0.105-0.703)	0.301(0.10-0.90)	0.032*
	Missed 2 times	28	13	0.158(0.062-0.397)	0.176(0.06-0.513)	0.001*
	Missed above 2 times	20	16	0.092(0.037-0.23)	0.088(0.028-0.278)	<0.0001*
Reason for adherence	Drug unavailability	58	2	1(0)	1(0)	
	Drug adverse effect	20	1	0.69(0.06-8.0)	0.87(0.064-11.74)	0.917
	Financial shortage	13	4	0.112(0.019-0.679)	0.175(.024-1.28)	0.086
	Forgetfulness	123	41	0.103(0.024-0.442)	0.104(0.021-0.523)	0.006*
	Other reason	7	1	0.241(0.019-3.02)	0.85(0.058-12.36)	0.905

Note: A; Adherent, NA, Non-adherent; COR: Crude Odds ratio; AOR: Adjusted Odds ratio; CI: Confidence interval; * statistically significant

6. Discussion

Based on the finding from Renal Transplant Unit in Saint Paul Hospital Millennium Medical College, on the prevalence of medication adherence among kidney transplant recipients and the associated factors. The prevalence of medication adherence among post kidney transplant patients was 81.9%. The factors associated with medication adherence were missing follow up, above five years of duration after transplant and forgetfulness.

According to SMAQ scale, the prevalence of medication adherence among the kidney transplant population was found to be 81.9%. This proportion is high as compared from previous study done on chronic medication adherence at Tikur Anbessa Hospital (1). And despite all the shortages in the country for kidney transplant service, immunosuppressant medication, investigation modality, limited skilled professionals, adherence at St. Paul's hospital was higher than from the WHO stated adherence level and other studies. (1,7,11,12) This could be explained by the continuous health education program given for the patients by the health care providers at induction of treatment. In addition, the scarcity of resources for transplant service forces patients to be adherent; and it is a matter of life and death because the alternative is transplant rejection which is an unacceptable option for most patients due to many limitations.

After a multivariable binary logistic regression model was used at 95% CI and 5% level of significance, and there was a significant association identified with decreased adherence and duration after transplant above five years, missed follow up visits and forgetfulness. All the other factors found to be not significant in the multivariable analysis. Missing follow up had a strong association with decreased medication adherence level among kidney transplanted patients as compared to those who never missed follow up visits. Those who missed more than two times had higher, 91.2% less adherent as compared to those who missed two times, 82.4% and one time, 69.9% when they were compared with those who never missed follow up. This could be explained by that if patients had missed their follow up, it is more likely that they will finish their medication without refilling; and hence, will not fully adhere to their medication. This is also supported by other studies conducted in US. (5) Similarly, the duration after transplant was the other significant associated factor for adherence level; patients with duration after transplant above five years had 92.6% less adherent as compared to those with duration after transplant one year and below. The reason for problems of adherence were different among the patients; financial reason and drug

unavailability were the common ones in addition to forgetfulness. These factors were not found to be statistically significant. This can be explained by, as the duration after transplant was increasing so is the treatment intake years; therefore, patients tend to get fed up as time goes in the long run. The other important factor that determines medication adherence was being forgetfulness. The odds of being adherent in patients responded forgetfulness is lower than the other reasons provided by the patients like drug unavailability, financial shortage and drug adverse effects. That means, being forgetfulness was associated with 90.6% decreased medication adherence level as compared to the other reasons provided. This is supported by other studies done in US, Iraq, WHO and Ethiopia (1,6,7,8,11). There were other factors significantly associated with medication adherence in other studies like knowledge about medication, financial shortage, perceived health and others. But none of these factors were not significantly associated with adherence level in this study.

The strength of this study is that it has included most of the represented population which can be used for generalization. The limitation of this study was patients could have a recall bias due to the long duration of after transplant years, which may reveal a lower prevalence rate than the measured one. And also, the measurements have not been validated and reliability tests were not done for this particular setup.

7. Conclusion

In Ethiopia, the prevalence of medication adherence among kidney transplant patient was optimal. The factors that decreases adherence were missing follow up, above five years of duration after transplant and being forgetfulness. This suggests that in post kidney transplant patients in St. Paul's hospital, Ethiopia, despite all the limitations that the patients face the proportion of medication adherence was higher as compared to other international and domestic studies. The associated factors determined by the study were coherent with the factors identified from other studies.

8. Recommendations

The recommendation is to the researchers, to have another study to assess the validity and reliability of the two measurement (SMAQ and BAASIS) with repetitions of the data collection by different health care worker for intra-observer and inter-observer interview variation. And also to do cause and effect relationship by using a stronger study design based on this study finding.

And for health care provider, they should strictly follow medication adherence among patients. They should strengthen the health education that is being given; and persuade their patients to set a reminder or an alarm on their mobile and note pad about their medication intake time and follow up visits. The other recommendation for HCP is to count pills during follow up time to follow for missed dose, under dose or overdose. Patients with above five years post-transplant should be given special attention on the above recommendations.

For the institution, it should continuously and readily avail the medication and the investigation modalities like tacrolimus level. It should encourage and strengthen the service that is being given. To empower and build capacity of the HCP. It should build a system for regular messaging, tracking patients when they miss follow up and contacting them through their phone number.

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10. ANNEXES

Annex I: Consent Statement

This is questionnaire for the assessment of medication and follow up adherence and associated factors in kidney transplant patients at SPHMMC renal transplant unit to be answered.

This questionnaire has sociodemographic part, economic related, customer related, treatment related, health system related and disease condition related factors. Your participation will be helping you, the community and the organization towards better care in the future. Your name is not written in this form and never be used in connection with any information you tell us.

All information given by you is being kept strictly confidential. Your participation is voluntary and you are not obligate to answer any question which you do not wish to answer. If you fill discomfort with this, please fill free to drop it any time you want. This may be taking about 5-10 minutes. are you willing to participate in the study? (If yes, tick and provide the questionnaire and if no, skip to the next participant)

Are you voluntary to participate in the study? Make a tick (√) on your choice.

Yes ☐

No ☐

Signature of the participant----- Date -----

Data collector's Name-----signature----- date-----

THANK YOU!!

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ANNEX II. Patients' questionnaire

Questionnaire for medication and follow up adherence and the associated factors.

Date _____ unit code _____

Instructions: read each questions carefully and please provide your genuine answer to the questions. If you have any question about the questionnaire, please do not hesitate to ask the data collector.

Part I: Sociodemographic and economic variable data.

1. Age

2. Sex

Male

Female

3. Level of education: (please circle your answer)

- i. Primary school
- ii. Secondary school
- iii. Diploma
- iv. First degree and above

4. Marital status: (please circle your answer)

- i. Married
- ii. Single
- iii. Widow
- iv. Divorced

5. Occupation/ source of income

- i. Governmental employee
- ii. Non-governmental employee
- iii. Private business

- iv. other, please specify,.....
- 6. Religion (please circle your answer)
 - i. Orthodox Christian
 - ii. Muslim
 - iii. Protestant Christian
 - iv. Catholic
 - v. Other specify:

PART II: HEALTH SYSTEM AND CONDITION RELATED FACTORS

- 2. How long has it been since your illness started before transplant:
- 3. How long has it been since your transplant done:
- 4. How would you describe the renal transplant unit service?
 - i. Excellent
 - ii. Very good
 - iii. Good
 - iv. Fair
 - v. Not good
- 5. How would you describe patient to health care provider interaction?
 - i. Excellent
 - ii. Very good
 - iii. Good
 - iv. Fair
 - v. Not good
- 6. Do you always encounter the same health care provider during follow up?
 - i. Yes
 - ii. No
- 7. if no, does that affect your attitude towards medication and follow up adherence?
 - i. Yes
 - ii. No
- 8. Does the health care provider ask and follow about your medication intake in details?
 - i. Yes

- ii. No

PART III: PATIENT AND TREATMENT RELATED FACTORS

1. Do you have any physical limitation that affects your day to day life? (please circle your answer)
 - A. Yes
 - B. No
2. How long does it take you to visit health facility when you are sick?
 - a. If symptom persists for more than a month
 - b. If symptom persists for more than two weeks
 - c. If symptom persists more than a week
 - d. Within 1 week of symptoms.
3. Is there a family member who support, encourage and care for you at times of sickness?
 - a. Yes, specify:
 - b. No
4. Do you think clinical appointments are important?
 - a. Yes
 - b. No
5. How many times did you missed your clinical follow up over the past one year?
 - a. Never
 - b. 1 times
 - c. 2 times
 - d. > 2 times
6. How many drugs are you taking?
7. How often is taken your prescribed medication?
 - a. 1 times per day
 - b. 2 times per day
 - c. 3 times per day
 - d. 4 times per day
 - e. More than 4 times per day
8. Do you know why your medications are prescribed?

- a. Yes
 - b. No
9. How would you describe your medications importance?
- a. Very important
 - b. Important
 - c. Less important
 - d. Unimportant
10. Do you ever forgetten to take your medication? (SMAQ 3)
- a. Yes
 - b. No
11. Do you always take your medication at the appropriate time? (SMAQ 1)
- a. Yes
 - b. No
12. When you feel worse/bad, have you ever discontinued taking your medication? (SMAQ 2)
- a. Yes
 - b. No
13. Thinking about the last week. How MANY TIMES did you fail to take your prescribed dose?
(SMAQ 5)
- a. Never
 - b. 1-2 times
 - c. 3-5 times
 - d. >5 times
14. Did you ever missed your medicine over the past weekend? (SMAQ 4)
- a. Yes
 - b. No
15. Over the past 3 months or since your last visit (appointment), how many days have you not taken
any medicine at all? (SMAQ 6)
- a. <= 2
 - b. > 2 days
 - c. No missed day
16. Have you ever experienced medication adverse effects?

- a. Yes
- b. No

PART IV: IMMUNOSUPPRESSIVE MEDICATION

1. In the previous 4 weeks, how often have you forgot to take your immunosuppressant?
 - a. Once per month
 - b. Once per 2 weeks
 - c. Every week
 - d. More than once per week
 - e. Every day
 - f. Never
2. In the previous 4 weeks, how often have you forgot to take several consecutive doses of your immunosuppressant?
 - a. Once per month
 - b. Once per 2 weeks
 - c. Every weeks
 - d. More than once per week
 - e. Every day
 - f. Never
3. In the previous 4 weeks, how often have you made at least 2 hrs. delay in immunosuppressant intake?
 - a. Once per month
 - b. Once per 2 weeks
 - c. Every week
 - d. More than once per week
 - e. Every day
 - f. Never
4. In the previous 4 weeks, have you reduced the dose of your immunosuppressant?
 - a. Once per month
 - b. Once per 2 weeks
 - c. Every week

- d. More than once per week
 - e. Every day never
 - i. Never
5. If what do you think could be the reason behind for medication non-adherence?
- a. Financial reason
 - b. Lack of social support
 - c. Health care provider not suitable
 - d. Health care service not suitable
 - e. Too many drugs to be taken
 - f. Medication adverse effect/ side effect
 - g. Forgetfulness
 - h. Drug unavailability
 - i. Other, specify

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Declaration

I, the undersigned declare that this thesis is my original work in partial fulfillment of the requirement for the degree of Master of Public Health. I also declare that it has never been presented in this or any other university and that all resources and materials in the thesis have been duly acknowledged.

Student name:

Signature:

Place of submission:

Date of submission:

This thesis has been submitted with my approval as a college/university advisor.

Advisor name:

Signature:

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