# Assessment of Adherence to Ocular Hypotensive Agents among Glaucoma Patients in Menelik II Referral Hospital, Addis Ababa, Ethiopia

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This is to certify that the thesis prepared by Tesfay Mehari, entitled *"Assessment of Adherence to Ocular Hypotensive Agents among Glaucoma Patients in Menelik II Referral Hospital, Addis Ababa, Ethiopia*" and submitted in partial fulfillment of the requirements for 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 Adherence to Ocular Hypotensive Agents among Glaucoma Patients in Menelik II Referral Hospital, Addis Ababa, Ethiopia: A prospective cross sectional study**

**Tesfay Mehari**

**Addis Ababa University, 2015**

Without good adherence and appropriate administration technique of hypotensive agents, an elevated intraocular pressure leads to progressive optic nerve degeneration and visual field deterioration. Investigations of adherence and administration technique are very crucial in glaucoma management. The purpose of this study was to assess adherence to ocular hypotensive agents among glaucoma patients in Menelik II Referral Hospital. A hospital-based prospective cross sectional study was conducted on359 patients. Eligible patients were interviewed and their medical charts were reviewed form June 1, 2015 to July 31, 2015 using a pretested structured questionnaire. The rates of adherence and appropriate administration technique were 42.6% and 17.3% respectively. Higher educational level, being self-employed and taking lesser frequency of pilocarpine were significantly associated with adherence while being a farmer, having very low monthly family income and self-purchasing of medications were significantly but inversely associated with adherence. Being a female, having advanced glaucoma and more frequent follow-uphad an important role in deciding appropriate administration technique. In contrary, patients with primary angle closure and open angle glaucoma, who had immediately administered their consecutive dose, had experienced side effect, and had low vision were significantly associated with inappropriate administration technique. Moreover, the odds of being adherent for patients who appropriately administered their medications were almost three-fold greater compared to those who did not administer adequately. In conclusion, both adherence and administration technique were sub-optimal and poor and tailored educational interventions according to the modifiable patient's and clinical characteristics are required.

**Key Words***: Adherence, Administration Technique, Ocular Hypotensive Agents, Glaucoma*

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## List of Abbreviations

| | | |
|---|---|---|
| AOR | ..... | Adjusted Odds Ratio |
| CI | ..... | Confidence Interval |
| COR | ..... | Crude Odds Ratio |
| EDAT | ..... | Eye Drop Administration Technique |
| ELC | ..... | Eye Lid Closure |
| ETB | ..... | Ethiopian Birr |
| IOP | ..... | Intraocular Pressure |
| M-II-RH | ..... | Menelik II Referral Hospital |
| MMAS | ..... | Morisky Medication Adherence Scale |
| NLO | ..... | Naso-Lacrimal Occlusion |
| OPD | ..... | Out-Patient Department |
| OR | ..... | Odds Ratio |
| SD | ..... | Standard Deviation |
| SPSS | ..... | Statistical Package for Social Sciences |
| WHO | ..... | World Health Organization |

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# 1. INTRODUCTION

## 1.1. Background

Glaucoma is a progressive optic neuropathy, often asymptomatic, caused by the death of the retinal ganglion cells and is currently the leading cause of irreversible blindness in the world (Katherine and Georgios, 2015; Tham *et al*., 2014).The medical management of glaucoma is lowering of intra-ocular pressure (IOP) using ocular hypotensive agents since IOP variation is an important predictor of glaucoma prognosis (Lee, 2007).

Different epidemiological estimates have been done which were important in guiding the designs of glaucoma screening, treatment, and related public health strategies. In 2013, the number of people (aged 40-80 years) with glaucoma worldwide was estimated to be 64.3 million and will be increasing to 76.0 million by 2020 and 111.8 million by 2040 disproportionally affecting people residing in Africa and Asia (Tham *et al*., 2014). Glaucoma is the second leading cause of blindness and has a higher prevalence, an early onset and more rapid progression in Africans than in Caucasians. These aspects are further compounded by poor awareness and low knowledge about glaucoma even by persons affected by the condition (Kyari *et al*., 2013). Other studies also highlighted that glaucoma, predominantly open-angle glaucoma, is a public health problem in sub-Saharan Africa (Alemu, 2009).

The major determinant for success in medical therapy of glaucoma is the adherence of patients to their medication (Weinreb *et al*., 2014). Adherence is defined as the extent to which a patient's behavior in taking medication corresponds with agreed recommendations from provider. In contrast to the term "compliance," adherence requires the patient's agreement to the recommendation. In recent years, the term "adherence" has replaced what traditionally was referred to as "compliance" (WHO, 2003).

In addition to adherence, the medical management of glaucoma relies primarily on the administration of topical ocular medications (Tony *et al*., 2007). According to Varies *et al* (2009), the ideal technique for drop instillation involves washing hands thoroughly, grasping the lower eyelid near the margin with the thumb and index finger and pulling outward to create a pouch in the lower cul-de-sac. After creating a pocket in the lower

eyelid by pulling it away from the eye, without touching the dropper tip to any ocular structures, positioning it above the eye by direct visualization. Then applying one drop to the pocket created. Following drop administration, the eye should be closed and pressure should be applied to the tear ducts with a finger (a technique known as punctal occlusion) for at least two minutes (McVeigh and Vakros, 2015; Varies *et al.,* 2009).

Glaucoma management, therefore, requires good adherence and appropriate administration technique of these medications and follow-up regimens to reduce the risk of progression and blindness by decreasing aqueous humor production and increasing uveoscleral outflow through trabecular meshwork (Katherine and Georgios, 2015).

## 1.2. Statement of the Problem

The important components of medical management of glaucoma are good adherence and appropriate eye drop administration technique. Health care providers, nevertheless, often neglect the importance of instruction on adherence and appropriate administration technique of eye drops. They rarely ask patients about their adherence behavior and how patients actually apply the topical ocular medications on their eye. These issues may be related to the relative success or failure of currently prescribed therapies (Tony *et al*., 2007).

Patients' health may also be jeopardized and health care resources maybe wasted by failures in patient adherence and adequate instillation technique. Glaucoma patients have chronic conditions and require lifelong treatment and follow-up care. They are, therefore, susceptible to poor adherence and inadequate administration technique. A large body of research has documented that both adherence and instillation technique of eye drops are significant problems among glaucoma patients (Schwartz, 2006).

Glaucoma medications require vigilant prescribing, dispensing and use as the drugs may have negative side effects. Additionally, glaucoma patients usually require a lifelong treatment but often do not realize any direct benefits from the therapy. Consequently, patients should be routinely assessed for their adherence behavior and instillation technique in order to tailor educational and interventional strategies according to the individual characteristics and thereby optimizing the treatment outcome.

Adherence and administration technique of hypotensive agents are also often overlooked and particularly vexing to practitioners who treat patients with chronic conditions. Without good adherence and appropriate administration technique of hypotensive eye drops, an elevated IOP may lead to progressive optic nerve degeneration and deterioration of the visual field (Konstas *et al*., 2000; Stewart *et al*., 2004). Moreover, improper administration technique can lead to contamination and inaccurate dosing (Kholdebarin *et al*., 2008). In order to manage these issues in everyday-practice settings, health care providers particularly eye care providers need to be able to identify patients who are non-adherent and/or not appropriately administer their eye drops, as well as those who are at risk for such behaviors.

The awareness of glaucoma was found to be 28.4% (Degineh and TekleGiorgis, 2013) in Menelik II Referral Hospital (M-II-RH). Nevertheless, to the investigator's knowledge no studies to date have been done on the assessment of adherence using Morisky Medication Adherence Scale-8 and administration technique in M-II-RH. Therefore, this study was undertaken to investigate adherence and administration technique and their prevalences. Besides, the present study identified the determinant factors for the adherence and administration technique. A better understanding of the settings, circumstances, and methods adopted by patients when they administer eye drops may be the first step toward improving patient education, adherence, and therapeutic efficacy. This study attempted to address these issues.

### 1.3. Literature Review

Non-adherence is one of the major problems in glaucoma treatment because there are no obvious symptoms in the earlier course for glaucoma patients (Olthoff *et al*., 2005).Ocular hypotensive agents not only lower IOP but also minimize IOP fluctuations, a potential risk factor for glaucomatous deterioration, (Lee *et al*., 2007) which strengthens the claim that patients with glaucoma should aim for 100% adherence to reduce IOP fluctuations (Cate *et al*., 2013).

The primary methods used to measure medication adherence in glaucoma patients have been (a) patient self-report via either a self-administered questionnaire or a structured interview by trained personnel and (b) calculation of medication-possession ratios and average days without therapy. Rates of medication adherence measured by patient self-report have been quite variable(Taylor *et al*., 2002).

Lack of adherence may be confused with a therapy's lack of efficacy. This confusion could lead to a change in therapy or the application of more aggressive therapeutic measures, such as laser or incisional surgery (Tony *et al*., 2007). Additionally, non-adherence is one of the major problems in glaucoma treatment due to no obvious symptoms in the earlier course for glaucoma patients (Olthoff *et al*., 2005). Non-adherence has long-term impacts on the visual function of the patient (Konstas *et al*., 2000; Stewart *et al*., 2004); causes approximately 10% of visual field defects and exhibits higher mean IOP and worse visual field loss (Konstas *et al*., 2000). Non-adherence is also associated with improper use of prescribed medication, which may lead to a further burden on the health–economic system (Reeder *et al*., 2008).

In glaucoma, non-adherence with eye drop therapy is a well-recognized problem, with a rate of 80% of the patients, measured using various techniques and methods (Gupta *et al*., 2012; Tony *et al*., 2007). Non-adherence and inappropriate administration of hypotensive agents can potentially result in treatment failure (Gupta *et al*., 2012) and due to the asymptomatic nature of glaucoma, long-term adherence and correct administration technique of ocular hypotensives are crucial in order to limit disease progression (McVeigh and Vakros, 2015).

In a 12-week, randomized, observer-masked crossover study of two formulations of a topical beta-blocker, 98% and 96% of patients responded that they never or rarely forgot their medications. Similarly, 92% of 48 patients from an academic-based glaucoma specialty practice reported never missing a dose of their ocular hypotensive therapy during the preceding two weeks and 85% of 230 patients seen in glaucoma subspecialty practices reported never or almost never missing a dose. In contrast, all members of a focus group that included 21 patients who had seen at least two ophthalmologists and who were taking at least two topical ocular hypotensive agents acknowledged some level of non-adherence (Taylor *et al*., 2002).

Other studies have found substantial but widespread rates of non-adherence. For example, 44% of patients with chronic glaucoma reported missing more than two doses per week (Konstas *et al*., 2000) and 24% of patients who were prescribed a topical beta-blocker reported frequently or occasionally missing doses(Krousel-Wood *et al*., 2004).

Preferred techniques for applying eye drops have been described in the literature(Shaw, 2014; Tham *et al*., 2014) and a practical manual prepared by World Health Organization (WHO) (Varies *et al* , 2009). Contact time is related to a medication's efficacy and potentially to its systemic absorption and adverse events (Tony *et al*., 2007).Studies have shown that it takes two full minutes for the drop to completely penetrate the surface of the eye to get inside. This increases the ocular contact time and medication efficacy as well as limits the systemic absorption and secondary potential adverse effects of the medication. A five-minute window is required between instillation of different eye drops, and drops should precede any ointments used. Problems such as lid or ocular touch, missing the eye, or flooding the eye with drops have been reported (McVeigh and Vakros, 2015; Varies *et al,* 2009).

Absorption of drugs in the eye takes place through corneal or non-corneal route. Maximum absorption takes place through the cornea, which leads the drug into the aqueous humor. Loss of administered dose of the drug takes place through spillage and removal by the naso-lacrimal apparatus. The non-corneal route involves absorption across the sclera and conjunctiva into the intra-ocular tissues. Medications applied to the eye drain through the naso-lacrimal duct rapidly, and then as much as 80% of the drug is absorbed through the

nasal mucosa and into the systemic venous circulation. Therefore, naso-lacrimal occlusion (NLO) and eyelid closure (ELC) are simple techniques that not only increase the ocular bioavailability of topically applied ocular drugs but also reduce the probability of adverse systemic effects. Each serves to improve the therapeutic index. Both NLO and ELC seem to be safe, simple, and effective procedures that could minimize dosage requirements, as well as side effects (Flach, 2008)

Some patients may have a problem with eye drop bottle contamination. Only 36.4% of survey participants reported “always” washing their hands before administering eye drops, and 15.8% reported “rarely” or “never” doing so. Furthermore, almost 5% reported “always” or “usually” touched the dropper tip touch to the eye during administration (Tony *et al*., 2007).

A multicenter study from ten centers across Canada shows that over 50% of the patients surveyed were either non-adherent or demonstrated improper administration technique (Kholdebarin *et al*., 2008). Missed doses are often due to problems with medication adherence; however, even a patient with good adherence may not be receiving a correct dose because of problems associated with the technique of eye drop administration. A study by Sleath *et al*(2006) found that 44% of patients reported regularly missing the eye during attempted drop application. A further study by Stone *et al*(2009) found that when observing drop instillation, less than one-third were performed adequately, with 17%–25% unable to successfully administer the medication to the eye as desired.

A qualitative study of glaucoma adherence by Lacey *et al* (2009) also found that only a small percentage of the participants had received any guidance with respect to effective administration and subsequently relied on the medication instruction manual, often considered difficult to read, or confusing as it conflicted with information obtained from other sources, such as internet, pharmacists, or other patients (McVeigh and Vakros, 2015).

Poor techniques can include missing the eye completely, delivery of an excessive dose, ocular trauma or bottle contamination due to contact between the tip of the bottle and the globe or lid. Possible sequelae of improper administration of eye drops include treatment failure, unnecessary use of additional medications and potentially to spread of infection (Gupta *et al*., 2012; Sleath *et al*., 2011).

# 2. OBJECTIVES

## 2.1. General Objective

The main purpose of this study was to assess adherence to ocular hypotensive agents among glaucoma patients in Menelik II Referral Hospital, Addis Ababa, Ethiopia.

## 2.2. Specific Objectives

- To determine the rate of topical glaucoma medication adherence
- To identify factors affecting topical glaucoma medication adherence
- To evaluate the appropriateness of administration technique of ocular hypotensive agents
- To identify factors affecting appropriate administration technique of ocular hypotensive agents
- To assess the association of adherence with administration technique of ocular hypotensive agents

# 3. METHODOLOGY

## 3.1. Study Setting

The study was carried out at the glaucoma clinic of M-II-RH, Addis Ababa, Ethiopia. M-II-RH is a teaching referral hospital and houses the ophthalmology department that is a pioneer specialized unit for ophthalmological services in Ethiopia. The ophthalmology department provides specialized services and trainings, and consists of different units such as glaucoma unit, general outpatient department (OPD), optometry unit, retinal unit, anterior segment clinic, pediatric unit, wards and major and minor operation theaters. The department caters ophthalmic services to more than 63,000 clients per year referred from all areas of the country. The glaucoma clinic gives services for almost 13,000 clients per year. The clinic also comprises of glaucoma specialists, ophthalmic nurses and other supportive staff (Statistics office of M-II-RH).

## 3.2. Study Design and Period

A hospital-based prospective cross-sectional study was conducted at glaucoma clinic of M-II-RH. Eligible patients, who attended the clinic during the course of the study, were interviewed and their medical records were reviewed prospectively for a period of two months starting from June 1, 2015 to July 31, 2015.

## 3.3. Source and Study Population

The source population was all glaucoma patients who had obtained services at the glaucoma clinic of M-II-RH. On the other hand, the study population was all glaucoma patients who had obtained services during the study period at the clinic of M-II-RH.

## 3.4. Sample Size Determination and Sampling Technique

The minimum sample size was calculated using a formula used to estimate the sample size for a single population (Daniel and Cross, 2005):

$$n = \frac{\left(Z_{1-\frac{\alpha}{2}}\right)^2 (p \times q)}{d^2}$$

Where:

- n = the desired sample size when population is >10,000
- $Z_{1-\alpha/2}$ = the standard normal variable at (1- α) % confidence level and α is the level of significance. At a 95% confidence level, the value of this parameter is 1.96 that was used in the study.
- p = the positive character (expected prevalence)
- q = the negative character
- d = the degree of accuracy (absolute precision) required, usually set at 0.05

Since there was no information from similar studies, past studies, or studies done on similar populations and no pilot study about the proportion was done, a conservative sample estimate was used assuming that the sample was independent and randomly selected.

$$n = \frac{\left(Z_{1-\frac{\alpha}{2}}\right)^2 (p \times q)}{d^2} = \frac{(1.96)^2 \times 0.5 \times 0.5}{(0.05)^2} = 384.16 \approx 384$$

As the estimated total study population is < 10,000 (in average 49 patients obtained service per working days and for the total of two months 2120 patients were served) (Statistics office of M-II-RH), correction formula was then used. Therefore,

$$nf = \frac{n}{1 + \frac{n}{N}} = \frac{384}{1 + \frac{384}{2120}} = \frac{384}{1.18} = 325.42 \approx 326$$

Where:

- nf = the desired sample size when population is <10,000
- n = the desired sample size when population is >10,000
- N = the study population size

Ten percent contingency (326×10% = 32.6) for non-respondents was added to the computed value. Finally, the minimum required sample size was calculated to be 326 + 32.6 = 358.6 ≈ 359.

In addition to sample size determination, systematic random sampling technique was employed for the study. Patients who were given services at glaucoma unit of the hospital during the study period were considered as a sampling frame. The sampling interval was then calculated to be 2120/359 =6. A starting point was chosen randomly form numbers 1 to 6 and hence eligible individuals were chosen every sixth client at regular intervals from the sampling frame.

### 3.5. Patient Inclusion and Exclusion Criteria

**Inclusion Criteria**: Those eligible patients were selected based on the following criteria

- Patients who had been diagnosed as pseudoexfoliative glaucoma, open-angle glaucoma, angle-closure glaucoma, normal tension glaucoma, secondary glaucoma or other types and those who had not undergone past laser or surgical glaucoma therapy within the last 3 months before enrollment.
- Glaucoma patients who had been on treatment with one or more topical hypotensive medications (not systemic) in one or both eyes at least for the past 6 months.
- Glaucoma patients who had routinely attending the clinic with regular follow-up.
- Glaucoma patients who were 18 years old or older.

**Exclusion Criteria:** Those patients who were excluded from the study were

- Glaucoma cases of postoperative follow-ups, any diagnostic test/procedure(s) or other cases that did not require any topical glaucoma medication(s) during the study period.
- Glaucoma patients with anti-inflammatory drops, anti-infective drops and other topical medications other than ocular hypotensive medications.
- Glaucoma patients who had already been enrolled in the study (including in the pretest).
- Glaucoma patients who were not willing to give informed written consent.

### 3.6. Study Variables

**Independent Variables**

- **Scio-demographic characteristics:** Age, sex, marital status, educational level, place of residence, religion, occupation and monthly family income.
- **Glaucoma related factors:** Type, severity and duration of glaucoma, follow-up period, duration of treatment, previous managements and comorbidities.
- **Medication related factors:** Number, type, frequency, dose and side effect of medication(s),and financial source and problem to obtain the medication(s).
- **Patient and provider related factors:** Family support, busy daily schedule, intra-ocular pressure, visual acuity, and information about eye drop administration from physicians, pharmacists, brochures and/or leaflets.

**Dependent variables**

- Medication adherence
- Administration technique

### 3.7. Data Collection Procedures

#### 3.7.1. Instruments

Data was collected prospectively by interviewing patients and reviewing their charts. The structured questionnaire (Annex I) was adopted from literature and finally developed to collect the relevant data to meet the intended objectives. All potential factors of medication adherence and administration technique were aimed to be included in the data collection instruments. The proposal particularly emphasizing on the assessment tool was presented to senior ophthalmologists and ophthalmic residents for further refinement before the data collection procedure. The tool, then, comprehensively reviewed by three senior ophthalmologists independently and necessary modifications were made. Experts in pharmacology and pharmacotherapy also reviewed the concept version of the questionnaire. Questions about the various dependent and independent variables were also formulated in plain Amharic language (Annex II). Additionally, data abstraction format was developed to review chart of each eligible patient to type and severity of glaucoma, IOP and visual acuity. The two dependent variables, adherence and administration technique, were investigated using the following assessment tools.

**Morisky Medication Adherence Scale-8**

In the absence of any pre-existing gold standard measure, adherence of topical hypotensive eye drops was measured using Morisky Medication Adherence Scale-8 (MMAS-8) in this study. The MMAS-8 is a generic self-reported and medication-taking behavior scale. This scale is validated for hypertension but used for a wide variety of chronic medical conditions (Riccardo and Vietri, 2014) including glaucoma (Cate *et al.,* 2013). MMAS-8, which is the latest version of the scale, has a good internal consistency (Cronbach's $\alpha$ = 0.83) (Morisky *et al*., 2008). It consists of eight items focusing on past medication use patterns with a scoring scheme of "Yes" = 0 and "No" = 1 for the first seven items except item number five in which the values of "Yes" and "No" were reversed and for the last item, a five-point Likert response was used with options "never", "once in a while", "sometimes", "usually", and "always." In this Likert scale, values ranging from 0 to 1 were given at a specified interval of 0.25 with "0" given for "never" and "1" given for "always". The items were then summing to give a range of scores from low adherence to high adherence with a maximum score of eight. For the purpose of data analysis, the original three categories of adherence were re-categorized into two and thereby participants were dichotomized. Accordingly, high and medium adherence were re-assigned as adherent with a score of less than two and low adherence was regarded as non-adherent with a score of two or more.

**Eye Drop Administration Technique-9**

Eye Drop Administration Technique-9 (EDAT-9) was according to WHO recommended producers (Vries *et al*., 2009) in alignment with different studies (Shaw, 2014; Tham *et al*., 2014; Tony *et al.,* 2007). In this study, the patients were asked to demonstrate how they routinely apply their drops and then reaffirmed with nine questions. These questions comprised of three responses with value "0" representing "rarely/never", "1" indicating "often and "2" signifying "always/usually" except question number two and seven in which case the values of "0" and "2" were reversed for "always/usually" and "rarely/never" respectively. The maximum score was eighteen and individual patient's score was made

binary for the viability of data analysis. The patient was deemed to have an appropriate EDAT if the score was greater than twelve points.

### 3.7.2. Recruitment of Research Participants

Glaucoma patients entered the clinic's triage and made a queue in the waiting area. The nurses measured both visual acuity and IOP and registered these findings on the patient's chart prior to getting services form physicians. During that time, while the patients were waiting at a waiting area on their appointment day, a lottery method was used to blindly pick the first of the six patients and every morning the interviewers selected every $6^{th}$ patient form the queue after identifying the random number and thereby the respective patient. After the attending physician saw the patient, each patient, who had fulfilled the inclusion criteria, was briefed about the purpose of the study and then requested for willingness to be interviewed at a nearby separate room. Any patient who did not fulfill the inclusion criteria was replaced by the next eligible person.

### 3.7.3. Recruitment and Training of Data Collectors

Three ophthalmic nurses who had more than three years work experience in the ophthalmic settings were recruited as data collectors. The data collectors were well familiarized with the glaucoma clinic but had not recently worked at the glaucoma clinic before the study period. They were recruited from the staff members of the hospital and trained as data collectors for one day.

### 3.7.4. Data Quality Control

The data collection instruments were pre-tested in 5% of the sample size (i.e. 5% of 359 = 17.95 ≈18 patients). The final tool was developed with some modifications after a thorough and deep review by experts and other three senior ophthalmologists and was then employed for data collection. To maximize quality of the data, training of the data collectors on how to extract the necessary information, interview the participants and familiarize them with the format was conducted for one day. Completeness of the data collected was supervised and monitored adequately by the principal investigator every day during the data collection process.

### 3.8. Data Analysis

The filled-in forms were checked for completeness of data, were cleaned prior to data entry and then were entered using Epi Info™ version 3.5.3. In order to minimize data-entry errors, data were double entered and checked for discrepancies. Data analysis was carried out using Statistical Package for Social Sciences (SPSS®Statistics) program version 21 (SPSS; Chicago, IL, U.S.A.). Descriptive statistics such as frequency, percentage, mean and standard deviation (SD) were also employed to summarize patient's characteristics and other related information.

Univariate binary logistic regression analysis was performed to relate each variable to adherence and administration technique. From the univariate analysis, those variables with $p < 0.2$ were selected for multivariate binary logistic regression analysis. The multivariate binary logistic regression analysis was also used to assess the predictability of the independent variables of adherence and administration technique of ocular hypotensive agents and to estimate the odds ratios (OR), 95% confidence intervals (CI) and p-values. The association was declared significant at $p < 0.05$.

### 3.9. Ethical Considerations

All applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed during this study. The study was undertaken after obtaining of ethical clearance from School of Pharmacy's Ethical Review Committee, College of Health Sciences, Addis Ababa University. In addition, the Research Committee of Addis Ababa Health Bureau, and Research and Publication Committee of the Department of Ophthalmology, College of Health Sciences, Addis Ababa University were also requested for ethical permission to conduct the study. To ensure confidentiality, name and other identifiers of patients, physicians, and other staff members of the hospital were not recorded on the data abstraction instrument. Furthermore, confidentiality of the information obtained in the course of the study was maintained. Informed written consent was also obtained from patients.

### 3.10. Operational Definitions

**Adherent:** The study participant was deemed to adherent when the Morisky Medication Adherence Scale - 8 score was <2 (Muntner *et al.,* 2011).

**Non-adherent:** The study participant was deemed to non-adherent when the Morisky Medication Adherence Scale - 8 score was ≥2 (Muntner *et al.,* 2011).

**Critical instilling procedures**: Critical instilling procedures are procedures, if followed succinctly, can effectively increase the ocular bioavailability of topical glaucoma medications and decrease the systemic adverse effects and contamination of these medications. These procedures are procedures numbered2, 3, 5, 6, 7 and 8 (Annex I) and must be followed strictly during the administration technique of ocular hypotensive agents.

**Appropriate Administration Technique:** When the patient accomplished at least all the critical instilling procedures and/or scored a comparative result, that is, when the participant scored > 12 points from the total of 18 score points.

**Inappropriate Administration Technique:** When the patient did not accomplish at least one of the critical instilling procedures and/or did not score a comparative result, that is, when the participant scored ≤ 12 points from the 18 score points.

# 4. RESULTS

## 4.1. Socio-demographic Characteristics

Among 359 eligible patients, about half of the patients (n=181, 50.4%) were in the age group of 61-80 years old. The mean age of the study population was 60.91 years (SD*:±12.34 years; range: 18 to 88 years). Majority of the patients were males (n=247, 69.0%) whereas almost three-fourth(n= 266, 74.7%) of the participants were married. Meanwhile, the major type of occupation, religion and place of residence were being retired (n=115, 32.0%), Orthodox (n=308, 87.0%) and urban (n=322, 89.7%) respectively. Concerning the educational status, lower educational level(elementary school and/or below) was accounted for about under two-thirds of the participants (n=229, 63.9%). One hundred fifty-nine patients (44.3%) earned low monthly family income (Table 1).

*SD is Standard Deviation

Table 1: Socio-demographic characteristics of patients attending the glaucoma clinic of Menelik II Referral Hospital

| Variables | Frequency | Percent |
|---|---|---|
| **Age (n=359)** | | |
| 18-40 | 22 | 6.1 |
| 41-60 | 149 | 41.5 |
| 61-80 | 181 | 50.4 |
| ≥ 81 | 7 | 1.9 |
| **Sex (n=358)** | | |
| Male | 247 | 69.0 |
| Female | 111 | 31.0 |
| **Marital Status (n=356)** | | |
| Single | 32 | 9.0 |
| Married | 266 | 74.7 |
| Divorced | 20 | 5.6 |
| Widowed | 38 | 10.7 |
| **Educational Level (n=358)** | | |
| Illiterate or Non-formal Education | 109 | 30.4 |
| Elementary School (Grade 1-8) | 120 | 33.5 |
| High School (Grade 9-12) | 73 | 20.4 |
| Diploma and/or above | 56 | 15.6 |
| **Place of Residence (n=358)** | | |
| Rural | 36 | 10.1 |
| Urban | 322 | 89.9 |
| **Religion (n=331)** | | |
| Orthodox | 308 | 87.0 |
| Islam | 17 | 4.8 |
| Protestant | 25 | 7.1 |
| Other(s)* | 4 | 1.1 |
| **Occupation (n=359)** | | |
| House wife | 29 | 8.1 |
| Farmer | 23 | 6.4 |
| Retired | 115 | 32.0 |
| Employee (Paid work) | 79 | 22.0 |
| Self-employed (Merchant) | 34 | 9.5 |
| Other(s)† | 79 | 22.0 |
| **Monthly Family Income‡ (n=359)** | | |
| Very Low (< 445 ETB§) | 96 | 26.7 |
| Low (446-1200 ETB) | 159 | 44.3 |
| Average (1201-2500 ETB) | 50 | 13.9 |
| Above Average (2501-3500 ETB) | 24 | 6.7 |
| High (> 3501 ETB) | 30 | 8.4 |

* Catholic, Wakfetir, Yehiwa Miskir

†Student, Unemployed, Prisoner

‡ Based on the Ethiopian Civil Service monthly salary scale for civil servants

§ETB = Ethiopian Birr

### 4.2. Glaucoma and Medication Related Factors

According to the medical records, the most prevalent type of glaucoma was pseudoexfoliative glaucoma which was accounted for 40.5 % (n=138),followed by primary open angle glaucoma (n=93, 27.3%).Regarding the severity of glaucoma from the documented medical chart, 64.1% (n=173), 24.1% (n=65) and 11.9% (n=11.9) of the patients had moderate, advanced and early glaucoma respectively (Table 2).

Based on the results, patients had been diagnosed with glaucoma for an average of 5.6years (SD:±5.48 years; range: 6 months to 48 years).Similarly, the duration of taking glaucoma medications ranged from half a year to forty-eight years was found to have a mean of 5.35 years (SD:±5.30 years). The average frequency of follow-up per year was 0.254 times (SD:±0.11 times). Nearly half (n=166, 46.6%) of the patients had previous eye surgery as a glaucoma management while 61.2% (n=218) of the participants had not major comorbidities such as cardio-vascular diseases, central nervous problems, arthritis and alcohol abuse.

Almost all (97.5%, n=350) of the patients had used one and/or two medications with equivalent proportions. Timolol as an immunotherapy accounted for about half (44.0%, n=158) of the prescribed medications followed by combination of timolol and pilocarpine (36.8%, n=132). Majority of frequency of eye drop administration were twice a day for timolol (n=317, 99.1%), once a day for latanoprost (n=6, 66.7%), four times a day for pilocarpine (n=106, 65.4%) and twice a day for medications labeled as ‘others’ (n=58, 65.4%). Almost all of the medications were administered as one drop (range: 98.2% to 100.0%). In addition to this, one in three of the patients (n=123, 32.8%) had waited more than five minutes to administer the second or consecutive drop. Roughly, above half of the patients reported that they had not experienced an immediate side effects (n=200, 56.0 %,) (Table 2).

Table 2: Glaucoma and medications related characteristics of patients attending the glaucoma clinic of Menelik II Referral Hospital

| Variables | Frequency | Percent |
|---|---|---|
| **Types of Glaucoma** | | |
| Primary Open Angle Glaucoma | 93 | 27.3 |
| Secondary Glaucoma | 3 | 0.9 |
| Primary Angle Closure Glaucoma | 48 | 14.1 |
| Normal Tension Glaucoma | 5 | 1.5 |
| Pseudoexfoliative Glaucoma | 138 | 40.5 |
| Other (s)* | 54 | 15.8 |
| **Severity of Glaucoma** | | |
| Early Glaucoma | 32 | 11.9 |
| Moderate Glaucoma | 173 | 64.1 |
| Advanced Glaucoma | 65 | 24.1 |
| **Number of Medications** | | |
| One | 174 | 48.7 |
| Two | 176 | 48.8 |
| Three or more | 9 | 2.5 |
| **Type of Glaucoma Medications** | | |
| Timolol | 158 | 44.0 |
| Latanoprost | 1 | 0.3 |
| Pilocarpine | 2 | 0.6 |
| Other(s)† | 13 | 3.6 |
| Timolol and Latanoprost | 4 | 1.1 |
| Timolol and Pilocarpine | 132 | 36.8 |
| Timolol and Other(s) | 18 | 5.0 |
| Latanoprost and Other(s) | 1 | 0.3 |
| Pilocarpine and Other(s) | 21 | 5.8 |
| Timolol, Latanoprost and Pilocarpine | 2 | 0.6 |
| Timolol, Latanoprost and Other(s) | 1 | 0.3 |
| Timolol, Pilocarpine and Other(s) | 6 | 1.7 |
| **Time Elapsed to Administer the Second or Consecutive Drop** | | |
| Immediately | 11 | 6.0 |
| 1-5 minutes | 49 | 26.8 |
| 5-10 minutes | 54 | 29.5 |
| >10 minutes | 69 | 37.7 |
| **Immediate Experience of any Side Effects from the Medications** | | |
| Yes | 157 | 44.0 |
| No | 200 | 56.0 |

* Neovascular Glaucoma, Ocular Hypertension, Post-traumatic Glaucoma, Post-uveitic Glaucoma, Juvenile Glaucoma,Steroid induced Glaucoma

†Dorzolamide (Xola), Xolamol (Dorzolamide 20 mg + Timolol 5 mg), Brimonidine, Betaxolol

### 4.3. Patient and Health Care Provider Related Factors

Over half (n=186, 52.0%)of the patients claimed that they obtained their medications free of charge, although more than two-thirds (n=175, 68.9%) of the patients (for both free patients who had purchased when the medications were out of stock in the hospital and self-buyers)reported that they had financial problem to get the medications. Majority of the patients (n=316, 89.0%) had not used other eye drops than glaucoma eye drops. Similarly, majority of the patients responded that they did not obtain adequate/relevant information about eye drops administration from physicians (n=296, 82.5%), pharmacists (n=339, 94.4%) and leaflets/brochures (n=309, 86.1%). Those patients who had not sought family support for eye drop use were 64.5% (n=231) while who had not had a very busy daily schedule were 94.7% (n=339) (Table 3).

According to the medical charts, the mean intraocular pressure (IOP), in mmHg, in the right eye and left eye was17.78 (SD:± 7.72; range:3.00 to 52.00) and 18.03 (SD:± 8.79; range: 3.00 to 61.00) respectively. During the stratification, above half of the patients (n=195, 54.3%) had normal IOP and about one-third of the patients had (near-) normal vision (n=122, 34.3%), low vision (n=130, 36.6%) and (near-) blindness (n=115, 32.3%) (Table 3).

Table 3: Patient and health care provider related factors associated with patients attending the glaucoma clinic of Menelik II Referral Hospital

| Variables | | | Frequency | Percent |
|---|---|---|---|---|
| **Getting the Medication(s)** | | | | |
| Free of Charge | | | 186 | 52.0 |
| Self-buy | | | 172 | 48.0 |
| **Financial Problem to Get the Medications** | | | | |
| Yes | | | 175 | 68.9 |
| No | | | 79 | 31.1 |
| **Taking Other Eye Drops than Glaucoma Medications** | | | | |
| Yes | | | 39 | 11.0 |
| No | | | 316 | 89.0 |
| **Getting adequate or relevant information about eye drop administration from** | Physicians | Yes | 63 | 17.5 |
| | | No | 296 | 82.5 |
| | Pharmacists | Yes | 20 | 5.6 |
| | | No | 339 | 94.4 |
| | Leaflets, brochures and/or medias | Yes | 50 | 13.9 |
| | | No | 309 | 86.1 |
| **Family Support for Eye Drop Use** | | | | |
| Yes | | | 127 | 35.5 |
| No | | | 231 | 64.5 |
| **Very Busy Daily Schedule** | | | | |
| Yes | | | 19 | 5.3 |
| No | | | 339 | 94.7 |
| **Intraocular Pressure** | | | | |
| Lower than Normal IOP (<10 mmHg) | | | 25 | 7.0 |
| Normal IOP (10-21 mmHg) | | | 195 | 54.3 |
| Higher than Normal IOP (>21 mmHg) | | | 139 | 38.7 |
| **Visual Acuity** (ICO, 2002) | | | | |
| (Near-) Normal Vision (6/6 to 6/18) | | | 122 | 34.3 |
| Low Vision (6/24 to 2/60; Counting Finger ≥ 1 meter(s)) | | | 119 | 33.4 |
| (Near-) Blindness* | | | 115 | 32.3 |

*(Near-) Blindness = 1/60 or less to No Light Perception; Counting Finger in- front, Light Perception or Hand Motion

### 4.4. Rate of Topical Glaucoma Medication Adherence

Assessment of patients' response to the eight-items Morisky Medication Adherence Scale revealed that 153 (42.6%) patients were adherent to the prescribed regimen of their glaucoma medications (Table 4).

Table 4: Summary of glaucoma patients' response to the eight-item Morisky instrument at the glaucoma clinic of Menelik II Referral Hospital

| No | **Morisky Medication Adherence Scale (MMAS-8)** | **Frequency (%)** | |
|---|---|---|---|
| | | **Response** | |
| | | Yes | No |
| 1 | Do you sometimes forget to take your eye drop(s)? | 209 (58.2) | 150 (41.8) |
| 2 | People sometimes miss taking their eye drop(s) for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not apply your eye drop(s)? | 116 (32.3) | 243 (67.7) |
| 3 | Have you ever cut back or stopped taking your eye drop(s) without telling your doctor because you felt worse when you took it? | 19 (5.3) | 340 (94.7) |
| 4 | When you travel or leave home, do you sometimes forget to bring along your eye drop(s)? | 48 (13.4) | 311 (86.6) |
| 5 | Did you take all your eye drop(s) yesterday? | 323 (90.0) | 36 (10.0) |
| 6 | When you feel like your eye pressure is under control, do you sometimes stop taking your eye drop(s)? | 31 (8.6) | 328 (91.4) |
| 7 | Applying eye drop(s) every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your treatment plan? | 84 (23.4) | 275 (76.6) |
| 8 | How often do you have difficulty remembering to apply all your eye drop(s)? | | |
| | Never/rarely | 140 (39.0) | |
| | Once in a while | 137 (38.2) | |
| | Sometimes | 56 (15.6) | |
| | Usually | 24 (6.7) | |
| | Always | 2 (0.6) | |
| | **Distribution of Scores** | **Frequency (%)** | |
| | [0-1] | 136 (37.9) | |
| | (1-2] | 34 (9.5) | |
| | (2-3] | 145 (40.4) | |
| | (3-4] | 24 (6.7) | |
| | (4-5] | 17 (4.7) | |
| | (5-6] | 2 (0.6) | |
| | (6-7] | 0 (0) | |
| | (7-8] | 1 (0.3) | |
| | **Cut off** | **Frequency (%)** | |
| | <2 | 153(42.6) | Adherent |
| | ≥2 | 206(57.4) | Non-adherent |

## 4.5. Factors Associated with Topical Glaucoma Medication Adherence

In this study, factors considered potentially to predict topical glaucoma medication adherence were tested using binary logistic regression analysis. The number and type of medications were found to have a statistically significant association with adherence during a univariate binary logistic regression analysis.

The effect of the number of medications was significant but inverse, indicating that the odds of being adherent for patients who had taken two medications were 69% (COR=0.31, 95% CI: 0.20-0.48, $p$ = 0.000) less compared to patients who had taken only one medication. Similarly, the odds of being adherent for patients who had taken combination of timolol and pilocarpine, and combination of pilocarpine and medications labeled as 'others' were 76% (COR=0.24, 95% CI: 0.14-0.40, $p$ = 0.000) and 66% (COR=0.34, 95% CI: 0.14-0.94, $p$ = 0.000) less, respectively, compared to patients who had taken timolol alone (Table 5).

The findings of univariate analysis, on the other hand, showed that, the odds of being adherent for patients who had obtained adequate/relevant information from brochures and/or leaflets were almost two-fold (COR=1.87, 95% CI: 1.03-3.42, $p$ < 0.041) more compared to patients who had not obtained the information. However, glaucoma medication adherence was not significantly associated with socio-demographic characteristics and glaucoma related factors on the univariate regression analysis (Table 5).

The present study revealed that educational level, occupation, monthly family income, frequency of pilocarpine and financial source to obtain the medications were found to be significantly associated with glaucoma medication adherence after controlling the independent variables and incorporating those variable with p-value less than 0.2 in to multivariate logistic regression analysis. Accordingly, the odds of being adherent for patients with highest educational level (diploma and/or above) were nearly five-fold (AOR=4.60, 95% CI: 1.01-21.03, $p$ < 0.049) more compared to patients whose educational level were elementary (Grade 1-8) (Table 5).

The odds of being adherent for farmer patients were 93% (AOR=0.07, 95% CI: 0.01-0.75, p<0.028) less compared to those patients who had been retired. In contrary to this, the odds of being adherent for patients who were self-employed (merchants) were approximately six-fold (AOR=6.14, 95% CI: 1.37-27.50, $p < 0.018$) more odds of being adherent compared to those participants who were retired. Another finding revealed in this study was that the odds of being adherent for patients who had had very low monthly family income were 78% (AOR=0.22, 95% CI: 0.06-0.77, $p < 0.019$) less compared to those who had had high monthly family income (Table 5).

During the multivariate analysis, it was also found that the odds of being adherent for patients who had taken pilocarpine twice a day were approximately three-fold (AOR=2.89, 95% CI: 1.25-6.66, $p < 0.013$) more compared to those who had taken pilocarpine four times a day. The other factor that was found significantly associated with adherence was the financial source to get the medications. The odds of being adherent for patients who had bought the medications by themselves were about 70% (AOR=0.30, 95% CI: 0.10-0.93, $p < 0.036$) less compared to individuals who had obtained the medications free of charge (Table 5).

Table 5: Multivariate logistic regression analysis of factors associated with medication adherence among patients attending the glaucoma clinic of Menelik II Referral Hospital

| Variables | | Adherence, n(%) | | COR (95% CI) | AOR (95% CI) |
|---|---|---|---|---|---|
| | | Non-adherent | Adherent | | |
| **Marital Status** | Single | 14 (43.75) | 18 (56.25) | 1.64(0.78, 3.43) | 1.65(0.30, 9.15) |
| | Married | 149 (56.0) | 117 (44.0) | 1.00 | 1.00 |
| | Divorced | 15 (75.0) | 5 (25.0) | 0.42(0.15, 1.20) | 0.27(0.02, 3.81) |
| | Widowed | 26 (68.42) | 12 (31.57) | 0.59(0.28, 1.21) | 0.56(0.10, 3.00) |
| **Educational Level** | Illiterate | 67 (61.46) | 42 (38.54) | 1.01(0.59, 1.72) | 2.07(0.53, 8.13) |
| | Elementary School | 74 (61.66) | 46 (38.34) | 1.00 | 1.00 |
| | High School | 38 (52.05) | 35 (47.95) | 1.48(0.82, 2.67) | 1.87(0.48, 7.26) |
| | Diploma & above | 26 (46.42) | 30 (53.57) | 1.86(0.98, 3.53) | 4.60(1.01, 21.03)* |
| **Occupation** | Retired | 66 (57.39) | 49 (42.61) | 1.00 | 1.00 |
| | Farmer | 17 (73.9) | 6 (26.1) | 0.48(0.16, 1.29) | 0.07(0.01, 0.75)* |
| | House wife | 18 (62) | 11 (38) | 0.82(0.36, 1.90) | 4.40(0.82, 23.49) |
| | Employee | 42 (53.16) | 37 (46.84) | 1.19(0.67; 2.11) | 2.40(0.70, 8.21) |
| | Self-employed | 16 (47) | 18 (53) | 1.52(0.70, 3.27) | 6.14(1.37, 27.50)* |
| | Other(s) | 47 (59.5) | 32 (40.5) | 0.92(0.51, 1.64) | 0.763(0.15, 3.86) |
| **Monthly Family Income** | Very Low | 59 (61.45) | 37 (38.55) | 0.82(0.49, 1.37) | 0.22(0.06, 0.77)* |
| | Low | 90 (56.6) | 69 (43.4) | 1.71(0.78, 3.75) | 0.91(0.18, 4.57) |
| | Average | 31 (62) | 19 (38) | 0.80(0.42, 1.53) | 0.31(0.10, 1.96) |
| | Above Average | 13 (54.16) | 11 (45.84) | 0.47(2.61,0.00) | 0.62(0.14, 2.71) |
| | High | 13 (43.33) | 17 (56.67) | 1.00 | 1.00 |
| **Follow-up per Year** | 1 – 2 times | 4 (33.33) | 8 (66.67) | 2.50(0.73, 8.54) | 7.54(0.46, 122.95) |
| | 3 – 4 times | 125 (55.6) | 100 (44.4) | 1.00 | 1.00 |
| | 5 – 6 times | 38 (64.40) | 21 (35.6) | 0.69(0.38, 1.25) | 0.33(0.07, 1.43) |
| | >6times | 39 (61.9) | 24 (38.1) | 0.77(0.43, 1.36) | 0.74(0.21, 2.60) |
| **Number of Medication(s)** | One | 74 (42.3) | 101 (57.7) | 1.00 | 1.00 |
| | Two | 123 (70.3) | 52 (29.7) | 0.31(0.20, 0.5)* | $5.3E^{+7}$(0.00, -) |
| | Three or more | 9 (100.0) | 0 (0.0) | 0.00(0.00, -) | 0.976(0.00, -) |
| **Type of Medication(s)** | Timolol (T) | 66 (41.8) | 92 (58.2) | 1.00 | 1.00 |
| | Latanoprost (L) | 0 (0.0) | 1 (100.0) | $1.1E^{+9}$(0.00, -) | 0.304(0.000, -) |
| | Pilocarpine (P) | 1 (50.0) | 1 (50.0) | 0.72(0.04, 11.8) | - |
| | Other(s) (O) | 6 (46.15) | 7 (53.85) | 0.84(0.27, 2.61) | 0.282(0.067, 1.18) |
| | T and P | 99 (75.0) | 33 (25.0) | 0.24(0.14, 0.10)* | - |
| | P and O | 14(66.67) | 7(33.33) | 0.34(0.14, 0.94)* | - |
| **Pilocarpine frequency** | 2 Times | 3 (75.0) | 1 (25.0) | 1.85(0.88, 3.91) | 2.89(1.25, 6.66)* |
| | 3 Times | 35 (67.3) | 17 (32.7) | 1.27(0.13, 12.8) | 1.77(0.17, 18.26) |
| | 4 Times | 84 (79.25) | 22 (20.75) | 1.00 | 1.00 |
| **Time Elapsed to administer 2nd drop** | Immediately | 8 (72.72) | 3 (27.28) | 0.54(0.24, 1.21) | 0.68(0.20, 2.24) |
| | 1-5 minutes | 36 (73.47) | 13 (26.53) | 0.68(0.30, 1.51) | 0.39(0.11, 1.34) |
| | 5-10 minutes | 42 (77.78) | 12 (22.22) | 0.70(0.17, 2.90) | 1.03(0.18, 5.94) |
| | >10 minutes | 45 (65.22) | 24 (34.78) | 1.00 | 1.00 |
| **Side effect** | Yes | 97 (61.78) | 60 (38.22) | 0.73(0.47, 1.11) | 1.03(0.40, 2.66) |
| | No | 108 (54.0) | 92 (46.0) | 1.00 | 1.00 |
| **Getting the Medications** | Free of Charge | 111 (59.7) | 75 (40.3) | 1.00 | 1.00 |
| | Self-buy | 94 (54.65) | 78 (45.35) | 1.23(0.81, 1.87) | 0.30(0.10, 0.93)* |
| **Information from physicians** | Yes | 42 (66.67) | 21 (33.33) | 0.62(0.04, 1.10) | 0.31(0.07, 1.39) |
| | No | 164 (55.4) | 132 (44.6) | 1.00 | 1.00 |
| **Information from leaflets** | Yes | 22 (44.0) | 28 (56.0) | 1.87(1.03,0.42)* | 2.34(0.57, 9.63) |
| | No | 184 (59.5) | 125 (40.5) | 1.00 | 1.00 |

* Statistically Significant at P<0.05

### 4.6. Rate of Topical Glaucoma Medication Administration Technique

Assessment of patients' response to the nine-item eye drop administration technique revealed that 17.3% (n=62) of the patients were appropriately administering the prescribed regimen of their glaucoma medications (Table 6).

Table 6: Summary of glaucoma patients' response to the nine-item administration technique of ocular hypotensive agents at the glaucoma clinic of Menelik II Referral Hospital

| No | **Topical Glaucoma Medication Administration Technique** | **Frequency (%)** | | |
|---|---|---|---|---|
| | | **Response** | | |
| | | Always / Usually | Often | Rarely/ Never |
| 1 | Remembering to wash hands thoroughly with soap and water before the procedure | 144 (40.1) | 166 (46.2) | 49 (13.6) |
| 2 | Touching the dropper's opening against eye, face, hand or anything else | 26 (7.2) | 143 (39.8) | 190 (52.9) |
| 3 | Pulling lower eyelid down to form a pocket or "gutter" while slightly tilting head up | 37 (10.3) | 98 (27.3) | 224 (62.4) |
| 4 | Positioning the tip of bottle so that it does not come closer than two centimeters above lower lid | 159 (44.3) | 112 (31.2) | 88 (24.5) |
| 5 | Applying the prescribed amount of doses in the "gutter" correctly | 199 (55.4) | 146 (40.7) | 14 (3.9) |
| 6 | Closing eyes for at least two minutes after instilling of the medication | 277 (77.2) | 49 (13.6) | 33 (9.2) |
| 7 | Shutting, massaging eye too tight and/or blinking or squeezing eyelids after applying the drops | 27 (7.5) | 107 (29.8) | 225 (62.7) |
| 8 | Occulting naso-lacrimal route for at least two minutes immediately after instilling drops | 8 (2.2) | 5 (1.4) | 346 (96.4) |
| 9 | Using a clean tissue, handkerchief or others to absorb excess eye drops that run onto the cheeks | 253 (70.5) | 42 (20.1) | 34 (9.5) |
| **Distribution of Scores** | | **Frequency (%)** | | |
| | 0-3 | 1 (0.3) | | |
| | 4-6 | 11 (3.1) | | |
| | 7-9 | 65 (18.1) | | |
| | 10-12 | 220 (61.3) | | |
| | 13-15 | 58 (16.2) | | |
| | 16-18 | 4 (1.1) | | |
| | **Cut off** | **Frequency (%)** | | |
| | ≤12 | 297 (82.7) | Inappropriate | |
| | >12 | 62 (17.3) | Appropriate | |

## 4.7. Factors Associated with Administration Technique of Ocular Hypotensives

The result of univariate binary logistic regression analysis showed that no variable from sociodemographic characteristics, glaucoma related, patient related and provider related factors was found to be significantly associated with the appropriate topical hypotensive administration technique. On the other hand, the finding of univariate binary logistic regression analysis on the association between medication related factors and appropriate eye drop administration technique showed that the number of medications, the type of glaucoma medications and time elapsed to administer the second or consecutive drop were found to be significantly associated with the appropriateness of administration technique (Table 7).

Accordingly, the odds of administering eye drop appropriately for patients who had taken two medications were 50% (COR=0.50, 95% CI: 0.28-0.89, $p < 0.018$) less compared to patients who had taken one medication only. Similarly, the odds of administering eye drop appropriately for patients who had taken combination of timolol and pilocarpine were 48% (COR=0.52, 95% CI: 0.28-0.98, $p < 0.043$) less compared to patients who had taken timolol alone. During univariate analysis, it was also revealed that the odds of administering eye drop appropriately for patients who had immediately administered the second or consecutive drop were 75% (COR=0.25, 95% CI: 0.07-0.94, $p < 0.040$) less compared to patients who had waited more than ten minutes to administer the second or consecutive drop (Table 7).

During the multivariate logistic regression analysis, the present study revealed that sex, type of glaucoma, severity of glaucoma, follow-up schedule, time elapsed to administer the second or consecutive drop, immediate experience of side effects and visual acuity were found to be significantly associated with appropriate administration technique after incorporating those variables with p-value less than 0.2 in to the analysis. Accordingly, the odds of administering eye drop appropriately for female patients were nearly three hundred fold (AOR=304.56, 95% CI: 3.27-28383.56, $p < 0.013$) more compared to males. Similarly, the odds of administering eye drop appropriately for patients with advanced glaucoma were almost three-fold (AOR=3.46, 95% CI: 1.09-10.97, $p < 0.035$) more compared to patients with moderate glaucoma (Table 7).

The result of multivariate analysis, however, depicted that the odds of administering eye drop appropriately for patients with primary angle closure and open angle glaucoma were almost 100% (AOR=0.00, 95% CI: 0.00-0.25, $p < 0.022$) and 100% (AOR=0.00, 95% CI: 0.00-0.36, $p < 0.027$) less, respectively, compared to patients with pseudoexfoliative glaucoma (Table 7).

Another factor that was found to be significant was the average frequency of follow-up per year. The odds of administering eye drop appropriately for patients with the most frequent follow-up (more than six times per year) were about six-fold (AOR=5.94, 95% CI: 1.19-29.62, $p < 0.030$) more compared to patients whose follow-up were less frequent (three-four times) per year (Table 7).

The odds of administering eye drop appropriately for patients who had immediately administered their second or consecutive drop were 99% (AOR=0.01, 95% CI: 0.001-0.58, $p < 0.027$) less compared to individuals who had waited more than ten minutes to administer the second or consecutive drop. The odds of administering eye drop appropriately for patients who had experienced an immediate side effect were also 87% (AOR=0.13, 95% CI: 0.02-0.92, $p < 0.041$) less compared to individuals who had not experienced the side effect. Likewise, the odds of administering eye drop appropriately for patients who had had low vision were 99% (AOR=0.001, 95% CI: 0.000-0.37, $p < 0.024$) less compared to patients who had had (near-) normal vision (Table 7).

Table 7: Multivariate logistic regression analysis of factors associated with appropriate administration technique among patients attending the glaucoma clinic of Menelik II Referral Hospital

| Variables | | Administration Technique | | COR (95% CI) | AOR (95% CI) |
|---|---|---|---|---|---|
| | | Inappropriate | Appropriate | | |
| **Sex** | Male | 208 (84.2) | 39 (15.8) | 1.00 | 1.00 |
| | Female | 88 (79.27) | 23 (20.73) | 1.39(0.78, 2.47) | 304.56(3.27, 28383.56)* |
| **Religion** | Orthodox | 254 (82.46) | 54 (17.54) | 1.00 | 1.00 |
| | Islam | 13 (76.47) | 4 (23.53) | 1.45(0.45, 4.61) | 2.38(0.28, 20.00) |
| | Protestant | 24 (96) | 1 (4) | 0.20(0.03, 1.48) | 0.000(0.000, -) |
| **Occupation** | Retired | 98 (85.22) | 17 (14.78) | 1.00 | 1.00 |
| | Farmer | 18 (78.26) | 5 (21.74) | 1.60(0.53, 4.89) | 2.43(0.00, 3.5E10+6) |
| | House wife | 24 (82.75) | 5 (17.25) | 1.20(0.40, 3.58) | 0.02(0.00, 919.76) |
| | Employee | 61 (77.22) | 18 (22.78) | 1.70(0.82, 3.55) | 0.38(0.01, 14.57) |
| | Self-employed | 28 (82.35) | 6 (17.65) | 1.24(0.45, 3.43) | 1.73(0.03, 97.23) |
| | Other(s) | 68 (86) | 11 (14) | 0.93(0.41, 2.12) | 0.07(0.001, 6.61) |
| **Types** | Pseudoexfoliative | 111 (80.44) | 27 (19.56) | 1.00 | 1.00 |
| | Secondary | 3 (100.0) | 0 (0.0) | 0.00(0.00, -) | $9.9E^{+6}$ (0.00, -) |
| | $1^0$ Angle Closure | 38 (79.17) | 10 (20.83) | 1.08(0.48, 2.44) | 0.000 (0.00, 0.246)* |
| | Normal Tension | 3 (60.0) | 2 (40.0) | 2.74(0.44, 17.2) | 16.73(0.83, 3361.56) |
| | $1^0$ Open Angle | 79 (85.0) | 14 (15.0) | 0.73(0.36, 1.48) | 0.000 (0.00, 0.36)* |
| | Other(s) | 49 (90.74) | 5 (9.26) | 0.42(0.15, 1.15) | 0.00(0.00, -) |
| **Severity** | Early | 27 (84.4) | 5 (15.6) | 0.92(0.33, 2.59) | 3.65(0.72, 18.57) |
| | Moderate | 144 (83.24) | 29 (16.76) | 1.00 | 1.00 |
| | Advanced | 49 (75.4) | 16 (24.6) | 1.62(0.81, 3.24) | 3.46(1.09, 10.97)* |
| **Follow-up per year** | 1 – 2 times | 10 (83.33) | 2 (16.67) | 1.02(0.21, 4.83) | 7.76(0.27, 226.49) |
| | 3 – 4 times | 188 (83.55) | 37 (16.45) | 1.00 | 1.00 |
| | 5 – 6 times | 46 (78.00) | 13 (22.0) | 1.44(0.71, 2.92) | 3.52(0.95, 13.07) |
| | >6times | 53 (84.1) | 10 (15.9) | 0.96(0.45, 2.05) | 5.94(1.19, 29.62)* |
| **Previous Treatment** | None | 113 (79.6) | 29 (20.4) | 1.60(0.87, 2.91) | 0.28(0.0.01, 6.34) |
| | Surgery only | 143 (86.15) | 23 (13.85) | 1.00 | 1.00 |
| | Laser only | 17 (85.0) | 3 (15.0) | 1.10(0.30, 4.04) | 0.00(0.00, -) |
| | Laser & Surgery | 22 (78.57) | 6 (21.43) | 1.70(0.62, 4.63) | 5.38(0.006, 4592.51) |
| **Number of Medication** | One | 136 (77.7) | 39 (22.3) | 1.00 | 1.00 |
| | Two | 153 (87.43) | 12 (12.57) | 0.50(0.28, 0.9)* | 0.00(0.00, -) |
| | Three or more | 8 (88.9) | 1 (11.1) | 0.44(0.05, 3.59) | 0.00(0.00, -) |
| **Type of Medication** | Timolol (T) | 123 (77.85) | 35 (22.15) | 1.00 | 1.00 |
| | Latanoprost (L) | 0 (100) | 1 (0.00) | $5.7E^{+9}$(0.00, -) | 62543.9; 0.00(0.00, -) |
| | Pilocarpine (P) | 2 (100) | 0 (0.00) | 0.00 (0.00, -) | - |
| | Other(s) (O) | 10 (76.92) | 3 (23.08) | 1.05(0.27, 4.04) | 0.23(0.01, 6.22) |
| | T and P | 115 (87.12) | 17 (12.88) | 0.52(0.28, 0.98)* | - |
| **Pilocarpine Frequency** | 2 Times | 3 (75) | 1 (25) | 2.02(0.20, 20.5) | 0.31(0.02, 5.02) |
| | 3 Times | 49 (92.45) | 3 (7.55) | 0.37(0.10, 1.35) | 1566.76(0.00, $5.3E^{+10}$) |
| | 4 Times | 91 (85.85) | 15 (14.15) | 1.00 | 1.00 |
| **Time elapsed for consecutive drop** | Immediately | 10 (90.9) | 1 (9.1) | 0.25(0.07, 0.94)* | 0.01(0.00, 0.58)* |
| | 1-5 minutes | 42 (85.72) | 7 (14.28) | 0.72(0.26, 1.96) | 0.103(0.00, 3.57) |
| | 5-10 minutes | 51 (94.45) | 3 (5.55) | 0.43(0.05, 3.67) | 0.004(0.00, 1784.61) |
| | >10 minutes | 56 (81.16) | 13 (18.84) | 1.00 | 1.00 |
| **Side Effects** | Yes | 130 (82.2) | 27 (17.2) | 1.01(0.58, 1.77) | 0.13(0.02, 0.92)* |
| | No | 166 (83) | 34 (17) | 1.00 | 1.00 |
| **Visual Acuity** | (Near-) Normal | 95 (77.87) | 27 (22.13) | 1.00 | 1.00 |
| | Low Vision | 103 (86.55) | 16 (13.45) | 0.55(0.28, 1.08) | 0.001(0.000, 0.37)* |
| | (Near-) Blindness | 98 (85.2) | 17 (14.8) | 0.61(0.31, 1.19) | 0.12(0.005, 2.85) |

*Statistically Significant at P<0.05

### 4.8. Association of Adherence and Administration Technique

Among 153 (42.62%) patients who claimed adherent to their topical glaucoma medications, 40 (26.14%) of them appropriately administered their topical medications compared to 113 (73.86%) of them who inappropriately administered their medications. In contrast to this, among 206 (57.38%) patients who reported non-adherent to their topical glaucoma medications, 22 (10.68%) of them appropriately administered their topical medications compared to 184 (89.32%) of them who inappropriately administered their medications (Table 8).

Table 8: Relationship between adherence and administration technique of ocular hypotensives among patients attending the glaucoma clinic of Menelik II Referral Hospital

| | | Category of Glaucoma Medication Adherence | | Total |
|---|---|---|---|---|
| | | Non-adherent | Adherent | |
| Appropriateness of Administration Technique | Inappropriate | 184 (51.25%) | 113 (31.48%) | 297 (82.73%) |
| | Appropriate | 22 (6.13%) | 40 (11.14%) | 62 (17.27%) |
| Total | | 206 (57.38%) | 153 (42.62%) | 359 (100.0%) |

The odds of being adherent was almost three-fold (COR=2.96, 95% CI: 1.67-5.24, $p$ = 0.000) higher for patients who appropriately administered their medications compared to those who had not administered their eye drops adequately (Table 9).

Table 9: Univariate logistic regression analysis of medication adherence with administration technique among patients attending the glaucoma clinic of Menelik II Referral Hospital

| **Variables** | | **Adherence, n (%)** | | **COR (95% CI)** |
|---|---|---|---|---|
| | | Non-adherent | Adherent | |
| **Administration Technique** | Inappropriate | 184 (51.25%) | 113 (31.48%) | 1.00 |
| | Appropriate | 22 (6.13%) | 40 (11.14%) | 2.96(1.67, 5.24) |

## 5. DISCUSSION

The study has assessed adherence and administration technique of ocular hypotensive agents among glaucoma patients at Menelik II Referral Hospital. Glaucoma medication adherence can be measured in several ways including self-report, pharmacy refill reports, electronic monitoring and direct observation. To be clinically relevant, an 'acceptable' adherence level should be determined by its impact on clinical outcome (Olthoff *et al*., 2005). Such evidence is lacking for ocular hypotensive agents due to the requirement for long-term follow-up and known inaccuracies in determining IOP control, visual field defects or optic nerve damage (Kulkarni *et al*., 2008).

A gold standard measure of adherence remains elusive, but the experience of using Morisky Medication Adherence Scale-8 (MMAS-8) suggests that it is useful as an objective measure because the older techniques of interviewing patients in order to gain an estimate of their adherence is liable to the error of underreporting. Therefore, using this scale, threat of adherence to topical glaucoma medications was observed in 42.6% of the patients.

The present study identified 57.4% non-adherence rate which was similar to studies done in USA that reported non-adherence rates of 55% (Okeke *et al*., 2009), 60% (Stryker *et al*., 2010), 60% (Sleath *et al*., 2011) and in North West of England 69.8% (Richardson *et al*., 2013). Perhaps this similarity might be evident owing to the use of questionnaire for interviewing the patients and resemblance in sample size. However, the prevalence of non-adherence was greater than the non-adherence rates of other studies done in Greece 44% (Konstas *et al*., 2000), in Canada 27.9% (Kholdebarin *et al*., 2008) and in Dutch 27.3% (Olthoff *et al*., 2009). A systematic review of 31 studies also reported that non-adherence was an issue in more than 25% of patients (Lu *et al*., 2010). This differences can be expalained by the variances in the assessment tool used for adherence, methodologyemployed and study participants' knowledge and awareness about the glaucoma and its medications.

According to the literature, prevalence rates of reported non-adherence have varied widely from 5 to 80% from different glaucoma studies (Olthoff *et al*., 2005). The wide variation

may be partly attributable to inconsistency in the definition of non-adherence, subjectivity and heterogeneity in the frequently employed adherence assessment methods, differences in patient groups as well as the fact that patient self-reports are subjected to recall bias and that patients sometimes overestimate adherence to meet what they believe to be providers expectations (social desirability to be adherent to medication regimens) (Cate *et al*., 2013).

During multivariate logistic regression analysis in the present study, patients with higher educational level (diploma and/or above) were more likely to adherent being adherent compared to patients with lower educational level. This finding was similar to studies done in Canada (Kholdebarin *et al*., 2008), USA (Dreer *et al*., 2012; Boland *et al*., 2014) and Germany (Welge-lussen *et al*., 2015).Patients that are more literate might likely to question their eye care providers about glaucoma and its medications and might be more aware of the disease progression. Besides to the knowledge and awareness, these patients might have updated information on the importance of adherence, as patients might be less likely to be adherent if they did not understand that missing their medications increased the risk of poor vision. In the other point, self-employed (merchant) patients were more likely to be adherent compared to retired patients as the former patients might afford the medications easily. Moreover, retired patients are usually older than self-employed patients and hence they may have greater cognitive and physical impairment associated with aging.

The odds of being adherent was also approximately three fold higher for patients using pilocarpine twice a day compared to four times a day that was corresponded with a previous study (Konstas *et al*., 2000). This is evident by the fact that increased daily frequency of eye drop is associated with increased complexity of the regimen and patients may become feeble in taking of their medications and hence become less adherent. However, more emphasis should be given to the clinical importance of frequency of administration and available dosage preparations.

On the other hand, farmer patients were inversely but significantly associated with adherence and were less likely to be adherent compared to retired patients. This could be illustrated as majority of the farmers in developing countries are illiterate and hence may not be aware of the importance of adherence. Additionally, the patients may have limited

knowledge about glaucoma and usually have lower economic status and henceforth might not afford the medications.

The odds of being adherent for patients with very low monthly family income were also 78% lower compared to patients with high monthly family income because the earlier patients cannot afford their medications and hence more likely to be non-adherent. This finding was related to a previous study that revealed that unaffordability was a factor that significantly affects adherence (Friedman *et al*., 2009). Besides this, patients who had purchased topical hypotensive drops by themselves were less likely to be adherent compared to patients who had obtained the medications free of charge. The plausible reason might be due to an affordability issue of the medications. There might be premature discontinuation of the medications provided the patients consistently procured the medications by themselves.

With respect to the type of medications, differences in proportion of adherent and non-adherent patients did not reach statistical significance upon multivariate analysis but on univariate analysis, combination of timolol and pilocarpine and combination of pilocarpine and medications labeled as 'others' (such as dorzolamide (Xola®), Xolamol® (dorzolamide 20 mg + timolol 5 mg), brimonidine or betaxolol)were significantly associated with non-adherence when compared to timolol alone. This finding was complemented with the unadjusted odds ratio reported for non-adherence by a previous study (Olthoff *et al*., 2009).

Additionally, the odds of being adherent, in the current study, was 69% lower for patients who had taken two or more medications compared to patients who had taken only one medication. This result was corresponded with previously undertaken studies (Olthoff *et al*., 2009; Robin and Covet, 2005; Robin *et al*., 2007).The impressions of these previous researchers that stated non-adherence may be more common in patients receiving more medications and complex regimens was validated in the present study as eye drops burden negatively affect patient adherence to glaucoma treatment.

In this study, there was no significant correlation between age and sex with the medication adherence during the multivariate logistic regression analysis. The absence of a relationship between adherence and most of the socio-demographic factors was supported by the previous findings (Cate *et al*., 2013; Friedman *et al*., 2009; Konsta *et al*., 2000; Olthoff *et*

*al*., 2009; Ung *et al*., 2013; Welge-lussen *et al*., 2015). One plausible reason for this finding might be the characteristics of patients. The patients in the present study had a long history of glaucoma (for an average of 5.6 years) and were relatively familiar with their medication (the mean duration of taking hypotensive agents was 5.35 years). Therefore, demographic factors might have less influence on the adherence behavior of the study groups.

Multivariate analysis of the present study also indicated that medication adherence was not significantly associated with the type and severity of glaucoma, side effects (even though side effects were reported most commonly amongst those who were non-adherent in this study), duration of glaucoma diagnosis, obtaining information about drug administration, intraocular pressure and visual acuity. The result was analogous with different studies (Friedman *et al*., 2009; Hoevenaars, 2008; Konstas *et al*., 2000; Olthoff *et al*., 2009; Ung *et al*., 2013). It remains unclear whether these clinical parameters may influence the adherence behavior of glaucoma patients in general.

This study also indicated that proper administration of eye drops according to the WHO recommended procedures were a significant problem for glaucoma patients. Accordingly, the medication administration technique in the present study was inappropriate for majority of the study participants (82.7%) which was comparable to a study done in India with 90% rate (Gupta *et al*., 2012). The expected cause of this immense finding might be stemmed from inadequate provision of continuous education regarding eye drop administration from health care providers. These glaucoma patients might not have been periodically observed while performing the technique and reinforcement of the correct procedure might not have been routinely provided to them. Consequently, many patients were having difficulties in appropriate administration of eye drops.

However, the prevalence was much higher than studies done in USA 44% (Sleath *et al*., 2006) and 42.1% (Schwartz *et al*., 2013), in UK54.1% (Tatham *et al*., 2013), in Greece 47% (Konstas *et al*., 2000) and in Canada 33.8% (Kholdebarin *et al*., 2008). This enormous dissimilarity might have emanated from differences in the assessment tool used, characteristics of study population such as literacy level, number of participants and from the fact that developed countries have better health facilities that can easily facilitate educational interventions. The use of video recording in these previous studies might alert

the patient to give an exemplified but fabricated administration technique, which could not assess the routine instillation proficiency.

During the multivariate analysis in this study, the odds of appropriate administration of eye drops were almost three hundred higher for females compared to males as females may be relatively more cautious and have more spare times at their homes than males for the administration of eye drops in developing countries like Ethiopia. However, the 95% confidence interval was very wide (3.27 to 28383.56) which may indicate a spurious association. Knowledge about the effect of gender on administration technique is very scanty and hence further information is needed.

Severity of glaucoma was also significantly associated with appropriate instillation technique in which patients with advanced glaucoma were more likely to appropriately administer their medications compared to patients with moderate glaucoma. This could be attributed as the former patients might be more cautious about their glaucoma progression, have a fear of progression to blindness (Lacey *et al*., 2009) and have a potentially threatening condition, which may be key motivators for proper administration technique.

The odds of administering eye drops appropriately for patients with the most frequent follow-up were almost six-fold more compared to patients with less frequent follow-up. Patients with regular, numerous and tight follow-up might have obtained better guidance and information from providers, had better communication with providers and had regular checkup of their disease than patients with loose follow-up.

In contrary to the above, the odds of appropriate administration of eye drops were almost 100% lower for patients with primary angle closure glaucoma compared to patients with pseudoexfoliative glaucoma. The reason for this finding may be as angle closure glaucoma has dramatic symptoms such as severe eye pain, nausea and vomiting, headache, blurred vision and profuse tearing that made the patients to feel noxious and thereby inadequately instill their topical medications. Similar to this, patients with primary open angle glaucoma had similar lower odds of appropriate technique compared to patients with pseudoexfoliative glaucoma. Patients with open angle glaucoma do not have early warning or painful symptoms and develops slowly and sometimes without noticeable sight loss for

many years which can affect the commitment of the patient to appropriately administer the medications.

The other factor that was inversely but significantly associated with appropriate administration technique was the time elapsed to administer the second or consecutive drop. The odds of administering eye drop appropriately for patients who had immediately administered the second or consecutive drop were 99% lower compared to patients who had waited more than ten minutes. Immediate administration of the second or consecutive dose might be a sign of hastiness or a condition of urgency and the patient, in turn, might able to miss the critical procedures and hence affects the overall administration proficiency.

In addition to this, patients who had experienced an immediate side effect were more likely to incorrectly administer their topical medications compared to those participants who did not experienced side effect. This is notable as experience of side effects could cause physical and/or emotional sensation and patients might prematurely discontinue the instillation procedures. The other factor that had a negative but significant correlation with appropriate administration technique was low vision in which patients with low vision were less likely to properly administer their medications compared to patients with (near-) normal vision which was corresponded with previous studies (Dietlein *et al*., 2008; Welge-lussen *et al*., 2015). Patients with low vision might be more prone to error in administering procedures because they might unable to follow and notice fine details of the procedure and confronted with many daily and routine problems. Therefore, low vision can have a pronounced association with poor instillation technique of eye drops. Nevertheless, this statistical significance might not be clinical significant since patients with (near-) blindness did not show any statistical significance with the administration technique of ocular hypotensive agents.

This study, on the contrary, depicted that appropriate instillation proficiency was not significantly associated with age, educational level, intraocular pressure, length of time the patient had been using eye drops and other patient and clinical parameters which was similar to previous studies (Tatham *et al*., 2013; Welge-lussen *et al*., 2015). The possible explanations for this finding might be the nature of study participants. The patients enrolled in this study were having long duration of diagnosis and long experience of taking

medications (with a mean of 5.6 years and 5.35 respectively) so that patient and clinical related variables might have a lesser influence on the adequacy of administration technique. However, factors associated with poor technique had been examined with older age and limited school education (Kholdebarin *et al*., 2008). This difference may be evident because of the study settings difference. The study done by Kholdebarin *et al* (2008) employed ten multicenter study areas compared to a single site used in the present study.

During univariate logistic regression analysis, the odds of appropriate administration for two or more medications and combinations of timolol and pilocarpine were found be to significantly associated with poor administration technique which was in line with a study done in USA (Sleath *et al*., 2006). This can be explained as increased number of medications complicates and lengthens the instillation procedure and the patient becomes languish in applying the medications accurately. However, the balance between the clinical importance of combination of medications and its effect on adherence should be outweighed.

Another factor that was found to have inverse relationship with proper administration technique was immediate application of the second or consecutive drop. Patients who had immediately administered the second or consecutive drop might unable to follow the correct procedures and even the next drop could not reach ocular concentration. Patients should, therefore, be advised on the importance of time gapping between two drops.

Almost 60% of the study participants were either non-adherent or improperly administered their eye drops similar to studies done in USA that reported analogous rates(Taylor *et al*., 2002), in Greece 53% (Konstas *et al*., 2000) and Canada 50% (Kholdebarin *et al*., 2008).Additionally, the odds of being adherent was almost three-fold higher for patients who appropriately administered their medications compared to those who had not administered their eye drops adequately (COR=2.96, 95% CI: 1.67-5.24, p=0.000).This implied that adherence and administration technique are interconnected and poor practicing in administration technique could jeopardize adherence and vice versa.

Improper administration technique and poor adherence increase failure to deliver the desired drug to the eye and in turn lead to wasted medication and poor IOP control, and

eventually augment frequent changes in medication and more frequent hospital episodes (Tatham *et al*., 2013).In contrast, good adherence and drop instillation technique have the potential to improve drug delivery, increase the effectiveness of treatment, and therefore potentially reduce the number of patient visits. In other words, if resources are deployed to improve patients' drop technique and adherence, there are likely to be savings elsewhere (Tatham *et al*., 2013). Thus, eye care providers and other stakeholders should give more emphasis on the proper education of adherence and instillation technique.

The study has certain limitations. Cross-sectional nature of the study did not allow a follow-up, which would have provided a better design for identifying the factors associated with adherence and administration technique. Another limitation was that the results were relied on patients' response and hence patients are known to overestimate their ability to adhere with their therapy. Therefore, other objective methods of assessing adherence such as electronic medication monitoring system or biological assays would have lessened this limitation. The questionnaire was also only administered to patients of a single center, which may not represent the general population of glaucoma patients and have a limit in broader applications of these findings. Consequently, studies with more extensive study settings, longer assessment period, long-term follow-up period and objective measurements of adherence and administration technique should be planned in the future.

However, this study gave some useful insight into the adherence and appropriateness of eye drop instillation proficiency among the study population and provided useful baseline information for consultative, comparative and future research purposes in the study center.

## 6. CONCLUSION

In summary, the findings from the present study indicated that the rate of adherence to topical glaucoma medications in Menelik II Referral Hospital was suboptimal. Factors were identified that may provide useful information in identifying adherent patients and patients who had appropriately administered their ocular hypotensive agents. Patients with higher educational level, self-employed patients and patients who had taken lesser daily frequency of eye drops had positive and significant association with adherence. Nevertheless, being a farmer, having a very low monthly family income and self-purchasing of the medications had a significant association with non-adherence. Besides this, the rate of appropriate eye drop administration technique in the present study was found to be very poor. Being a female, having advanced glaucoma and having more frequent follow-up had an important role in deciding appropriate eye drop administration technique. In contrary, patients with primary angle closure and open angle glaucoma, who had immediately administered their second or consecutive dose, who had immediately experienced side effect and who had low vision were inversely associated with appropriate administration technique. The odds of being adherent was almost three-fold higher for patients who had appropriately administered their topical medications compared to those who had not administered their eye drops adequately. The current findings signposted poor adherence and worrisome proficiently in eye drop instillation. Interventions are, therefore, needed to address these modifiable and non-modifiable factors related to adherence and administration technique of ocular hypotensive agents.

## 7. RECOMMENDATIONS

- The results of this study highlight multiple avenues eye care providers can use to improve patients' adherence and eye drop administration proficiency. The variability in patients' practices suggested that eye care providers need to first ask patients how they actually administer their glaucoma medications. In fact, it may be helpful to directly observe patients when administering eye drops.
- Pharmacy professionals should give tailored educations and instructions about the importance of adherence and optimal eye drop administration techniques when they dispense eye drops in particular ocular hypotensive agents to customers. Therefore, it is recommended that drop instillation technique ought to be routinely taught and assessed for patients with glaucoma at the dispensary.
- Since prevalence rates of adherence and proper administration technique are low and suboptimal in the present study, efforts should be done to educate patients through medias and to allocate budgets for preparing posters and brochures which displays adequate and relevant information about the specific and detailed procedures of eye drop administration techniques.

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## 9. ANNEXES

### Information Sheet

Dear participant, Good Morning/Afternoon

Introduction

My name is _____. I am a member of the study that is carried out at Menelik II Referral Hospital entitled with "***Adherence and Administration Technique of Ocular Hypotensives among Glaucoma Patients in Menelik II Referral Hospital, Addis Ababa, Ethiopia".*** In particular, I am interested to investigate your adherence experience and topical glaucoma medication administration technique.

### Objective

The main purpose of this study is to assess adherence and administration technique of ocular hypotensives among glaucoma patients at Menelik II Referral Hospital, Addis Ababa, Ethiopia. Your input will be extremely valuable as the information will be used to assess the medication use and adherence and to identify gaps in in medication administration technique.

### Expected Outcomes and/or Benefits

At the end of the study, adherence and administration technique of ocular hypotensives will be evaluated. Therefore, the study will identify and investigate the main gaps and challenges associated with adherence and administration technique and will propose the feasible recommendations and may benefit you directly or indirectly by improving the glaucoma service in the hospital.

**With many thanks for your help.**

**Informed Consent Form**

Everything from your information and records would be completely confidential to the research and the data are stored without your name and only used for the purpose of this study. None of this would affect the care you receive from Menelik II Referral Hospital, but will help in future planning for the hospital. No identifying names or characteristics will go into my report, so you may share your thoughts openly. Additionally, taking part in this study is completely voluntary. It is your choice whether to participate or not. You may skip any questions that you do not want to answer. Please ask me to stop as we go through the information and I will take time to explain.

I would be grateful if you could sign the attached form to say you have no objections to our accessing any records concerning you and interviewing you. Would you be willing to assist me by having a 30-45 minutes' interview with me? Interview accepted: Yes ❒ No ❒

If the interviewee responds "Yes" please proceed and let him/her to sign or replies "No" gratitude him/her and quit the interview. If you have any questions concerning the study, please call **Tesfay Mehari (+251) 914-01 45 15.**

_____ _____

Signature of respondent Signature of interviewer

Date: _____ (Day/month/year)

With many thanks for your help.

**Tesfay Mehari Atey (B. Pharm)**

Principal Investigator

Department of Pharmacology and Clinical Pharmacy, School of Pharmacy,

College of Health Sciences, Addis Ababa University

Email: tesmar11@gmail.com

Mobile: +251-914 01 45 15

## Annex I: Data Collection Instruments

### A. Structured Questionnaire

| 1. | **SCIO DEMOGRAPHIC INFORMATION** |
|---|---|
| 1.1. | **Age:** _____ (Write in number)<br>❑ 18-40 ❑ 41-60 ❑ 61-80 ❑ ≥81 |
| 1.2. | **Sex**<br>❑ Male ❑ Female |
| 1.3. | **Marital Status**<br>❑ Single ❑ Married ❑ Divorced ❑ Widowed |
| 1.4. | **Ethnicity**<br>❑ Amhara ❑ Gurage<br>❑ Oromo ❑ Other(s) [specify]:_____<br>❑ Tigre |
| 1.5. | **Educational Level:** _____(Write in number/word)<br>❑ Illiterate or Non-Formal Education ❑ High School (Grade 9-12)<br>❑ Elementary School (Grade 1-8) ❑ Diploma and Above |
| 1.6. | **Place of Residence**<br>❑ Rural ❑ Urban |
| 1.7. | **Religion**<br>❑ Orthodox ❑ Islam ❑ Protestant ❑ Other(s) [Specify]:_____ |
| 1.8. | **Occupation**<br>❑ Retired ❑ Employee (Paid Work)<br>❑ Farmer ❑ Self- employed/Merchant<br>❑ House Wife ❑ Other(s) [Specify]:_____ |
| 1.9. | **Monthly Family Income (ETB):** _____(Write in number)<br>❑ Very Low (< 445 Birr) ❑ Above average (2501-3500 Birr)<br>❑ Low (446-1200 Birr) ❑ High (>3501 Birr)<br>❑ Average (1201-2500 Birr) |
| **2.** | **DISEASE RELATED FACTORS** |
| 2.1. | What is the **duration** since the **diagnosis** of your glaucoma?**:** _____ (Write in number/words)<br>❑ 0.5-2 years ❑ 5-6 years ❑ Unknown<br>❑ 3-4 years ❑ >6 years |
| 2.2. | For **how long time** have you taken your glaucoma **medications?:** _____ (Write in number/words)<br>❑ 0.5-2 years ❑ 5-6 years ❑ Unknown<br>❑ 3-4 years ❑ >6 years |

| | | | | | |
|---|---|---|---|---|---|
| 2.3. | What is your **average** frequency of **follow-up** per year?**:** _____ (Write in number/words)<br>❑ 1-2 times ❑ 5-6 times<br>❑ 3-4 times ❑ ≥ 6 times | | | | |
| 2.4. | Have you ever taken **surgery/laser treatment** in the previous times**?**<br>❑ None ❑ Laser only<br>❑ Surgery only ❑ Surgery and laser | | | | |
| 2.5. | Do you have **any major comorbidities** other than glaucoma [cardiovascular disease (angina, heart failure, hypertension), central nervous problems (epilepsy, Parkinson's disease etc.), alcohol abuse, rheumatoid arthritis etc.]<br>❑ Yes ❑ No | | | | |
| **3.** | **MEDICATION RELATED FACTORS** | | | | |
| 3.1. | How **many medications** do you use for your glaucoma?<br>❑ One ❑ Two ❑ Three or more | | | | |
| 3.2. | What **type** of glaucoma **medications** do you use? | ❑ Timolol | ❑ Latanoprost | ❑ Pilocarpine | ❑ Other(s) [Specify]: _____ |
| 3.3. | What is the **daily frequency** of administration of your glaucoma **medications**? | ❑ 1 time<br>❑ 2 times<br>❑ 3 times<br>❑ 4 times | ❑ 1 time<br>❑ 2 times<br>❑ 3 times<br>❑ 4 times | ❑ 1 time<br>❑ 2 times<br>❑ 3 times<br>❑ 4 times | ❑ 1 time<br>❑ 2 times<br>❑ 3 times<br>❑ 4 times |
| 3.4. | **How many drops per dose do you use at a time?** If the response to this question is "One" [Skip to question no. **3.6**.] | ❑ One<br>❑ Two or more | ❑ One<br>❑ Two or more | ❑ One<br>❑ Two or more | ❑ One<br>❑ Two or more |
| 3.5. | If the response to question 3.4 is "**two or more drops",** how much **time** do you **wait** to **administer** the second or consecutive drop?<br>❑ Immediately ❑ 5-10 minutes<br>❑ 1-5 minutes ❑ >10 minutes | | | | |
| 3.6. | Have you ever experience any **side effects** from the medications [such as redness, itching, burning, blurring of vision, etc.] **immediately** after starting the dose?]<br>❑ Yes ❑ No | | | | |
| 3.7. | How do you **get** the medications?<br>❑ Free of charge ❑ Self-buy | | | | |
| 3.8. | Do you have any **financial problem** to get the drugs?<br>❑ Yes ❑ No | | | | |
| 3.9. | Do you take **other eye drops** than glaucoma medications?<br>❑ Yes ❑ No | | | | |

| 4. | PATIENT RELATED FACTORS |
|---|---|
| 4.1. | Do you get **adequate/relevant information** about glaucoma eye drop **administration technique** form **physicians** at the time of **consultation**?<br>❑ Yes ❑ No |
| 4.2. | Do you get **adequate/relevant information** about glaucoma eye drop **administration technique** form **pharmacists** at the time of **dispensary**?<br>❑ Yes ❑ No |
| 4.3. | Do you get **additional information** about glaucoma eye drop **administration technique** from **leaflets, brochures and other materials**?<br>❑ ❑ |
| 4.4. | Do you have **family support** for eye drop use?<br>❑ Yes ❑ No ❑ Sometimes |
| 4.5. | Do you have a **very busy daily schedule** [that makes you to forget to take the eye drop(s)]?<br>❑ Yes ❑ No |

**B. Data Abstraction Format**

| 1. | GLAUCOMA RELATED FACTORS |
|---|---|
| 1.1. | **Types of Glaucoma**<br>❑ Pseudoexfoliative Glaucoma ❑ Normal Tension Glaucoma<br>❑ Secondary Glaucoma ❑ Primary Open Angle Glaucoma<br>❑ Primary Angle Closure Glaucoma ❑ Other(s) [Specify]:_____ |
| 1.2. | **Severity of Glaucoma**<br>❑ Early Glaucoma ❑ Moderate Glaucoma ❑ Advanced Glaucoma |
| **2.** | **MEASUREMENTS** |
| 2.1. | **Intra-Ocular Pressure (IOP-mmHg)**<br>❍ Right Eye:_____<br>❍ Left Eye:_____<br>❑ **Category**<br>❍ Lower than Normal IOP (<10 mmHg)<br>❍ Normal IOP (10-21 mmHg)<br>❍ Higher than Normal IOP (>21 mmHg) |
| 2.2. | **Visual Acuity (VA-Snellen Chart)**<br>❍ Right Eye**:**_____<br>❍ Left Eye**:**_____<br>❑ **Category**<br>❍ (Near-) Normal Vision (6/6 to 6/18)<br>❍ Low Vision (6/24 to 2/60; Counting Finger≥ 1 meter(s))<br>❍ (Near-) Blindness (1/60 or less to No Light Perception; Counting Finger < 1 meter and in front, Light Perception, Hand Motion) |

| C | Morisky Medication Adherence Scale - 8 (MMAS-8) | | |
|---|---|---|---|
| | **Questions** | **Yes** | **No** |
| 1. | Do you **sometimes forget** to take your eye drop(s)? | | |
| 2. | People **sometimes** miss taking their eye drop(s) for **reasons other than forgetting**. Thinking over the **past two weeks**, were there **any** days when you did **not** apply your eye drop(s)? | | |
| 3. | Have you ever **cut back or stopped** taking your eye drop(s) **without** telling your **doctor** because you **felt worse** when you took it? | | |
| 4. | When you **travel** or leave home, do you sometimes **forget** to bring along your eye drop(s)? | | |
| 5. | Did you take **all** your eye drop(s) **yesterday**? | | |
| 6. | When you feel like your **eye pressure** is **under control**, do you **sometimes stop** taking your eye drop(s)? | | |
| 7. | **Applying** eye drop(s) **every day** is a real **inconvenience** for **some** people. Do you ever feel **hassled** about sticking to your treatment **plan**? | | |
| 8. | How often do you have **difficulty remembering** to apply **all** your eye drop(s)? ❑ Never/rarely ❑ Once in a while ❑ Sometimes ❑ Usually ❑ All the time | | |

| D | Eye Drop Administration Technique-9 | | | |
|---|---|---|---|---|
| | **Procedures** | **Always /Usually** | **Often** | **Rarely /Never** |
| 1. | How often do you **remember to wash your hands** thoroughly with **soap and water** before the procedure? | | | |
| 2. | How often do you **touch** the dropper's **opening** against your eye, face, hand or anything else? | | | |
| 3. | How often do you **pull down your lower eyelid** to form a **pocket or "gutter"** while slightly tilting your head up**?** | | | |
| 4. | How often do you position the tip of bottle so that it does not **come closer than 2cm** above your lower lid? | | | |
| 5. | How often do you **apply** the prescribed **amount of doses** in the "gutter" **correctly**? | | | |
| 6. | How often do you **close** your eyes for at least **2 minutes** after instilling of the medication? | | | |
| 7. | How often do you **shut, massage** your eye too tight and/or **blink or squeeze** your eyelids after applying the drops? | | | |
| 8. | How often do you **occult naso-lacrimal route** for **2 minute**s immediately after instilling drops? | | | |
| 9. | How often do you use a clean **tissue, handkerchief or others to absorb excess** eye drops that run onto the cheeks? | | | |
| | ❑ Never/rarely ❑ Once in a while ❑ Sometimes ❑ Usually ❑ All the time | | | |

Date: _____ (Day/month/year) Medical Card No: _____

_____ _____

Name and Signature of the Data Collector Name and Signature of the Principal Investigator

## የጥናቱ መረጃ ቅጽ

**ቀን፡-**_____

**ውድ የቃለ መጠይቅ ተሳታፊ፤ እንደምን አደሩ/ዋሉ?**

**የጥናቱ መግቢያ**

ስሜ_____ ይባላል። “በዳግማዊ ምኒልክ ሪፈራል ሆሲፒታል በግላኮማ ታካሚዎች ዙርያ የግላኮማ መድኃኒቶች በታዘዘው መሰረት በአግባቡ የአወሳሰድና የአጠቃቀም ክህሎት” የተሰኘ የድህረ ምረቃ ጥናት አባል ነኝ። በተለይ የእርስዎ የመድሓኒት አጠቃቀም በጥናቱ ላይ በደንብ ከሚጠኑ ነጥቦች አንዱ ነዉ።

**የጥናቱ አላማ**

የዚህ ጥናት ዋና አላማው የግላኮማ መድኃኒቶች እንዴት እንደምጠቀሙት፣ በታዘዘው መሰረት በአግባቡ እንዴት መድኃኒትዎን እንደምወሰዱት እና መድኃኒትዎን ሁል ጊዜ እንዳይወሰዱ የሚያደርጉ ዋና ዋና ምክንያቶችና ክፍተቶችን በመለየት፤ የመፍትሄ ሀሳቦችን ማቅረብ ነው።

**ከጥናቱ የሚጠበቁ ውጤቶች/ጥቅሞች**

በዚህ ጥናት ላይ የእርስዎ የግላኮማ መድኃኒቶች በታዘዘው መሰረት በአግባቡ የአወሳሰድና የአጠቃቀም ክህሎት በድንብ ይጠናሉ። መድኃኒትዎን ሁል ጊዜ እንዳይወሰዱ የሚያደርጉ ዋና ዋና ምክንያቶችና ክፍተቶችን በመለየት፤ የመፍትሄ ሀሳቦችን ማቅረብ ነው።በተጨማሪም ከጥናቱ በሚገኙ ግኝቶች የግላኮማ ህክምና ዉጤትን በተወሰነ መልኩ ለማሻሻል እንደሚቻል በመገመት፤ እርስዎ የጥቅሙ ተቋዳሽ ይሆናሉ ብለን እናምናለን። ስለዚህ የእርስዎ ቅንና ሓቀኛ መረጃ ለጥናቱ እጅግ በጣም ወሳኝ ነው።

**የተከበረ ጊዜዎ ስለሰጡን እጅግ በጣም እናመሰግንዎታለን።**

## በቃለ መጠይቅ ለመሳተፍ የፈቃደኝነት ቃል መቀቢያ ቅጽ

በዚህ ጥናት የእርስዎ መረጃ ሙሉ በሙሉ በምስጥር የተጠበቀና ለምርምሩ አላማ ብቻ የሚዉል ነው። በተጨማሪም የእርስዎ ተሳታፊነት በፈቃደኝነት የተመሠረተ ነው። የጥናቱ አላምውን ተረድተውና ጊዜዎን ሰውተው፤ ከ 30-45 ደቂቃዎች ለሚፈጅ ቃለ-መጠይቅ እውተኛው መረጃ ለመስጠት ፍቃደኛ በመሆንዎ በቅድሚያ አመሰግናለሁ።

በየትኛው ጊዜ ጥያቄ ካለዎት **ተስፋይ መሓሪ** ብለው በ ስ.ቁ. (+251) 914-01 45 15 ወይም በ ኢ-ሜይል tesmar11@gmail.com ይጠይቁን።

| | |
|---|---|
| _____ | _____ |
| የቃለ መጠይቅ የቀረበለት ሰው ፊርማ | የቃለ መጠይቅ አቅራቢ ፊርማ |

**የተከበረ ጊዜዎ ስለሰጡን እጅግ በጣም እናመሰግንዎታለን።**


ተስፋይ መሓሪ

ዋና አጥኚ

አዲስ አበባ ዩኒቨርሲቲ፣ ጤና ሳይንስ ኮሌጅ፤ ፋርማሲ ስኩል፤ ፋርማኮሎጅና ክሊኒካል ፋርማሲ ትምህርት ክፍል

**ኢ-ሜይል**: tesmar11@gmail.com

**ስ/ቁ**: +251-914 01 45 15

**Annex II: Amharic Version of Data Collection Instrument**

## A. ቃለ መጠይቅ

| | |
|---|---|
| **1.** | **ስለ ታካሚው አጠቃላይ መለያዎች** |
| 1.1. | **ዕድሜ:-** _____ (በቁጥር ይፃፍ)<br>❑ 18-40 ❑ 41-60 ❑ 61-80 ❑ ≥81 |
| 1.2. | **ፆታ**<br>❑ ወንድ ❑ ሴት |
| 1.3. | **የጋብቻ ሁኔታ**<br>❑ ያላገባ ❑ ያገባ ❑ የፈታ/ች/ ❑ ባል የሞተበት /ሚስት የሞተችበት |
| 1.4. | **ብሔር**<br>❑ አማራ ❑ ጉራጌ<br>❑ ኦሮሞ ❑ ሌላ/ሌሎች (ይገለፅ):-___<br>❑ ትግሬ |
| 1.5. | **የትምህርት ደረጃ:-** _____ **(በቁጥር ይፃፍ)**<br>❑ ያልተማረ/ች ወይም ኢ-መደበኛ ትምህርት ❑ ሁለተኛ ደረጃ (ከ9-12 ክፍል)<br>❑ አንደኛ ደረጃ (ከ 1-8 ክፍል) ❑ ዲፕሎማ እና ከዛ በላይ |
| 1.6. | **መኖሪያ ቦታ**<br>❑ ገጠር ❑ ከተማ |
| 1.7. | **ሀይማኖት**<br>❑ ኦርቶዶክስ ❑ እስልምና ❑ ፕሮቴስታንት ❑ ሌላ/ሌሎች (ይገለፅ):-_____ |
| 1.8. | **የስራ ሁኔታ**<br>❑ ጡረተኛ ❑ ተቀጣሪ (ሠራተኛ)<br>❑ አርሶ-አደር ❑ የግል ስራ/ነጋዴ<br>❑ የቤት-እመቤት ❑ ሌላ/ሌሎች (ይገለፅ):-_____ |
| 1.9. | **ወርሓዊ የቤሰተብ ገቢ (በብር)**_____ (በቁጥር ይፃፍ)<br>❑ በጣም ዝቅተኛ(< 445 ብር) ❑ አማካይ (1201-2500 ብር)<br>❑ ዝቅተኛ (446-1200 ብር) ❑ ከፍተኛ (>3501 ብር)<br>❑ ከአማካይ በላይ (2501-3500 ብር) |
| **2.** | **ከግላኮማ ጋር የተያያዙ ነገሮች** |
| 2.1. | ግላኮማ **እንዳለብዎ ከተነገርዎት** ስንት ጊዜ ሁነውታል? _____ (በቁጥር/በቃል ይፃፍ)<br>❑ 0.5-2 አመታት ❑ 5-6 አመታት ❑ አላውቀውም<br>❑ 3-4 አመታት ❑ >6 አመታት |
| 2.2. | የግላኮማ **መድኃኒትን** መጠቀም **ከጀመሩ** ስንት ጊዜ ሁነውታል? _____ (በቁጥር/በቃል ይፃፍ)<br>❑ 0.5-2 አመታት ❑ 5-6 አመታት ❑ አላውቀውም<br>❑ 3-4 አመታት ❑ >6 አመታት |
| 2.3. | **በየአመቱ በአማካይ ስንት ጊዜ ክትትል** ያደርጋሉ?_____ (በቁጥር/በቃል ይፃፍ)<br>❑ 1-2 ጊዜ ❑ 5-6 ጊዜ<br>❑ 3-4 ጊዜ ❑ ≥ 6 ጊዜ |
| 2.4. | በባለፉት ጊዚያት **የአይን ቀዶ ጥገና** ወይም **የሌዜር (ጨረር)** ህክምና ወስደው ያውቃሉ?<br>❑ አልወሰድኩም ❑ የሌዜር (ጨረር) ህክምና ብቻ<br>❑ ቀዶ ጥገና ብቻ ❑ ቀዶ ጥገና ና የሌዜር ህክምና |
| 2.5. | ከግላኮማ **ውጪ ሌላ** በሽታ (የጤና ችግር) (ለምሳሌ **የልብ ችግር፣የደም ግፊት፣የምጥል በሽታ፣ የፓርንክሰን** |

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| | **በሽታ፣ የሪህ በሽታ፣ የ አልኮል ሱሰስነት** ና ሌሎችም) አለቦት እንዴ?<br>❑ አለኝ ❑ የለኝም | | | | |
| **3.** | **ከመድኃኒት ጋር የተያያዙ ነገሮች** | | | | |
| 3.1. | ለግላኮማው **ስንት አይነት መድኃኒቶች** ይጠቀማሉ?<br>❑ አንድ ❑ ሁለት ❑ ሶስት ና ከዛ በላይ | | | | |
| 3.2. | **ምን አይነት** የግላኮማ **መድኃኒት** ይጠቀማሉ? | ❑ ትሞሎል | ❑ ላታናፕሮስት | ❑ ፓይሎካርፕን | ❑ ሌላ/ሌሎች (ይገለፅ):-<br>____ |
| 3.3. | የግላኮማ መድኃኒትዎን **በቀን** ስንት ጊዜ ይጠቀማሉ? | ❑ 1 ጊዜ<br>❑ 2 ጊዜ<br>❑ 3 ጊዜ<br>❑ 4 ጊዜ | ❑ 1 ጊዜ<br>❑ 2 ጊዜ<br>❑ 3 ጊዜ<br>❑ 4 ጊዜ | ❑ 1 ጊዜ<br>❑ 2 ጊዜ<br>❑ 3 ጊዜ<br>❑ 4 ጊዜ | ❑ 1 ጊዜ<br>❑ 2 ጊዜ<br>❑ 3 ጊዜ<br>❑ 4 ጊዜ |
| 3.4. | **<u>በአንድ ጊዜ</u> ስንት የጠብታ <u>ዓይነትና ብዛት</u> ይጠቃማሉ?** (ለዚህኛው ጥያቄ መልሱ "አንድ" ከሆነ ወደ ተ.ቁ 3.6. ይሀዱ) | ❑ አንድ<br>❑ ሁለትና ከዛ በላይ | ❑ አንድ<br>❑ ሁለትና ከዛ በላይ | ❑ አንድ<br>❑ ሁለትና ከዛ በላይ | ❑ አንድ<br>❑ ሁለትና ከዛ በላይ |
| 3.5. | የተ.ቁ **<u>3.4</u>**. መልስ **"ሁለትና ከዛ በላይ"** ከሆነ፣ **<u>ሁለተኛው ወይም የሚከተለው ጠብታ</u>** ለመጠቀም **<u>ስንት ያህል ጊዜ ይጠብቃሉ?</u>**<br>❑ ወድያውኑ ❑ 1-5 ደቂቃዎች ❑ 5-10 ደቂቃዎች ❑ >10 ደቂቃዎች | | | | |
| 3.6. | መድኃኒትዎን **<u>ልክ እንደወሰዱ</u>** (እንደተጠቀሙ) **<u>የጎንዮሽ ችግር</u>** አጋጥሞት ያውቃሉ? (ለምሳሌ **<u>የአይን መቅላት፣ ማሳከክ፣ መቆርቀር፣ ብዥታ</u>**ና ሌሎችም)<br>❑ አዎ ❑ የለም | | | | |
| 3.7. | መድኃኒቶቹ **እንደት ያገኛሉ?**<br>❑ በነፃ ❑ ራሴን እገዛለሁ | | | | |
| 3.8. | መድኃኒትዎን **ለመግዛት የፋይናነስ ችግር አለብዎት?**<br>❑ አዎ ❑ የለኝም | | | | |
| 3.9. | ከግላኮማ መድኃኒቶች **<u>ውጪ</u>** ሌሎች **<u>የአይን ጠብታዎች</u>** ይጠቀማሉ ወይ?<br>❑ አዎ ❑ አልጠቀምም | | | | |
| **4.** | **ከታካሚ ጋር የተያያዙ ነገሮች** | | | | |
| 4.1. | በግላኮማ ክሊንክ **ቀጠሮ** ሲነሮት **ከሀኪሞ** ስለ የግላኮማ መድኃኒት **አጠቃቀምና የአወሳሰድ ሂደት (ክህሎት) በቂና አስፈላጊ ምክር** ያገሻሉ?<br>❑ አገኛለሁ ❑ አላገኝም | | | | |
| 4.2. | መድኃኒትዎን ከመድኃኒት ቤት **(ፋርማሲ)** ሲገዙ **ከመድኃኒት ባለሞያው** ስለ የግላኮማ መድኃኒት **አጠቃቀምና የአወሳሰድ ሂደት (ክህሎት) በቂና አስፈላጊ** ምክር ያገሻሉ?<br>❑ አገኛለሁ ❑ አላገኝም | | | | |
| 4.3. | በተለያዩ ጊዜ **ከበራሪ ወረቀቶች፣ መፃሓፍትና** ሌሎች **ፅሕፎች** ስለ የግላኮማ መድኃኒት **አጠቃቀምና የአወሳሰድ ሂደት (ክህሎት) ተጨማሪ መረጃ** ያገሻሉ?<br>❑ አገኛለሁ ❑ አላገኝም | | | | |
| 4.4. | የአይን ጠብታ ሲጠቀሙ (ስወሰዱ) **የቤተሰብ እርዳታ** ይሻሉ/ይጠቀማሉ?<br>❑ አዎ ❑ አልጠቀምም | | | | |
| 4.5. | በየቀኑ (እጅግ) **የተጨነናቀ** ስራ አለብዎት [መድሓኒትዎን መውሰድ **እስከሚያስረሳ** ድረስ]?<br>❑ አዎ ❑ የለኝም | | | | |

## B. መረጃ መሙያ ቅጽ

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| **1.** | **ከግላኮማ ጋር የተያያዙ ነገሮች** |
| 1.1. | **የግላኮማ አይነት**<br>❑ **ሲዶ-ኤክስፎልየትቭ** ግላኮማ ❑ **ኖርማል** ተንሸኘ ግላኮማ<br>❑ **ሰከንደሪ** ግላኮማ ❑ ፕራይሜሪ ኦፕን አንግል ግላኮማ<br>❑ ፕራይሜሪ አንግል **ክሎዝር** ግላኮማ ❑ ሌላ/ሌሎች (ይገለፅ)፡-_____ |
| 1.2. | **የግላኮማ ክብደት**<br>❑ መጠነኛ/መጀመርያ ደረጃ/ ግላኮማ ❑ መሀከለኛ ደረጃ ግላኮማ ❑ ከባድ/ከፍተኛ ደረጃ/ ግላኮማ |
| **2.** | **መለኪያዎች** |
| 2.1. | **የአይን ግፊት (በ ሚ.ሜ. ሜርኩሪ)**<br>❍ ቀኝ አይን:-_____<br>❍ ግራ አይን:-_____<br>❑ **ክፍል**<br>❍ ከመደበኛ ግፊት በታች (<10 ሚ.ሜ. ሜርኩሪ)<br>❍ መደበኛ ግፊት (10-21 ሚ.ሜ. ሜርኩሪ)<br>❍ ከመደበኛ ግፊት በላይ (>21 ሚ.ሜ. ሜርኩሪ) |
| 2.2. | **የአይን እይታ መጠን (በ ሲነለን ቻርት)**<br>❍ ቀኝ አይን:-_____<br>❍ ግራ አይን:-_____<br>❑ **ክፍል**<br>❍ (ከፍል-) ጤናማ እይታ (ከ 6/6 እስከ 6/18)<br>❍ ዝቅተኛ እይታ (ከ 6/24 እስከ 2/60; በጣት ቆጠራ ≥ 1 ሜትር)<br>❍ (ከፍል-) አይነ-ስውርነት ((ከ 1/60 ወይም በታች እስከ ምንም ብርሃን አለማየት፤ በጣት ቆጠራ < 1 ሜትር እና ፊት ለፊት፤ ብርሃን በትንሹ ማየት፤ የእጅ እንቅስቃሴ ማየት) |

| C. | **ሞሪስኪ" መድኃኒትን በታዘዘው መሰረት በአግባቡ ስለመውሰድ" መለኪያ- 8** | | |
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| | **ጥያቄዎች** | አዎ | የለም |
| 1. | **አንዳንድ ጊዜ** የአይን ጠብታዎን መውሰድ **ይዘነጋሉ**? | | |
| 2. | ሰዎች **አንዳንድ ጊዜ** ከመርሳት (ከመዘንጋት) ባሻገር **በተለያዩ ምክንያቶች** መድኃኒታቸውን **ሳይወስዱ ይቀራሉ**። ይህንን ታሳቢ በማድረግ፤ **ያለፉትን ሁለት ሳምንታት** ሲያስቧቸው፣ የአይን ጠብታዎን **ያልወሰዱባቸው አንዳች ቀኖች** ነበሩ? | | |
| 3. | ሐኪምዎን **ሳይነግሩ**፣ የአይን ጠብታዎን **በወሰዱት ጊዜ ህመምዎ ከመጣብዎ (የተባባሰ ሲመስልዎ)**፤ የአይን ጠብታዎን **ለአፍታም አቋርጠው ያውቃሉ**? | | |
| 4. | **ጉዞ** ሲጓዙ ወይም ከቤትዎ **ርቀው** ሲሄዱ፣ **አንዳንድ ጊዜ** የአይን ጠብታዎን (ወደ ጉዞው) ከእርስዎ ጋር **ሳይወስዱት ዘንግተውት ያውቃሉ**? | | |
| 5. | **በትላንትናው** ዕለት **ሁሉምንም** የአይን ጠብታዎን **ወስደዋል**? | | |
| 6. | የአይንዎ **ግፊት የቀነሰ ሲመስልዎ** (**የጠፉ** ሲመስልዎ)፣ **አንዳንድ ጊዜ** የአይን ጠብታዎን መውሰድ **አቁመው ያውቃሉ**? | | |
| 7. | የአይን ጠብታዎች **ቀን በቀን** መውሰድ **ለአንድአንድ** ሰዎች **አስቸጋሪና ምቾት አይሰጣቸውም**። ይህንን ታሳቢ በማድረግ፤ የአይን ጠብታዎን **በየቀኑና በፕሮግራሙ** መሰረት፣ እንድሁም **አንድም ሰዓት ሳያዛንፉ** መውሰድ፣ **የመሰላቸት ስሜት ተሰምቷቸው (አስቸጋሪ ሆኖብዎት) ያውቃል**? | | |
| 8. | የአይን ጠብታዎን **መውሰድ** እንዳለብዎት **ለማስታወስ ምን ያህል ጊዜ አስቸግሮዎት ያውቃል**?<br>❑ በጭራሽ ❑ ብዙ ጊዜ<br>❑ አልፎ አልፎ (ከዕለታት አንድ ጊዜ) ❑ ሁል ጊዜ<br>❑ አንዳንድ ጊዜ | | |

| D. | **የግላኮማ መድኃኒቶች አጠቃቀም ሂደት** | | | |
|---|---|---|---|---|
| | **ሂደቶች** | ሁል ጊዜ /ብዙ ጊዜ | አንዳንድ ጊዜ | በጭራሽ /አልፎ/ |
| 1. | የአይን ጠብታዎን ከማድረግዎ **በፊት እጆዎን በሳሙናና ውሃ የመታጠብ ልምድ** አለዎት ወይ? ካለዎት **ምን ያህል ጊዜ** ይታጠቡታል? | | | |
| 2. | የጠብታው **ጫፉ (መክፈቻው) ከአይንዎ፣ ከፊትዎና ከእጆዎን ምን ያህል ጊዜ ሊነካካ** ይችላል? | | | |
| 3. | ጭንቅላትዎን **ወደ ላይ** በትንሹ **ቀና** አድርገው፤ በጣትዎ **የታችኛው** የአይንዎን **ቆብ ወደ ታች ሳብ** በማድረግ **"ኪስ"** ነገር **ምን ያህል ጊዜ** ይሰራሉ? | | | |
| 4. | የጠብታው **ጫፉ (መክፈቻው) ከአይንዎ ራቅ** (2 ሴ.ሜ. ያክል ርቀት) **አድርገው ይይዙታል** ወይ? ከያዙት **ምን ያህል ጊዜ**? | | | |
| 5. | የአይን **ጠብታ** ወደ አይንዎ **በትክክል ምን ያህል ጊዜ** ያደርጋሉ? | | | |
| 6. | ጠብታዎን ካደረጉ **በኋላ ቢያንስ ለ2 ደቂቃ** ያክል አይንዎን **ምን ያህል ጊዜ ይዘጉታል?** | | | |
| 7. | ጠብታዎን ካደረጉ በኋላ አይንዎን **የማርገብገብ፣ የማሸት፣ የመጭመቅ ወይም አጥብቆ የመጨፈን ልምድ** አለዎት ወይ? ካለዎት **ምን ያህል ጊዜ**? | | | |
| 8. | ከአፍንጫዎ አጠገብ የሚገኝ **የእንባ ማስተላለፍያ ቱቦ ቢያንስ ለ2 ደቂቃ ያክል የመዝጋት ልምድ** አለዎት ወይ? ካለዎት **ምን ያህል ጊዜ**? | | | |
| 9. | ከአይንዎ **የፈሰሰውን ትርፍ** ጠብታ **በሰፍት፣ በመሀረብ** ወይም በ**ንፁህ ጨርቅ የመጥረግ ልምድ** አለዎት ወይ? ካለዎት **ምን ያህል ጊዜ**? | | | |

**የተከበረ ጊዜዎ ስለሰጡን እጅግ በጣም እናመሰግንዎታለን።**

**ቀን:**_____/_____**/2007 ዓ.ም** **የካርድ ቁጥር:**_____

_____ _____

**የመረጃ ሰብሳቢ ስምና ፊርማ** **የዋና አጥኚ ስምና ፊርማ**