Systematic Review

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EFFECT OF EDUCATION ON KNOWLEDGE, ADHERENCE, AND INTRAOCULAR PRESSURE ON GLAUCOMA OUTPATIENTS: A SYSTEMATIC REVIEW

Wahyuni[1*], Yosi Irawati Wibowo[1], A. Adji Prayitno Setiadi[1]
[1]Magister of Clinical Pharmacy, Faculty of Pharmacy, Universitas Surabaya, Surabaya, Indonesia
Coresponding author: Wahyuni
Email: ayuni84@ymail.com

ABSTRACT

Introduction: To evaluate educational interventions to improve patient knowledge, and adherence to glaucoma treatment that results in a reduction in intraocular pressure based on current clinical evidence. **Methods:** A systematic review of PubMed (NIH) was conducted to identify studies evaluating educational interventions to improve patient knowledge, and adherence to glaucoma treatment that resulted in decreased intraocular pressure. The search was conducted from March to August 2020. **Results:** The educational intervention was successful in increasing the skill of using eye drops for one month from 6% to 35%, and 64% after six months of education. The percentage of patients who successfully implanted the eye drops correctly increased from 66.7% to 82.2%. The educational intervention was successful in increasing adherence to treatment followed by MEMS from 67% -98% to 78% -86%. The adherence monitored with the pharmacy database resulted in a PDC of 57%, and the medication possession ratio (MPR) of 71% because many data were not recorded in the pharmacy. African American patients had significantly low adherence (OR = 0.29 95% CI = 0.16, 0.52). The educational intervention has no significant effect on the IOP value. Patients with low adherence tend to have low VFQ-25 (visual acuity) scores. After education, 99% of the patients were satisfied with the health program implemented. **Conclusion:** All educational interventions were successful in increasing patient knowledge, medication adherence, and eye care medical visits. Educational interventions did not significantly affect IOP values. Patients who are not adherent tend to have low visual acuity.

Keywords: glaucoma, education, knowledge, adherence, intraocular pressure

INTRODUCTION

Glaucoma is a disease that attacks the nerves of the eye slowly and blindness can last forever. In 2011, open-angle glaucoma occurred in about 60 million people and blindness in both eyes was estimated to occur in 4.5 million people in 2010 and to 5.9 million in 2020 (Jr et al., 2015). The cause of blindness in glaucoma is undiagnosed, not treated properly, and low therapeutic adherence (Jr et al., 2015). The prevalence of glaucoma is known to be age-related and increases with the aging of the population. The majority of glaucoma cases worldwide remain undiagnosed or under-managed, particularly in many developing countries for multi-factorial reasons (Choi et al., 2013; Mostafa et al., 2019). Research in the United States shows that glaucoma is more common among African-Americans (Sleath et al., 2018).

Progressive vision loss in glaucoma can be slowed by lowering the intraocular pressure (IOP) through drugs, laser treatment, or incision surgery (Wang et al., 2018). Non-adherence to medication may be caused by not getting a prescription, not taking medication, missing doses, taking the wrong amount of medication, not taking medication on time, taking medication not according to doctor's instructions (for example with or without food) and stop taking medication temporarily or forever (Bazargan et al., 2017; Al-sharqawi and Bayoud, 2018).

Previous studies have shown that medication adherence can be improved with educational interventions with limited discussion (Newman-Casey et al., 2017), and visual impairment on the quality of life for glaucoma patients (Quaranta et al., 2016). We identified that a successful health program is likely one that can increase patient knowledge of glaucoma

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and the risks associated with non-adherence against the treatment. Glaucoma is a group of progressive optic neuropathy and is associated with a high level of intraocular pressure (IOP) (Jr et al., 2015). In chronic disease treatment effects require long-term observation, so an observational design is more appropriate than a randomized study (Al-sharqawi and Bayoud, 2018). In this literature review, it is considered to review the provision of education to provide understanding and knowledge regarding glaucoma disease and its treatment with adequate follow-up, which is expected to produce relevant findings as a guide in the clinical practice of glaucoma treatment.

This literature review aims to identify and evaluate studies examining educational interventions on patient knowledge, and adherence to glaucoma treatment that resulted in decreased intraocular pressure as a reflection of glaucoma progression.

METHODS

The study was approved by the Institutional Ethical Committee University of Surabaya (approval number 151/KE/III/2021).

Literature Search

A literature search was carried out using a database from PubMed (NIH) to search available research articles from March to August 2020. The terms and titles of medical subjects (MeSH) used are: “glaucoma” and “education” and “knowledge” and “adherence” and "intraocular pressure." The search was carried out by taking into account the synonyms of medical subjects (MeSH) keyword and title as follows: 1. "Glaucoma" AND (as topics used "patient education" or "intervention education"), 2. "Glaucoma" AND (as topics used "increase knowledge" or "patient knowledge”), 3.“Glaucoma” AND (as topics used “medication adherence,” or “compliance medication,” or “self-management”). 4.“Glaucoma” AND (as topics used “decrease intraocular pressure” or "intraocular pressure reduction").

Study Selection

Evaluation of research titles and abstracts is carried out by a researcher to determine their eligibility for this study. The inclusion criteria used are as follows: articles are in English or have published English translations, evaluation of the effect of education in glaucoma patients, patient knowledge, medication adherence, and intraocular pressure (IOP) as the main outcome and as a secondary outcome whether there is an assessment of patient satisfaction, research published in the last five years (2015 to 2020).

The exclusion criterion was the effect of education on glaucoma patients, children, and adolescents.

Data Extraction

Data extraction was carried out by the main researcher and the results were consulted with two other researchers. Data were extracted from research articles using a data collection form, which included: author, study design, sample (number, type of glaucoma), intervention, intervention results, and study quality (Jadad score for RCT study and Newcastle-Ottawa score for observational study).

Assessment of Outcome Measures

One researcher assessed the outcome measures and the results were confirmed with two other members to reduce subjectivity. The assessment was carried out by classifying the effect of education on patient knowledge, adherence to glaucoma treatment, and intraocular pressure (IOP) as the main outcome.

National Eye Institute Visual Functioning Questionnaire-25 (NEI-VFQ-25) was used to assess visual function and or the GSS (Glaucoma Symptom Scale) questionnaire (Quaranta et al., 2016). The NEI-VFQ-25 score correlates with visual

acuity. Eyes with the more severe diseases tend to have low scores (Quaranta et al., 2016). GSS questionnaire was used to assess 10 non-visual ocular complaints such as burning/stinging/stinging and visual ones such as blurred/dim vision, difficulty seeing during the day, and difficulty seeing in the dark (Quaranta et al., 2016).

Assessment of patient satisfaction in glaucoma treatment was assessed using a treatment questionnaire designed to assess patient satisfaction with topical eye treatment. Patient satisfaction was correlated with the patient's view of drug use, eye irritation, conjunctival hyperemia, ease, and comfort of the patient toward treatment (Quaranta et al., 2016).

Research Quality Assessment

Assessment of research quality for randomized controlled studies (RCT) used the modified Jadad (Oremus et al., 2012) score and the modified Ottowa-Newcastle score for observational research (Riera-guardia et al., 2014).

The Jadad modification score was used to evaluate the quality of the study using a five-point scale and each point was awarded for the following criteria: whether the study was randomized, whether there is an appropriate description of the missing subject is followed up, and whether the study was double-blind (provider and patient were not aware of the intervention). If adherence is measured by pharmaceutical refill or electronic monitoring two points are awarded. If adherence is measured by self-report, no points are awarded.

The Newcastle-Ottawa score is a five-point scale that includes: does the cohort represent the appropriate population, how to ascertain the condition of the disease (e.g. through medical records or self-reports), whether the outcome assessors were blinded to the status of care, whether the length of follow-up was appropriate (≥ 6 months), whether there was a suitable description for patients who were lost to follow-up.

Assessment of the quality of the research was carried out by one researcher, and, to reduce subjectivity, the results of the assessment were consulted with two other researchers.

RESULTS

The search returned one hundred, and twelve unique references. Fifty-four research articles were evaluated for potential relevant results. Twenty research articles were identified as relevant for inclusion in this systematic review article. The procedure for selecting articles is depicted in Figure 1. The studies consisted of seven randomized controlled trials (RCTs), and thirteen observational studies.

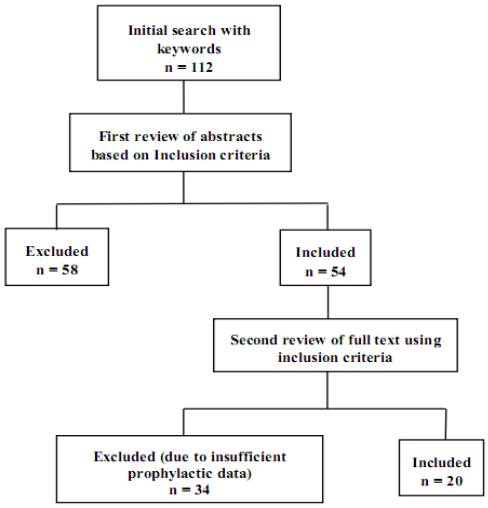

Figure 1. The process of selecting articles for literature review

There are seven RCT studies, two showed an increase in knowledge, and five studies showed an increase in adherence after an educational intervention. Of the thirteen observational studies, four showed increased knowledge, and two showed increased adherence (Table 1).

Randomized Controlled Trial (RCT)

Cook et al. (2018) conducted a study to test interventions that would have a greater effect on treatment adherence against glaucoma patients. All participants received a drug event monitoring system (MEMS) vial for the collection of

adherence data. The result is call reminders are better at improving medication adherence than usual care. Interview motivation (MI), and usual care did not differ significantly in improving treatment adherence (Cook et al., 2018).

An RCT study was conducted by Lampert et al, (2019) to test the individual skills of administering eye drops, and administering special counseling. Patient education through demonstration of eye drop administration, and counseling by pharmacy staff has been shown to improve eye drop administration skills (Table 1) (Lampert et al., 2019).

Myers et al. (2016) conducted a study to assess adherence to eye drop treatment using Travoprost Dosing Aid (TDA). Adherence was not statistically different between the functional TDA, and the TDA without alarm groups. The increase in adherence in patients who felt monitored was not statistically significant (Myers et al., 2016).

A study was conducted by Hark et al. of patient navigators in a prospective, randomized, controlled intervention with urban patients versus patients working in offices. There was no statistically significant difference in the level of follow-up visit adherence in urban patients and those who worked in offices with patient navigators or not (Table 1) (Waisbourd, 2016).

Cook et al. (2016) identified various variables that may be associated with glaucoma adherence. Compliance was monitored using a MEMS (Medication Event Monitoring System) bottle. The greatest predictors of adherence were self-efficacy, motivation, a larger number of doses per day, and race (Cook *et al.*, 2016).

In a study conducted by Murdoch et al. (2020) on open-angle glaucoma (POAG) patients in Kenya, patients received counseling about glaucoma, therapeutic goals, and drop technique. The weighing of the bottles was carried out before and after being given to the patient and the difference in the weight of the bottles was used to calculate the amount of medicine used by the patient. Treatment adherence reports vary because of different adherence assessment methods (Murdoch et al., 2020).

Waterman et al. (2018) conducted an RCT study in the United Kingdom (UK) to evaluate information during a nurse-conducted glaucoma consultation. Group-based education provided by nurses can be accepted by patients, and provides information about glaucoma health (Waterman et al., 2018).

Observational Studies

The level of adherence to treatment of glaucoma patients in a community pharmacy was evaluated by Feehan et al.(2016). Adherence rates used standard metrics to determine the number of days covered for treatment (PDC) and the ratio of drug ownership (MPR). Treatment adherence was evaluated using drug refill data in pharmacies showing a very high non-adherence rate (Table 1) (Feehan et al., 2016).

Fudemberg et al. conducted a study to compare the adherence rates of patients diagnosed with glaucoma in two clinics. Patient CPEC clinic schedules appointments with automatic phone call reminders three days before appointment, and resident glaucoma clinic without call reminders were examined. There were no significant differences in treatment adherence between patients who received phone calls, and those who did not (Lee et al., 2016).

Compliance with glaucoma treatment measured through the use of drugs (MEMS) and the quality of vision through VRQoL scores has been evaluated by Thompson et al. (2018), Non-adherent patient MEMS had lower VRQoL values for glaucoma treatment than adherent patients. Eye drop non-adherence was associated with eye pain, and a low VFQ-25 score (Thompson et al., 2018).

Sleath et al. (2016) evaluated the relationship between glaucoma education and its treatment, patient questions, self-

efficacy, expectations of the results of treatment compliance. If the provider educates the patient about eye drop administration, and self-efficacy toward glaucoma treatment, it is associated with a positive association with treatment adherence (Sleath et al., 2016).

The study conducted by Carpenter et al. (2017) evaluated whether service provider communication improved the self-efficacy of treating glaucoma patients. Patients get high self-efficacy if the doctor educates glaucoma, perception of glaucoma, and how to treat it (Carpenter et al., 2017). Research on the feasibility of health development of glaucoma patients conducted by Vin et al. (2015) found health coaching has the potential to improve the treatment of patient glaucoma and health. Factors that influence include age, gender, personality, and cognitive function (Vin et al., 2015).

Treatment compliance based on the reconciliation of electronic medical record data was evaluated by Bacon et al. Treatment compliance was determined by the consistency of the patient drug regimen, electronic medical record data, and doctor's plan on the previous drug regimen. If patient inconsistency occurs, it is better to follow the doctor than medical record data (Press, 2016).Sayner et al. (2017) evaluated by recording a patient's medical visits to an eye clinic on video recordings. The patient's factors affect his ability to administer the drops. There is opportunity for pharmacists to have a positive effect on glaucoma, because doctors rarely provide continuous education and patients have difficulty managing their eye drops (Sayner et al., 2017). Al-Owaifeer et al. (2018) in Saudi Arabia evaluated educational intervention on knowledge of glaucoma and the factors that influence it through brief videos of glaucoma education. The use of video as an educational tool can increase short-term knowledge in glaucoma patients (Al-Owaifeer et al., 2018). Health program eligibility (GOAL)© for glaucoma treatment adherence in African-American patients was evaluated by Dreer et al. Before the research, the patient was trained to use electronic TDA. A culturally packed health promotion program (GOAL ©) can improve glaucoma treatment adherence in African-American patients with open-angle glaucoma who are suspected of having low adherence (Acceptability and Informed, 2016).

Sleath et al. (2015) evaluated the compliance with glaucoma treatment electronically through resources and support providers in self-management when interacting with patients. Compliance with glaucoma treatment increases if the provider has a positive influence and educates patients about glaucoma and treatment (Sleath et al., 2015).

Lazcano-Gomez et al. evaluated the effect of planting eye drops. So determine the patient results in the right technique, 30 minutes later the patient was evaluated to see the effectiveness of the training. The single educational session using eye drops was successful in improving eye drop administration, but the effect of long-term education could not be evaluated (Assessment, 2015). The effect of the EQUALITY telemedicine eye health education program on the knowledge of patients at risk of glaucoma, and their attitudes to eye care was evaluated by Rhodes et al. (2016) in the Alabama region, USA. Increasing patient knowledge about glaucoma and attitudes toward eye care in risk groups can increase early detection, and thus reduce blindness (Rhodes et al., 2016).

Result Assessment

In all of the seven RCT studies, three used electronic drug monitoring (MEMS) to monitor patient adherence. Three studies used self-reporting, and one study used pharmaceutical data to monitor treatment adherence.

In observational studies, five studies used electronic monitoring (MEMS) to measure adherence, one study used drug dispensing records, and seven

studies used self-reporting. Of the twenty studies identified three studies did not measure the patient's intraocular pressure, namely the study conducted by Lampert et al. Evaluating the effectiveness of counseling and the use of eye drops in a pharmacy, Feehan et al. evaluated patient compliance using a pharmacy database. Bacon et al. evaluated compliance with drug regimen data (Table 1).

Three studies assessed patient satisfaction with treatment, the study by Cook et al. (2016) compared patient satisfaction with usual care, a combination of regular care with counseling, and regular care with call reminders Research conducted by Rhodes et al. assessed patient satisfaction with the telemedicine program (EQUALITY) Cook et al. (2016) and Rhodes et al.'s studies assessed patient satisfaction with a self-developed questionnaire, whereas Dreer et al. assessed the satisfaction of patient education programs with problem-solving counseling and training using the Glaustat questionnaire.

Research Quality

Overall, of the twenty studies identified, the quality of the studies was good (Table 1). Of the seven RCT studies, there were three studies with a Jadad score of 3/5, because the study used its measurement for adherence. Of the thirteen observational studies, four studies scored Newcastle-Ottawa score of 3/5 because in the study the length of follow-up was less than six months, and the outcome assessors were not blinded in treatment.

Table 1. Summary of extraction results for each study

Author, Year	Design study	Sample	Intervention	Outcome	Quality study
Cook et al., 2017	RCT	201 patients open-angle glaucoma and OHT	-regular maintenance -regular maintenance + MI -regular maintenance + phone calls	Adherence: Call reminders improved adherence higher than usual care with MEMS measurements, p = 0.005, with self-measurements p = 0.04. Satisfaction: Patient satisfaction was higher at MI than on call reminders p = 0.007. Reminder calls and usual care had the same satisfaction p = 0.10.	Jadad score: 4/5
Lampert et al., 2019	RCT	152 patients at 28 community pharmacies.	60 minutes of eye drop counseling and training vs. 120 minutes	Knowledge: Eye drop education increased administrative skills from 6% at baseline after 1 month to 35% (P≤ 0.001), after 6 months to 64% (P ≤ 0.001)	Jadad score: 3/5
Myers et al., 2016	RCT	45 glaucoma patients Group 1: 20 patients	Fully functional TDA (visual alarm, sound dose reminder, drop recording) Vs TDA inactive	Adherence: Adherence for functional TDA: 78% (95% CI: 70% -80%).	Jadad score: 4/5

Author, Year	Design study	Sample	Intervention	Outcome	Quality study
		with fully functional TDA Group 2: 20 patients with TDA only recorded active dose use. Group 3: 5 patients with disabled TDA.		Adherence for inactive TDA: 76% (95% CI: 65% - 89%). In the group of patients without an alarm, the odds ratio for adherence was higher. Patients reported that the use of TDA affected the use of eye drops.	
Hark et al., 2016	RCT	155 glaucoma patients Group 1: 53 patients (community-based eye clinic + navigator) Group 2: 57 patients (office-based eye clinic + navigator) Group 3: 45 patients (office-based eye clinic without a navigator)	Patient navigators in urban community settings vs office-based settings (regular care)	Adherence: Adherence for one follow-up visit G1 = 69.8%, G2 = 82.5%, G3 = 73.3% (p = 0.28). Adherence for ≥ 2 follow-up visits G1 = 91.3%, G2 = 74.3%, G3 = 66.7% (p = 0.11). IOP and visual acuity: NEI-VFQ-25 mean values (scale 1-100): G1: 83.98 ± 14.75; G2: 80.97 ± 15.85; G3: 77.29 ± 20.92	Jadad score: 3/5
Cook et al., 2015	RCT	201 glaucoma patients	-regular maintenance - call reminder -motivational counseling	Adherence: Self-report compliance measures: 94.1% and MEMS: 78.5%. The bivariate correlation between the 2 compliance measures rs = 0.31. Predictors of compliance with MEMS: self-efficacy,	Jadad score: 4/5

Author, Year	Design study	Sample	Intervention	Outcome	Quality study
				motivation, dosage regimen, and race/ ethnicity and affect variability as much as 35% in adherence. Predictors of adherence based on self-reports: self-efficacy and intention to comply accounted for 20% of the variability in adherence.	
Murdoch et al., 2020	RCT	11 patients glaucoma (POAG)	Glaucoma counseling, therapeutic goals, and eye drop technique.	Adherence: 45% of patients fail to complete 1 full year of topical therapy. 55% completed 1 year of follow-up and controlled IOP at each visit. Number of drugs that have been successfully infused per day: 1.74 (SD 0.69).	Jadad score: 4/5
Waterman et al., 2018	RCT	9 nurses and 112 glaucoma patients (OAG, OHT, normal tension glaucoma)	Nurse training to provide group-based education to glaucoma patients in 3 educational phases.	Knowledge: Information provided by nurses to patients in phase 1 and phase 3: -self-management (importance of taking eye drops: 83% and 100%. -Treatment (eye drop option): 60% and 100%. -Drug side effects: 43% and 100%. -Prognosis (if treated mostly do not become blind): 3% and 100%. -Time to lose sight: 2% and 6%.	Jadad score: 3/5
Feehan et al., 2016	Observational	3615 glaucoma patients	Drug expenditure data were analyzed by the number of days covered by treatment (PDC) and comparison of drug ownership (MPR)	Adherence: 1-year compliance rate for proportion of days covered (PDC): 57% and drug ownership ratio (MPR): 71%. The proportion of PDC and MPR with satisfactory adherence increased at> 65 years (P <0.001). The highest adherence to α2-adrenergic PDC:	New Castle - Ottawa score: 4/5

Author, Year	Design study	Sample	Intervention	Outcome	Quality study
				36%, MPR: 47.6%. The use of cholinergic agonists obtained PDC: 25.0% and MPR: 31.2%, for combination products PDC: 22.7% and MPR: 31.0%.	
Fudemberg et al., 2016	Observational	295 patients were divided into: 144 glaucoma clinic patients and 151 patients in the CPEC clinic	Phone call reminder (CPEC clinic) Vs without reminders for medical visits (glaucoma clinic)	Adherence: Patients with call reminders (65.6%) and no receive (68.1%) did not differ significantly in treatment adherence; OR = 1.35 (CI = 95%; 0.79-2.32, P = 0.28). Adherence was higher at 50-80 years of age than at <50 years and> 80 years, P = 0.02.	New Castle - Ottawa score: 4/5
Thomson et al., 2018	Observational	79 open-angle glaucoma (OAG) patients.	Use of eye drops with MEMS electronic monitoring and filling out the National Function Institute Questionnaire-25 (VFQ-25) questionnaire	Adherence: 30% of patients took glaucoma medications <80% of the prescribed dose. IOP and visual acuity: Non-adherent patients had lower VFQ-25 scores 70.66 ± 20.50 Vs 75.91 ± 19.12, SMD = 0.27 and after 3 years 71.68 ± 21.93 Vs 76.25 ± 21, 67, SMD = 0.21.	New Castle - Ottawa score: 4/5
Sleath et al., 2015	Observational	279 glaucoma patients from 6 eye clinics	Videotaped medical visits and communication variability	Adherence: African-American patients had significantly lower adherence than non-African-Americans (OR = 0.37, 95% CI: 0.16, 0.86). Patients use the correct dosage regimen every day if they receive education from a doctor (β = 0.18, P = 0.008).	New Castle - Ottawa score: 3/5
Carpenter et al., 2016	Observational	279 glaucoma patients and 15 ophthalmologists	Videotaped medical visits of patients and ophthalmologists.	Adherence: If the provider educates the patient about glaucoma, there is an increase in self-confidence toward treatment (β = 0.35, P <0.001).	New Castle - Ottawa score: 4/5

Author, Year	Design study	Sample	Intervention	Outcome	Quality study
				African-American patients experienced lower self-adherence barriers than non-African β = 2.15, P <0.05. Women reported less self-efficacy than men β = 0.63, P <0.05.	
Vin et al., 2015	Observational	4 glaucoma patients	Health coaching for 3 months with a health behavior change methodology	Adherence: MEMS treatment adherence at study entry: 67% - 98%, post-training adherence: 78% - 86%. Health coaching is beneficial and recommended for families with glaucoma.	New Castle - Ottawa score: 3/5
Bacon et al., 2016	Observational	160 glaucoma patients	- the patient's stated drug regimen - prescribed drug regimens - electronic medical record of patient treatment	Adherence: If there is a difference in data between what the doctor stated and the medical record, the patient follows the doctor: 72.5%; does not follow: 20%. Adherence did not differ based on sex (P = 0.912) and the number of drugs taken (P = 0.242). Adherence by race for Caucasians 91% (P = 0.31), African-Americans 83% (P = 0.54), Hispanics 81% (P = 0.58).	New Castle - Ottawa score: 3/5
Sayner et al., 2016	Observational	279 patients from 6 eye clinics and 15 ophthalmologists	Video recording of interview and demonstration of correct eye drop method	Knowledge: Patients with higher education were more appropriate to instill one drop in the eye P = 0.017. Women tended not to properly instill one drop in the eye P = 0.026.	New Castle - Ottawa score: 4/5
Al-Owaifer et al., 2018	Observational	196 glaucoma patients	Short educational video on glaucoma knowledge	Knowledge: Pre-intervention knowledge: 6 on a scale of 17 and post-intervention to 11.1 on a scale of 17. Knowledge before and after the intervention was significantly different P	New Castle - Ottawa score: 4/5

Author, Year	Design study	Sample	Intervention	Outcome	Quality study
				<0.001. Good predictors of knowledge: age <60 years, male, higher education, living in urban areas, high income, and family history of glaucoma.	
Dreer et al., 2016	Observational	11 glaucoma patients, African-American	Educational programs, motivational interviews (MI) and problem-solving training on glaucoma treatment	Adherence: Treatment adherence significantly increased t (10) = -2.55, P <0.03, significant improvement for glaucoma management self-efficacy p = 0.03, ease of use of eye drops P = 0.02. IOP: There is no difference between emotional health and IOP. Satisfaction: Improvement in treatment satisfaction P = 0.05, confidence in the need for glaucoma medication P = 0.05 and visual ocular functional symptoms.	New Castle - Ottawa score: 3/5
Sleath et al., 2015	Observational	279 glaucoma patients in 6 eye clinics and 14 ophthalmologists	Video recording of patient medical visit interview about glaucoma treatment	Adherence: The adherence of African-American patients was smaller than that of non-African-Americans (OR = 0.29 95% CI = 0.16, 0.52) Patients with many types of drugs tended not to take their doses on time (OR = 0.62, 95% CI = 0.39, 0.98) Patients tended to be adherent if the provider gave positive reinforcement of drug use (OR = 3.37 95% CI = 1.69, 6.71) and if the provider educated the patient (OR = 1.35 95% CI = 1.03, 1.78).	New Castle - Ottawa score: 4/5

Author, Year	Design study	Sample	Intervention	Outcome	Quality study
Lazcano-Gomes et al., 2015	Observational	45 glaucoma patients	Educational video for the correct use of eye drops	Knowledge: Before giving education: the average number of drops infused was 1.5 ± 0.9 ml, and after education, the number of drops planted was 1.2 ± 0.5 ml (P = 0.011). The percentage of patients implanting 1 drop correctly increased from 66.7% to 82.2%.	New Castle - Ottawa score: 4/5
Rhodes et al., 2016	Observational	518 glaucoma patients (glaucoma, OHT, POAG)	Telemedicine EQUALITY education about glaucoma, adherence to appointments, and adherence to care. Education: videos, brochures, and posters	Knowledge: There was a significant increase in positive knowledge and attitudes. Unemployment (OR = 0.63, 95% CI = 0.42 - 0.95, P = 0.026) and patients with low education level (OR = 0.55, 95% CI = 0.29-1.02, P = 0.058) there was a lower increase in glaucoma knowledge. African-Americans (OR = 0.47, 95% CI = 0.23-0.94, P = 0.035) had a lower increase in knowledge than white races. Satisfaction: After education 99% of patients are satisfied with CEE.	New Castle - Ottawa score: 4/5

DISCUSSION

Overall research was in using interventions to increase patient knowledge in the use of eye drops (Assessment, 2015; Myers et al., 2016; Thompson et al., 2018),), increase adherence to medical visits (Manuscript, 2015;) Waisbourd, 2016; Cook et al., 2018), (), or a combination of interventions (Sayner et al., 2017; Lampert et al., 2019; Murdoch et al., 2020)) by various methods. Two retrospective studies recorded drug data to assess treatment adherence.

Knowledge and administrative skills in the use of eye drops for glaucoma patients are still lacking, thus it is necessary to conduct education regarding eye drops to increase knowledge of eye drop administration. A study by Myers et al. used Travoprost Dosing Aid (TDA) to assess eye drop medication adherence (Myers et al., 2016), whereas Thompson et al. (2018) used MEMS to assess adherence). A study conducted by Lazcano-Gomez et al, educated patients on the use of video-recorded eye drops to increase patient knowledge of the use of eye drops (Assessment, 2015). Although the methods

used are different, the ultimate goal is patient adherence to glaucoma treatment. The severity of glaucoma was associated with an error of planting eye drops to resulted in pain in the eyes (Assessment, 2015).

Knowledge and medication adherence of glaucoma patients can be analyzed from the rate of medical visits to healthcare providers. The severity of glaucoma can be inhibited by patient compliance with medical visits. Several methods are used to increase compliance with medical visits including phone call reminders and motivational interviews (MI) or face-to-face counseling, patient navigators, educational and counseling video recordings, and with telemedicine. Adherence interventions are useful for maintaining existing high levels of adherence. Treatment adherence is a complex construct and the degree of non-adherence detected depends on how data are collected (Cook et al., 2018).

Patient medication adherence can also be evaluated from the medication regimen used using refill data, and electronic medical records from the pharmacy. The study conducted by Feehan et al. (2016) analyzed medication adherence by using drug refills at community pharmacies, while Bacon et al. analyzed drug reconciliation from electronic medical records (Press, 2016). Both studies resulted in an unsatisfactory patient adherence, because drug refills could be done elsewhere and there was a possibility that the patient had already received a prescription from another doctor, besides that the medical record did not reflect the most accurate and current treatment. Analysis of medication adherence with pharmaceutical refill, and electronic medical records was not a patient-centered primary study, there may be a difference between patient adherence, and medication adherence. The accuracy of eye drops is associated with drops of planting skills, the balance between eye and hands, and sharpness of vision (Feehan et al., 2016).

Glaucoma severity is associated with an increase in TIO. Reducing IOP can prevent the development of glaucoma, insufficient IOP reduction can accelerate progression, and blindness due to glaucoma (Jr et al., 2015). The high IOP target is thought to be due to less aggressive intervention and infrequent follow-up visits (Jr et al., 2015). The success of glaucoma management from a clinician perspective is associated with IOP parameters, visual field, and progression of damage, possibly in contrast to the patient perspective. Decreased visual function of glaucoma patients can be assessed by the patient's ability to read, walk on stairs, and recognize people (Hoevenaars, 2015).

Patient satisfaction in treatment is an important factor to ensure treatment adherence (Quaranta et al., 2016). Factors associated with satisfaction include the frequency of use of eye drops, subjective comfort, and ease of administration (Hoevenaars, 2015). Patients are satisfied with the therapy, possibly due to the educational efforts undertaken by an ophthalmologist in stressing the importance of reducing intraocular pressure (IOP) in patients (Hoevenaars, 2015). Patient satisfaction with health services effects on increasing treatment compliance, active in healthcare, and continuing medical nurses (Quaranta et al., 2016).

The limitation of this study is that the literature review was carried out on one PubMed database (NIH), the possibility of related studies was found in other databases that were not identified so there was a high probability of bias in data collection. Another limitation is that the study subjects were the majority of African-American glaucoma patients in the United States, and none of the studies were representative of glaucoma patients from Asia. Data on the prevalence of glaucoma incidence in the Asian region cannot be estimated because of the limited number of published studies. Further research needs to be carried out by

analyzing data from more databases as a source of literature so that more research can be identified with methodologies that are relevant to clinical conditions, and the variability of study subjects including Asian glaucoma patients. Another limitation is that study quality was evaluated by the Jadad score for the RCT study and the modified Newcastle-Ottawa score for observational studies. The Jadad and Newcastle-Ottawa scores evaluate the criteria for sample selection, comparison, and intervention/exposure outcomes, where simplification of the quality assessment is at risk of variability in results between assessors (Arrison et al., 2017). Further studies need to be carried out by involving various databases so that it is hoped that publications related to the glaucoma population can be obtained to provide a comprehensive picture regarding the benefits of education in glaucoma patients in terms of clinical, cost, and quality of life of patients.

The results of the study indicate that patient education can improve glaucoma medication knowledge and adherence, but there is insufficient evidence to recommend specific interventions, and so cannot make substantial clinical recommendations. Educational interventions to increase knowledge and medication adherence of glaucoma patients should be tailored to the patient's characteristics and the local culture of the local community.

CONCLUSION

Knowledge education interventions are carried out through counseling, and training on the use of eye drops, group-based education by nurses, and counseling by ophthalmologists. All the interventions were successful in increasing patient knowledge with mixed results due to different methodologies.

Educational interventions to improve patient adherence are carried out through counseling, and call reminders, eye drop counseling, and training, electronic monitoring with reminder alarms, telemedicine, educational and problem-solving programs, and health coaching. Educational interventions were successful in improving patient adherence to drug use, and adherence with eye care medical visits. Medication adherence monitored through a pharmacy database gives low adherence results because many data are not recorded in the pharmacy.

Patient knowledge of glaucoma disease can increase medication adherence, and medical visits, which are expected to maintain IOP values within normal limits, and maintain visual acuity of glaucoma patients. The majority of patients were satisfied with the eye care program that was followed.

REFERENCES

Acceptability, P. and Informed, C. (2016) 'HHS Public Access', 41(1), pp. 50–58. doi: 10.3109/02713683.2014.1002045. Feasibility.

Al-sharqawi, S. and Bayoud, T. (2018) 'Medication adherence in chronic illness : do beliefs about medications play a role ?', pp. 1687–1698. https://doi.org/10.2147/PPA.S169236

Al, A. M. *et al.* (2018) 'The effect of a short animated educational video on knowledge among glaucoma patients', pp. 805–810. https://doi.org/10.2147/OPTH.S160684

Arrison, J. E. K. I. H. *et al.* (2017) 'Using quality assessment tools to critically appraise ageing research : a guide for clinicians', (December 2016), pp. 359–365. https://doi.org/10.1093/ageing/afw223

Assessment, V. (2015) 'Videographic Assessment of Glaucoma Drop Instillation', 9(August), pp. 47–50. https://doi.org/10.5005/jp-journals-

10008-1183

Bazargan, M. *et al.* (2017) 'Non-adherence to medication regimens among older African-American adults', pp. 1–12. https://doi.org/10.1186/s12877-017-0558-5

Carpenter, D. M. *et al.* (2017) 'HHS Public Access', 93(7), pp. 731–737. https://doi.org/10.1097/OPX.0000000000000856

Choi, S. *et al.* (2013) 'Patterns of care for glaucoma patients in Korea from 2002 to 2013 using the national health insurance service claims data', pp. 6–8.

Cook, P. F. *et al.* (2016) 'NIH Public Access', 49(1), pp. 29–39. doi: 10.1007/s12160-014-9641-8.Predictors.

Cook, P. F. *et al.* (2018) 'HHS Public Access', 32(2), pp. 145–165. doi: 10.1080/08870446.2016.1244537. Motivational.

Feehan, M. *et al.* (2016) 'Adherence to Glaucoma Medications Over 12 Months in Two US Community Pharmacy Chains', pp. 1–8. https://doi.org/10.3390/jcm5090079

Hoevenaars, J. G. M. M. (2015) 'Patient satisfaction with glaucoma therapy : reality or myth ?', pp. 785–793. https://doi.org/10.2147/OPTH.S78918

Jr, R. S. *et al.* (2015) 'Why Do People (Still) Go Blind from Glaucoma ?', 4(2). doi: 10.1167/tvst.4.2.1. https://doi.org/10.1167/tvst.4.2.1

Lampert, A. *et al.* (2019) 'Improving eye-drop administration skills of patients – A multicenter parallel-group cluster-randomized controlled trial', pp. 1–13. https://doi.org/10.1371/journal.pone.0212007

Lee, B. *et al.* (2016) 'Factors contributing to nonadherence to follow-up appointments in a resident glaucoma clinic versus primary eye care clinic', pp. 19–25. https://doi.org/10.2147/PPA.S89336

Manuscript, A. (2015) 'NIH Public Access', 312(12), pp. 1237–1247. https://doi.org/10.1001/jama.2014.10059

Mostafa, A. *et al.* (2019) 'Management Of Glaucoma In Developing Countries : Challenges And Opportunities For Improvement', pp. 591–604. https://doi.org/10.2147/CEOR.S218277

Murdoch, I. *et al.* (2020) 'Adherence with Medical Therapy for Primary Open-Angle Glaucoma in Kenya – A Pilot Study', pp. 221–225. https://doi.org/10.2147/PPA.S236468

Myers, J. S. *et al.* (2016) 'Impossibility to eliminate observer effect in the assessment of adherence in clinical trials', pp. 2145–2150. https://doi.org/10.2147/PPA.S114746

Newman-casey, P. A. *et al.* (2017) 'Glaucoma Medication Adherence : an update in 2015', 11(1), pp. 5–20. https://doi.org/10.1586/17469899.2016.1134318

Oremus, M. *et al.* (2012) 'Inter-rater and test e retest reliability of quality assessments by novice student raters using the Jadad and Newcastle e Ottawa Scales', pp. 1–6. https://doi.org/10.1136/bmjopen-2012-001368

Press, D. (2016) 'Electronic medical record and glaucoma medications : connecting the medication reconciliation with adherence', pp. 221–225. https://doi.org/10.2147/OPTH.S92785

Quaranta, L. *et al.* (2016) 'Quality of Life in Glaucoma : A Review of the Literature', *Advances in Therapy*, 33(6), pp. 959–981. https://doi.org/10.1007/s12325-

016-0333-6

Rhodes, L. A. *et al.* (2016) 'Eye Care Quality and Accessibility Improvement in the Community (EQUALITY): impact of an eye health education program on patient knowledge about glaucoma and attitudes about eye care', pp. 37–48. https://doi.org/10.2147/PROM.S98686

Riera-guardia, N. *et al.* (2014) 'Quality assessment of observational studies in a drug-safety systematic review , comparison of two tools : the Newcastle – Ottawa Scale and the RTI item bank', pp. 359–368. https://doi.org/10.2147/CLEP.S66677

Sayner, R. *et al.* (2017) 'HHS Public Access', 24(2), pp. 78–85. doi: 10.1111/ijpp.12215.How.

Sleath, B. *et al.* (2015) 'Applying the resources and supports in self-management framework to examine ophthalmologist-patient communication and glaucoma medication adherence', 30(5), pp. 693–705. https://doi.org/10.1093/her/cyv034.

Sleath, B. *et al.* (2016) 'HHS Public Access', 122(4), pp. 748–754. https://doi.org/10.1016/j.ophtha.2014.11.001

Sleath, B. *et al.* (2018) 'HHS Public Access', 94(4), pp. 482–486. https://doi.org/10.1097/OPX.0000000000001059

Thompson, A. C. *et al.* (2018) 'Relationship between electronically measured medication adherence and vision- related quality of life in a cohort of patients with open-angle glaucoma', pp. 1–7. https://doi.org/10.1136/bmjophth-2017-000114

Vin, A. *et al.* (2015) 'Health coaching for glaucoma care : a pilot study using mixed methods', pp. 1931–1943. https://doi.org/10.2147/OPTH.S92935

Waisbourd, M. (2016) 'A randomized , controlled trial to test the effectiveness of a glaucoma patient navigator to improve appointment adherence', pp. 1739–1748. https://doi.org/10.2147/PPA.S108391

Wang, B. B. *et al.* (2018) 'Patient attitudes toward novel glaucoma drug delivery approaches', 02215. doi: 10.5693/djo.01.2018.07.001. https://doi.org/10.5693/djo.01.2018.07.001

Waterman, H. *et al.* (2018) 'Group-based patient education delivered by nurses to meet a clinical standard for glaucoma information provision : the G-TRAIN feasibility study', pp. 1–9. https://doi.org/10.1186/s40814-018-0313-5