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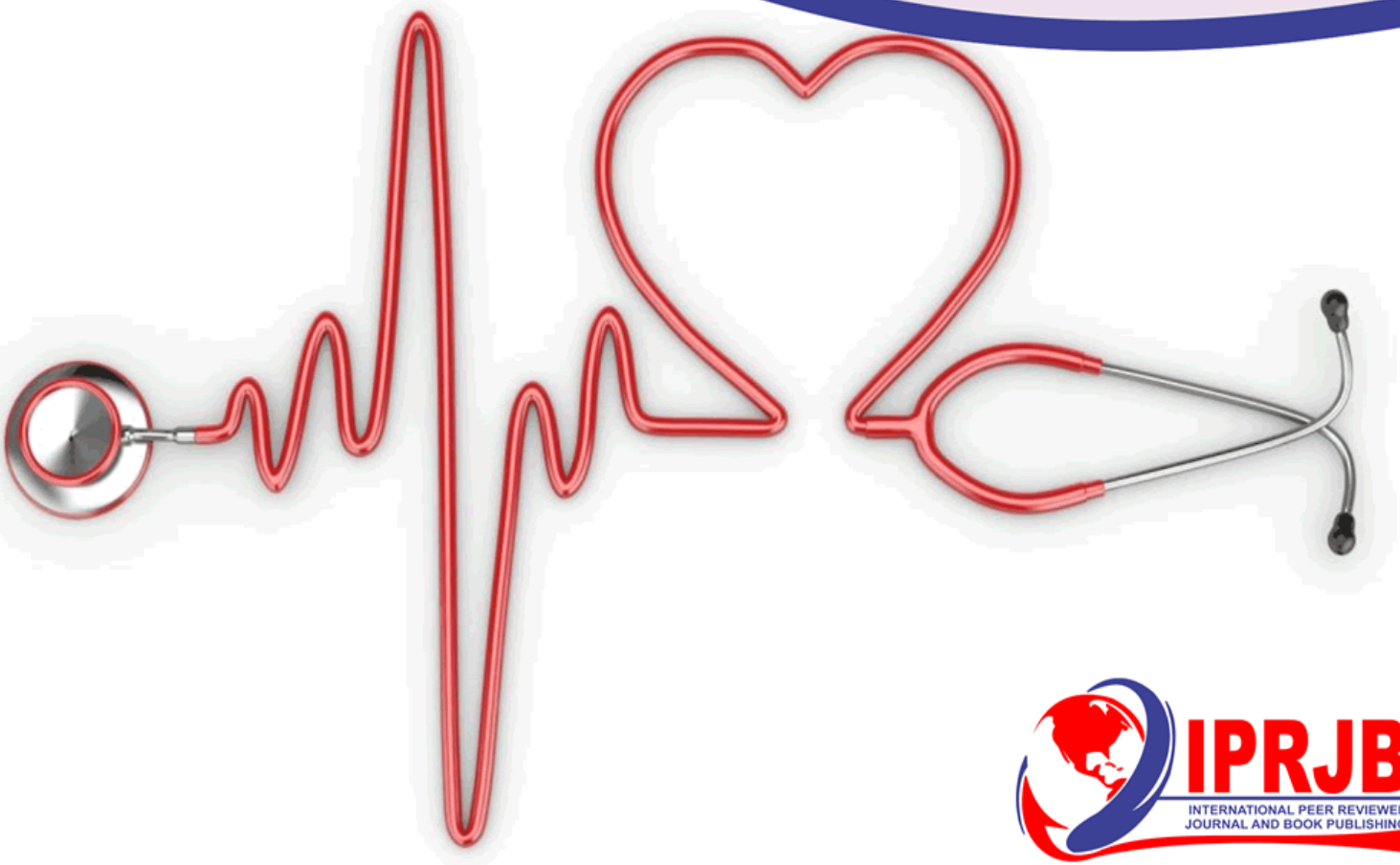
Faiza A. Abou-El-Soud and Helalia Shalabi Mohamed



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IMPACT OF SELF-EFFICACY THEORY ON IMPROVING ADHERENCE OF OLDER ADULTS PATIENTS WITH GLAUCOMA'S MEDICATION

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Purpose: This study was aimed to measure the impact of self-efficacy theory to improve medication adherence among older adults' patients with glaucoma.

Methodology: A quasi-experimental design was used to investigate the study hypotheses.

Study Sample: A total of 284 older adults with glaucoma were screened to select non-adherent patients with medication. The recruited study sample was (152) who are non-adherent with glaucoma medication divided equally into (76 study group) and (76 control group). **Setting:** the study was conducted at the outpatient clinics of Ophthalmology at University Hospital, Shebin El-Kom, Egypt. **Tools:** three tools were used for the purpose of data collection (I) Bio-socio-demographic characteristics questionnaire; (II) Medication Adherence Rating Scale (III) Glaucoma Medication Self-Efficacy Scale**.**

Findings: The findings revealed that the mean age of the studied sample was 74.86±4.63 (non-adherent to medication). Patients age and presence of more than three multiple chronic illnesses with poly-medications are the highest risk factors of adherence to medications (OR = 10.9; 95% CI 6.8 -16.32, P = 0.000); (OR = 12.6; 95% CI 8.2 -18.4, P = 0.000) and (OR = 13.2; 95% CI 7.4 -19.8, P = 0.000) respectively. Participants who received the intervention program showed a significant improvement in their self-efficacy in overcoming medication adherence barriers compared to the control group. An improvement of the self-efficacy in their ability in carrying out glaucoma medication correctly compared to the control group was shown by highly statistically significant differences between total mean scores at (t =3.426, P =.001; t =17.174, P=.000; t =18.141, P=.000) respectively. The intervention program of glaucoma medication management had a positive impact on the patients' outcomes compared to the control group. There is a statistically significant difference between patients' feelings and thoughts pre and post-intervention was detected.

Unique contribution to theory, practice and policy: The findings confirm the effectiveness of an intervention/educational program based on self-efficacy theory in terms of improving glaucoma medication adherence among older adults. Glaucoma's medication principles should be discussed at regular intervals based on patients' needs and the barriers they are facing.

Keywords: *Self-Efficacy, Medication Adherence, Older Adults, Glaucoma*

1.0 INTRODUCTION

Although the aging phenomena is projected that the elderly population will reach 2.1 billion by 2050 and the life expectancy is increasing across the world, but still, the prevalence of age-related eye diseases was increased with advanced age. [1-2] In addition, the vision 2020 of the World Health Organization (WHO, 2012) and the International Agency for the Prevention of Blindness (IAPB,2019) revealed that glaucoma is one of the main age-related eye diseases in the priority list which leads to more than 285 million are visually impaired in the world and 39 million individuals are living with blindness. [3-4] Globally, glaucoma is the second leading cause of irreversible blindness in both developing and developed countries. In 2010, it was projected that 60.5 million individuals had Open Angle Glaucoma (OAG) & Angle Closure Glaucoma (ACG) and by 2020, it was predictable to increase to 79.6 million individuals. Moreover, bilateral blindness was estimated at 4.5 and 3.9 million individuals with OAG and ACG respectively, in 2010; and it was expected to increase to 5.9 and 5.3 million individuals respectively in 2020. [5]

As reported by the Egyptian Society for glaucoma disease; Amin, Kamel, & El-Ashkar, (2020); Khalaf, Qayed, Fahmy, Wasfi, & Mohamed, (2015) the incidence of glaucoma in Egypt is about 0.5% to 1% of the total population.[6-7] Followed by Oman 4.75% and Africa 4.32%; Qatar 1.73%. In Latin America, the prevalence of patients with glaucoma was projected 3.35% and followed by China and Southeast Asia which had a prevalence ranged between 2.38% and 2.66%. [8-10] Furthermore, women were excessively affected by glaucoma and representative 59.1% of all people with glaucoma in 2020, where the women encompassed 55.4% of OAG and 69.5% of ACG affected as a result of both higher prevalence and greater longevity. Additionally, more than 51.5% of the world population over age 40 were females with glaucoma compared with males. In the USA, several research studies revealed that by age 69, approximately 6% of black Americans have glaucoma; and their risk rises to almost 12 % after age 80. [10-13]

According to the National Eye Institute, (2015); Mantravadi & Vadhar, (2015); Vin, Schneider, Muir, & Rosdahl, (2015) reported that glaucoma has been called the "silent thief of sight", because the loss of vision usually occurs slowly over a long period of time. [13-15] Due to the visual disability could be avoidable among patients with glaucoma and also, the progress of ocular damage can prevent blindness through the effectiveness of the treatment among patients with glaucoma, so it is crucial to focus on the medication adherence behavior (MAB) that describes the degree to which the patient's compliance or take medications according to the prescription provided by the health-care professional. [16-17]

For the medication adherence behavior among older adults, there are several research studies findings conducted by Mahmoodi, Jalalizad, Shaghaghi, Shooshtari, Jafarabadi, & Allahverdipour, (2019); Lee, Jiang, Dowdy, Hong, & Ory, (2018); Patton, Cadogan, Ryan, Francis, Gormley, Passmore, Kerse, & Hughes (2018); Patton, Hughes, Cadogan, & Ryan, (2017) who specified that the older adults persons are representative approximately 40-72 % had non-adherence to medications more than the other age groups. (18-21) In other findings, it was displayed that eighteen percent of elderly patients are missed their eye drop, sixty-five percent of

those patients contaminated the eye drop bottle by touching it to their eyes. [22] Additionally, other studies showed that 20% of patients reported that no one had shown how to use their glaucoma medication and around 50 % of the patients discontinue of the glaucoma medication within six months. [23-25]

By improving medication adherence through self-efficacy that play a significant role in changing the individual's behavior and cognitive processes which enhance one's confidence in their ability to carrying out a particular task in a successful approach. Non-adherence to medication among elderly patients has a negative impact that may result in the financial burden on the patients and health care systems due to increasing health care cost during re-hospitalization with a high rate of other co-morbidity which leads to delayed recovery and a rise in the mortality rate, hence this theory-based intervention is contributed to reducing burned of cost. [26-29] Therefore, the aim of the study was to measure the impact of self-efficacy theory to improve medication adherence among older adults' patients with glaucoma.

Theoretical Framework

According to Lopez-Garrido, (2020); Conner, (2010); Bandura's theory, (2001) self-efficacy is one of the key constructs in the social cognitive theory that applied in the current study to improve the self-confidence of the elderly patients for overcoming medication adherence barriers; and increase self-efficacy in carrying the medication correctly and evaluate the outcome expectations.[30-32]In addition, Bandura theory, (2001) elaborated that an individual's behavior is affecting by two factors: firstly**,** self-efficacy i.e., an individual's feelings and thoughts towards his/ her ability to achieve a specific task or activity which is measuring in the current study through the glaucoma medication self-efficacy scale.[30] In addition, the effort that will spend to carry out the task which is measuring through self-efficacy in carrying out specific tasks subscale, and how long he/she will persist to engage in this task when confronted with barriers which are measuring through self-efficacy in overcoming barriers subscale.[30] Therefore, those scales were reflecting self-efficacy where the elderly participants' confidence in the ability to complete a task or achieve a goal. Secondly, the outcome expectancy i.e., an individual's feelings and thoughts to have good behavior after the effective intervention that improves their self-efficacy which is measuring in the current study through the outcome expectation subscale.[30] According to Lopez-Garrido, (2020); Conner, (2010); Bandura's theory, (2001) stated that the individuals who perceived high self-efficacy, are more active and persistent to accomplish the task versus the individuals who not perceived self-efficacy, are less active, and not able to persistent in accomplishing the task. [30-32]

Based on Rdemond, (2010); Bandura, (1977) declared that the development of self-efficacy is gained through four sources of self-efficacy beliefs for sustaining an individual's behavior and performance to medication adherence. These self-efficacy sources are comprised:(1)Enactive e Mastery - i.e., when the individuals accomplished a new task well and succeeded, this experience can build up a high level of self-efficacy and self-confidence, which associated with similar tasks versus the individuals who have a low level of self-efficacy for a certain task, so they avoid this perform a task which prevents them to gain a positive the experience that might build up their self-confidence. (2)Vicarious Experience - i.e., people can develop high self-efficacy by watching other people on the You-tube and other medical resources such as brochure which demonstrate the right technique of eye drop treatment. Observing other people are more

likely to influence the individual self-efficacy when they feel that they are similar to the person who is watching; (3)Verbal Persuasion- i.e., self-efficacy is affected by reassurance and support relating to an individual's capability to achieve a new specified task such as adherence to medication; (4)Physiological Arousal - i.e., the individuals who have a positive emotion is producing greater feelings of self-efficacy versus the individuals who have negative emotions that aggravate the feeling of fear or anxiety which can challenge the individual's self-efficacy.[33,34] In addition, self-efficacy has several effects on thought patterns and responses which included: (1) Choices (approach versus avoid) - i.e., individuals who have low self-efficacy can lead them to avoid tasks because they believe this task is more difficult than they are excepted to perform. In the opposite approach, when the individuals have a high self-efficacy level, it leads the individual to have self-competence to complete tasks. [35,36] (2) Motivation – individuals who have high self-efficacy are more expected to do efforts to achieve their tasks and continue longer in those efforts than those who have low self-efficacy. In addition, individuals with low self-efficacy can lead them to have certain beliefs that they do not have an effort and helplessness to achieve their tasks successfully. (3) Work performance i.e., self-efficacy is definitely and strongly linked to work-related performance. This association depends on the difficulty of the task i.e., if the required task is complex to carry out, the individual may face low self-confidence to perform this task because it beyond his/her ability to perform compared to if the work-related task is simple, the individual has high self-confidence to perform. This indicates that the health care provider should deliver an accurate description of the tasks such as medication intake which is the essential supporting element for patients' health conditions to succeed in their adherence to medication. [37-38] (4) Thought patterns and responses – when individuals have low self-efficacy that can lead them to believe that the task is harder than they actually are. This often consequences due to weak task planning, as well as exposure to stressors and giving up. In other words, individuals with high self-efficacy have a tendency to act towards the task to control the best plan and accomplish a specific task. [39-41]

In other words, Patton, Ryan, Hughes (2020); Vrijens, Antoniou, Burnier, de la Sierra , Volpe (2017); Kardas, Lewek, Matyjaszczyk (2013); Bandura, (2001) who originally proposed the concept of self-efficacy is one of the main influential patients–related factors, and if it is not treated properly and it may lead to deterioration of the patient's health condition or delayed the patient recovery from their chronic illness.[42-44,32] According to Navarra, Gwadz, Bakken, Whittemore, Cleland, Melkus, (2019); Lubloy,(2014) presented that the nurse plays a crucial role in the health care system to link between theory and practices through the application of the self-efficacy theory for changing adherence to medication behavior among older adults' patients with glaucoma which had a greater influence on the effectiveness of treatment.[45,46].

Due to the silent thief of sight, slowly progressive, and irreversible nature of the vision loss that occurs with glaucoma, so the nursing interventions are required to focus upon the early detection and prevention of disease progression of glaucoma. [13-15] The nursing interventions are included the strict control of intraocular pressure by proper instructions about the correct technique for administration of the prescribed anti-glaucoma medication that increases the individual self-confidence to carrying out this a particular task and how to overcoming medication adherence barriers. Therefore, increasing self-efficacy among older adults' patients with glaucoma which has a positive influence on the patient's behavior and positive health outcomes towards adherence to the medications. [39-41]

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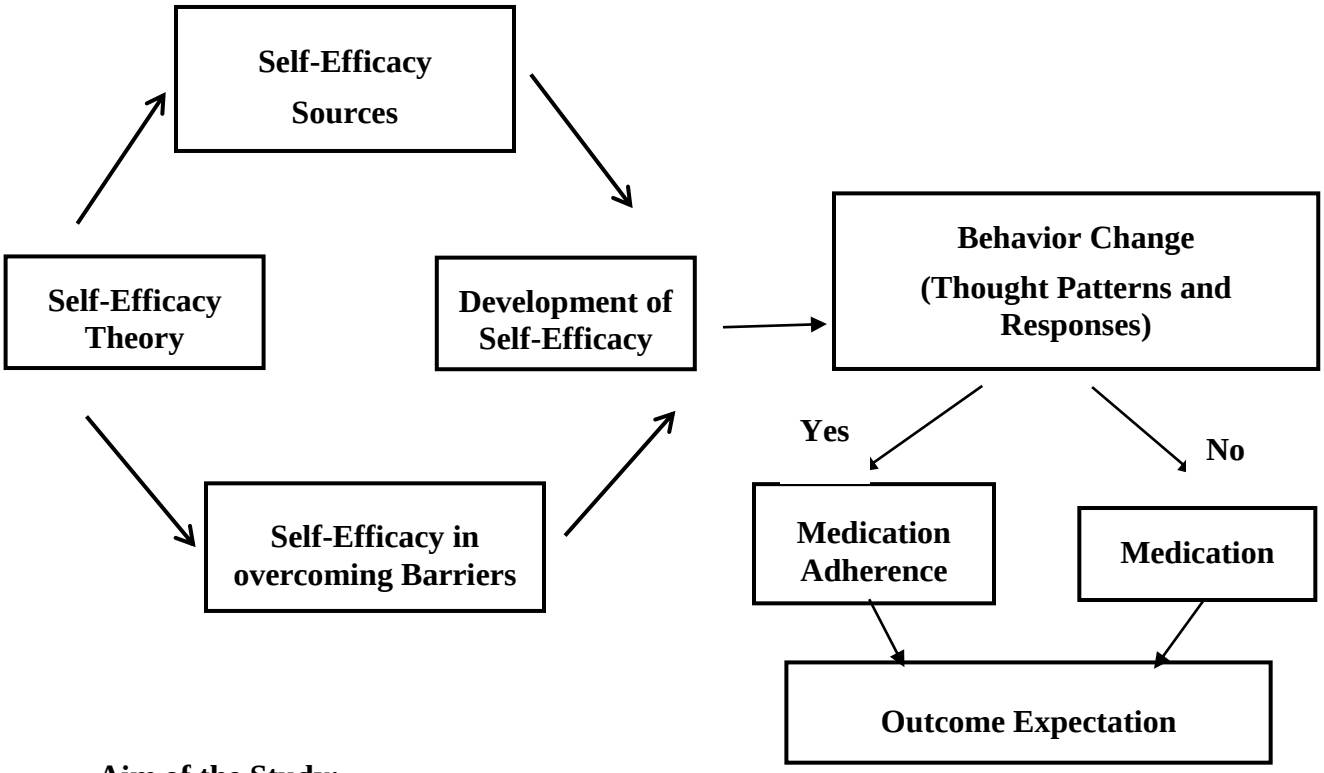
Figure (1) Bandura Self-Efficacy Theory



Aim of the Study:

The aim of the study was to measure the impact of self-efficacy theory to improve medication adherence among older adults' patients with glaucoma.

Research hypotheses

H1. The study group of the elderly patients who received the intervention program of glaucoma medication management may exhibit a significant improvement in their self-efficacy in overcoming medication adherence barriers compared to the control group.

H2. The study group of the elderly patients who received the intervention program of glaucoma medication management may exhibit a significant improvement in their self-efficacy on the ability in carrying out glaucoma medication correctly compared to the control group.

H3. The study group of the elderly patients who received the intervention program of glaucoma medication management may exhibit a significant improvement in their adherence to medication behavior compared to the control group.

H4. The study group of the elderly patients who received the intervention program of glaucoma medication management may exhibit a significant improvement in their outcome's expectation compared to the control group.

2.0 METHODOLOGY

Research Design: A quasi-experimental design was used to investigate the study hypotheses.

Research Setting: The baseline data was collected at the outpatient clinic of Ophthalmology at University Hospital, Shebin El-Kom, Egypt. Follow-up phases was conducted every four weeks (week 4, 8, 12) during their regular routine visit at the ophthalmic clinic. The data was collected between the end of May 2018 to the end of October 2019.

Study Sample: A total of 284 older adults suffer from glaucoma, regularly attending Ophthalmology outpatient clinic to receive their medical care was surveyed firstly using the Medication Adherence Rating Scale (MARS) to categorize participates into two groups: an adherent or non-adherent to glaucoma's medications. By using sample size calculator Rao soft, in power analysis of α 0.05, power 90, and medium effect size of 0.2, and using the correlation test, considering the confidence level 95% and a confidence interval 5% was (152). One-hundred fifty-two non-adherent participants were recruited for the purpose of the study after screened two-hundred eighty-four elderly patients with glaucoma. This non-adherent group was divided into two subgroups (study group=76 and control group=76). The researchers quantified the inclusion and exclusion criteria for participants who registered in the study as the flow chart described below in (Figure-2).

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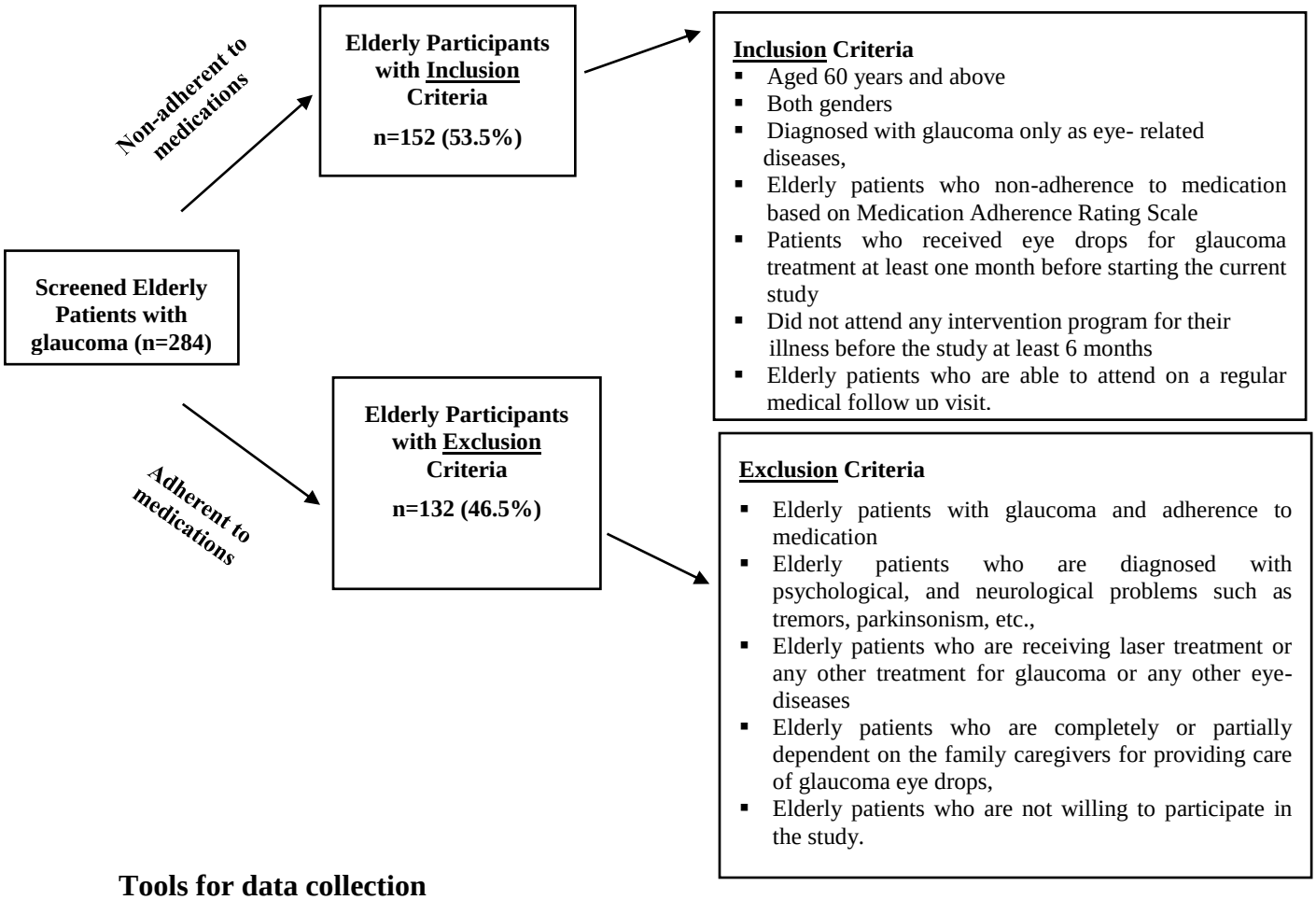
Figure (2) Flowchart of the Study Sample Recruitment Procedure from Ophthalmology Outpatient Clinics



Tools for data collection

The study participants were interviewed individually in a separate room at the outpatient clinics to assure the confidentiality of the information when answering the questionnaire. A self-reported questionnaire consists of three tools that answered within 40-50 minutes. These tools are included:

Tool I: Bio-socio-demographic data: It is composed of age, gender, marital status, level of education, and living arrangement; while biological data consists of the number of chronic illness, duration of glaucoma, which eyes affected by glaucoma and the number of glaucoma medications are used.

Tool II: Medication Adherence Rating Scale (MARS): This scale was developed by Unni, Olson, Farris (2014). It includes a 10-item questionnaire designed for measuring medication adherence behavior (MAB) with a yes/no response, as: Do you ever forgot to take your medication? The total score ranged between 0-10, where a higher score (6-10) indicates adherent to the medication group and a lower score (0-5) indicates non-adherent to medication

with a reliability coefficient (0.71) that attested to the internal consistency of the MARS questionnaire. [47]

Tool III. Glaucoma Medication Self-Efficacy Scale: This scale was developed by Sleath, et al., 2010. [22] It consists of three dimensions:

(1-III) Self-efficacy in overcoming barriers subscale – which included 21 items to assess the patient's ability to overcoming barriers that might interfere with the use of glaucoma medications. The older adults' patient's response for this glaucoma medication self-efficacy scale was categorized for self-efficacy items into (0 = Does not apply; 1= not at all confident; 2= somewhat confident, 3= very confident). The Cronbach alpha value for self-efficacy in overcoming barriers subscale was (0.90), with scores ranged from (0-63).

(2-III) Self-efficacy in carrying out specific task subscale – which included 14 items that assess the patient's ability in carrying out specific tasks that are required to administer eye drops in the correct technique. The older adults' patient's response for this glaucoma medication self-efficacy scale is categorized for self-efficacy items into (0 = Does not apply; 1= not at all confident; 2= somewhat confident, 3= very confident). The items for self-efficacy in carrying out specific tasks' subscale were summed and scored from 0 to 42. Where the Cronbach alpha for the (first eight items) of the subscale was (0.76), with scores ranging from 0-24 and the other (six-items) of the subscale was 0.87, with scores ranged from 0-18. The higher score indicated high self-efficacy and lower scores indicated low self-efficacy.

(3-III) Outcome expectation subscale – which included 4 items that examine the patient's beliefs and thoughts pre-intervention at baseline data and post-intervention at week 12 which reflecting their behavior change that has a direct impact on their health vision condition when following the health instructions correctly about his antiglaucoma medication. The patient responses for this scale was rated on a 9-point Likert scale, where all response items are summed and ranged from 4-36 and Cronbach's alpha was (0.83). The score for the items was categorized into (1= not at all, 2= somewhat, and 3= extremely). The higher score indicated positive outcome expectation i.e., the patient who is more active and persistent to accomplish the task and the low score indicated negative outcome expectation i.e., the patient who is less active and not able to persistent to accomplish the task. [22,48]

Validity and Reliability: In the current study, these tools were adopted and translated from English to the Arabic language by independent translators for the convenience of its contents and tested for content validity by different experts in the field of community health nursing and geriatric nursing. The required modification was done accordingly. This version was checked by the researchers of the present study to assess the similarity between the original version and the back-translated version to avoid discrepancies. The internal consistency was tested after translation where the values of the Cronbach alpha for medication adherence rate was 0.76. The self-efficacy in overcoming barriers subscale was 0.83; meanwhile, the Cronbach's alpha for the first eight items of the glaucoma medication self-efficacy scale was (0.75), and the other six-items was (0.80); the glaucoma outcome expectation scale was (0.82).

Pilot Study: The questionnaire was piloted among (15) older adults' patients with glaucoma which represents 10% of the study sample to assess the clarity and feasibility of the

questionnaires and also to determine the time frame that is required to fulfill the questionnaire. The modification was done accordingly. This pilot sample was not included in the study sample.

Procedure:

Data collected over 6 months from May 2018 to the end of October 2019. Three-days a week from 9.a.m to 12 noon.

Phases of the intervention program: The present study program was conducted in four phases:

I. Assessment phase: It is started at the beginning of the study where the baseline data was collected in the pre-intervention program (Time1=T1) from both studied groups (study and control groups) using study tools number (I, II, & III).

II. Planning Phase: Based on the assessment phase, the components of the intervention program were planned to cover the patients' needs as well as the barriers that are faced during the administration of their glaucoma medications.

III. Intervention Phase: The material of the program was given to the study group only, while the control group did not receive any intervention during the educational sessions which help study participants to understand their illness and the right technique of demonstration of eye drop instillation procedure through a video and then each participant re-demonstration of this procedure by using artificial tears.

IV. Evaluation phase: The observational checklist was used based on the International Glaucoma Association (IGA) instructions to evaluate the patients' self-efficacy in carrying out the right technique of eye drop instillation and self-efficacy in overcoming barriers at the pre-intervention program (T1), and post-intervention program at week four (T2), week eight (T3), and week twelve (T4).

Ethical consideration: An official permission to carry out the study was obtained from the responsible committees. A consent form was taken from the participants, confidentiality was ascertained. The researchers were clarified that no potential risks associated with participation and patients have the right to withdraw from the research without penalty at any time of the study period. Privacy and confidentiality were completely protected; no identifiers or personal information was collected.

Data analysis: The quantitative data were coded and analyzed using Statistical Package for Social Sciences (SPSS) version 20. The descriptive statistical analysis represents the calculated frequency count, percentage, mean and standard deviation were used for dependent variables (adherence to medication) and independent variables (self-efficacy). Paired-samples t-test is used to compare the means of two samples when each observation in one sample (study group) which paired with an observation on the other sample (control group) before and after participating in intervention program at different time points. The statistical significance level was $P<0.05$.

Limitations of the study: Inability of the study participants to attend regularly for their follow-up appointment due to physical inability or transportation difficulty, so the researchers rescheduling the convenient time for the next session through their cell phone to complete the phases of the intervention program.

4.0 RESULTS

Table 1: Risk Factors of Adherence to Medications among Older Adults Participants with Glaucoma

Variables	Studied Sample with Glaucoma (n=284)				Odds Ratio	95% Confidence Interval	P-value
	Non-Adherent		Adherent				
	Frequency	Percent	Frequency	Percent			
	152	**53.5%**	**132**	**46.5%**			
Age (Year)							
Young-old (60 – years)	28	18.4%	125	94.7%	10.9	6.8-16.32	0.000**
Old-old (74–years)	124	81.6%	7	5.3%			
Gender							
Female	43	28.3%	111	84.1%	1.64	1.75 - 3.5	0.02*
Male	109	71.7%	21	15.9%			
Marital status							
Married	12	7.9%	110	83.3%	0.55	0.37-2.45	0.78
Widowed	140	92.1%	22	16.7%			
Level of education							
Not educated	136	89.5%	20	15.2%	1.65	1.02-3.24	0.04*
Educated	16	10.5%	112	84.8%			
Living arrangement							
Live alone	104	68.4%	30	22.7%	1.78	1.06-3.03	0.03*
Live with family	48	31.6%	102	77.3%			
Family history of glaucoma							
Yes	70	46.1%	72	54.5%	1.40	0.88.-2.15	0.08
No	82	53.9%	60	45.5%			
No. of chronic illness							
1-2	11	7.2%	114	86.4%	12.6	8.2-18.4	0.000**
More than 2	141	92.8%	18	13.6%			
Duration of glaucoma (Year)							
> 5	87	57.2%	65	49.2%	0.60	0.33-2.10	0.84
< 5	65	42.8%	67	50.8%			
Which eye affected by glaucoma							
Unilateral	92	60.5%	73	55.3%	1.34	0.73-2.36	0.23
Bilateral	60	39.5%	59	44.7%			
Number of glaucoma medication are used							
2-3 medications	15	9.9%	112	84.8%	13.2	7.4-19.8	0.000**
More than three Medications	137	90.1%	20	15.2%			

Table (1) revealed that the highest prevalent risk factors of non-adherence with glaucoma medication among older adults are old-old age group compared with participants of the young-old group (OR=10.9; 95% CI 6.8-16.32, P=0.000), presence of multiple chronic illnesses (more than three) than older adults who had one or two multiple chronic illnesses (OR=12.6; 95% CI 8.2-18.4, P= 0.000), older adults who received polypharmacy for managing their illness than those who received only one or two medication (OR=13.2; 95% CI 7.7 -19.8, P=0.000) respectively. Factors associated with adherence to glaucoma's medication, a significant

statistical difference was found among males and females participant in relation to gender, (OR=1.64,95% CI 1.75-3.5, P = 0.02), level of education, (OR=1.65, 95% CI 1.02-3.24,P=0.04); and living arrangement respectively: (OR=1.78, 95% CI 1.06 - 3.03, P=0.03) respectively.

Regarding marital status, family history of glaucoma, duration of glaucoma, and which eye is affected were not significant risk factors for adherence to medication among older adults' participants who are suffering from glaucoma. The results displayed that there is no significant differences between married and unmarried study participants for adherence to medication (OR=0.55, 95% CI 0.37-2.45, P=0.78). Similarly, there are no significant differences between study participants who have a family history of glaucoma and who did not family history of glaucoma for adherence to medication (OR=1.40, 95% CI 0.88-2.15, P=0.08). In addition, the results presented that there is no significant differ among long term and short term duration of glaucoma in the study participants for adherence to medication (OR= 0.60, 95% CI 0.33-2.10, P=0.84); also in comparison to which eye is affected by glaucoma among the study participants, the results indicated that there is no significant difference among unilateral and bilateral glaucoma for adherence to medication (OR=1.34, 95% CI 0.73-2.36, P=0.23).

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Table 2: Bio-Socio-demographic Characteristics of the Non-adherence to Medication among Studied Groups

Variables	Non-adherence to Medication Groups (n=152)			
	Study Group		Control Group	
	Frequency	Percent	Frequency	Percent
	76	**100%**	**76**	**100%**
Age (Year)				
Young-old (60 – years)	20	26.3%	5	6.6%
Old-old (74–years)	56	73.7%	71	93.4%
Mean ± SD	**74.93±5.7**		**74.78±2.70**	
Gender				
Female	30	39.5%	15	19.7%
Male	46	60.5%	61	80.3%
Marital status				
Married	17	22.4%	12	15.8%
Widowed	59	77.6%	64	84.2%
Level of education				
Not educated	67	88.2%	59	77.6%
Educated	9	11.8%	17	22.4%
Living arrangement				
Live alone	59	77.6%	63	82.9%
Live with family	17	22.4%	13	17.1%
Family History of glaucoma				
Yes	57	75.0%	53	69.7%
No	19	25.0%	23	30.3%
No. of chronic illness				
1-2	8	10.5%	11	14.5%
More than 2	68	89.5%	65	85.5%
Duration of glaucoma (Year)				
> 5	39	51.3%	41	53.9%
< 5	37	48.7%	35	46.1%
Mean ± SD	**3.80±.67**		**3.67±.59**	
Which eye affected by glaucoma				
Unilateral	60	78.9%	66	86.8%
Bilateral	16	21.1%	10	13.2%
Number of glaucoma medication are used				
2-3 medications	12	15.7%	7	9.2%
More than three Medications	64	84.3%	69	90.8%
Mean ± SD	**4.75±.43**		**4.64±.48**	

Table (2) presented bio-sociodemographic data of the studied groups of the elderly participants who have glaucoma and non-adhering to medication. In this study, the total screened elderly participants with glaucoma (284) had a high percent of non-adherent to medication (53.5%). This non-adherent group sample (152) was divided equally into two groups (76) patients for the study group and (76) for the control group. As inferred from the table, the age of the study sample who are non-adherence to medication was ranged between 60-78 years old and the mean of age and

SD for the study group was 74.93±5.7, while the mean age for the control group was74.78±2.70. In addition, the higher percent of non-adherence to medication 73.7% & 93.4% was related to the "old-old group" among study and control groups compared to the young-old group. Regarding gender, non-adherence to medication was higher 60.5% & 80.3% among males compared to males in both study and control groups. Furthermore, non-adherence to medication was higher 77.6% & 84.2% among widowed compared to married in both studied groups. For the level of education, the results showed that the higher percentage of non-adherence to medication among non-educated elderly participants in both study and control groups was 88.2% & 77.6% respectively compared to educated participants. In relation to the living arrangements, the results exhibited that a higher percent of non-adherence to medication among elderly participants who are living alone in both study and control groups 77.6% & 82.9% respectively compared to the study participants who are living with their families.

Meanwhile, the result showed that the family history of glaucoma among both study and control groups had close percent to non-adherent to medication (75.0% & 69.7%) respectively. In relation to the elderly participants who had multiple-chronic illnesses (more than three diseases) are the one who had a higher percent of non-adherence to medication in both study and control groups (89.5% & 85.5%) respectively compared to study participants who have one or two chronic illnesses. Regarding the duration of glaucoma and which eye is affected, the results displayed that the percent of non-adherence to medication is almost closed between the entire study participants who had glaucoma less or more than five years as well as if they have bilateral or bilateral glaucoma. In addition, the result revealed the study participants in both study and the control group who had polypharmacy are the ones who had a higher percent of non-adherence to medication (84.3% & 90.8%) respectively compared to study participants who have one or two medications.

Table 3: Total Mean Score of Self-Efficacy in Overcoming Barriers that Might Interfere with Glaucoma Medications Adherence among Study and Control Groups Pre and Post Program Intervention

Study	Mean ± SD	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
		Lower	Upper			
Baseline Data (Pre- Intervention) Study Group Control Group	-.06579±.52499	-.18575	.05418	-1.092	75	.278
4 Weeks (Post-intervention) Study Group Control Group	.01316±.64277	-.13372	.16004	7.178	75	.059*
8 Weeks (Post-intervention) Study Group Control Group	.96053±.62055	.81872	1.10233	13.494	75	.000**
12 Weeks (Post-intervention) Study Group Control Group	1.06579±.61829	.92450	1.20707	15.028	75	.000**

*P < 0.05 level of significance **P < 0.001 level of significance

As shown in Table (3), the result supported the first hypothesis which states, "The study group of the elderly patients who received the intervention program of glaucoma medication management

may exhibit a significant improvement in their self-efficacy in overcoming medication adherence barriers compared to the control group". In this table, the results revealed that there were no significant differences between the mean score of self-efficacy in overcoming medication adherence barriers among study and control groups pre-intervention program as a baseline data at T1=first week (P=0.278). Meanwhile, there was a significant difference between the mean score of self-efficacy in overcoming medication adherence barriers among study group after each educational sessions at a variety of time "T2=fourth week, T3= eighth week, T4= twelfth week" (P=0.059; P=0.000; & P=0.000) respectively.

Table 4: Total Mean Score of Self-Efficacy in Carrying Out Specific Task for Glaucoma Medications

Correctly among Study and Control Groups Pre and Post Program Intervention

Study Period	Mean ± SD	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
		Lower	Upper			
Baseline Data (Pre- Intervention) Study Group Control Group	.02632±.16114	-.01051	.06314	1.424	75	.159
4th Weeks (Post-intervention) Study Group Control Group	.15789±.40175	.06609	.24970	3.426	75	.001**
8th Weeks (Post-intervention) Study Group Control Group	1.03947±.52766	.91890	1.16005	17.174	75	.000**
12th Weeks (Post-intervention) Study Group Control Group	1.10526 ±.53114	.98389	1.22663	18.141	75	.000**

*P < 0.05 level of significance **P < 0.001 level of significance

In Table (4), the results exhibited the second hypothesis that stated, "The study group of the elderly patients who received the intervention program of glaucoma medication management may exhibit a significant improvement in their self-efficacy on the ability in carrying out glaucoma medication correctly compared to the control group". The findings in table (4), presented that there were no significant differences between the mean score of their self-efficacy on the ability to carrying out glaucoma medication correctly among study and control groups in the pre-intervention program at T1 (P=0.159). Meanwhile, after the demonstration and re-demonstration of the intervention training program among a study group at a variety of time (T2, T3, T4), the results showed that there is an improvement in their self-efficacy in their ability in carrying out glaucoma medication correctly compared to the control group that is shown by a highly statistically significant differences between total mean scores at (P=0.001, P=0.000; & P=0.000) respectively.

Table 5: Total Mean Score of Medication Adherence Behavior Change among Study and Control Groups Pre and Post Program Intervention

Study Period	Mean ± SD	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
		Lower	Upper			
Baseline Data (Pre- Intervention) Study Group Control Group	-.01316 ± .11471	-.03937	.01305	-1.000	75	.321
4 Weeks (Post-intervention) Study Group Control Group	.18421 ± .39023	.09504	.27338	4.115	75	.002**
8 Weeks (Post-intervention) Study Group Control Group	.47368 ± .50262	.35883	.58854	8.216	75	.000**
12 Weeks (Post-intervention) Study Group Control Group	.63158 ± .53770	.50871	.75445	10.24	75	.000**

*P < 0.05 level of significance **P < 0.001 level of significance

In Table (5), the results displayed the third hypothesis that stated, "The study group of the elderly patients who received the intervention program of glaucoma medication management may exhibit a significant improvement in their adherence to medication behavior compared to the control group. As illustrated in this table, the findings showed that there were no statistically significant differences between total mean scores of adherence to medication behavior change among study and control groups in the pre-intervention program at T1 (P=0.321). Meanwhile, after the demonstration and re-demonstration the intervention program among study group at a variety of times (T2, T3, T4), the results showed that there was a statistically significant difference in their adherence to medication compared to the control group at mean scores (P=0.002; P=0.000; & P=0.000) respectively.

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Table 6: Total Mean Score of the Effect of Glaucoma Medication Management Program on Outcome's Expectation of the Study and Control Groups at Pre- and Post-Intervention

Outcome's Expectation Items	Study Period	Paired Differences (Mean ± SD)	t	df	Sig. (2-tailed)
How much do you think it will help your glaucoma to come to your appointments with your eye doctor?	Pre-intervention	.01316±.44702	.257	75	.798
	Post-intervention	1.13158 ± .61843	15.951	75	.000**
How much do you think it will help your glaucoma if you use your eye drops regularly?	Pre-intervention	.03947 ± .47443	.725	75	.471
	Post-intervention	1.22368 ±.60219	17.715	75	.000**
How much do you think it will help your vision to come to these appointments with your eye doctor?	Pre-intervention	.07895 ±.48341	1.424	75	.159
	Post-intervention	1.09211±.61487	15.484	75	.000**
How much do you think it will help your vision if you use your eye drops regularly?	Pre-intervention	.05923 ±.51640	.256	75	1.000
	Post-intervention	.97368±.63190	13.433	75	.000**

*P < 0.05 level of significance **P < 0.001 level of significance

In Table (6), the findings presented the fourth hypothesis that stated "The study group of the elderly patients who received the intervention program of glaucoma medication management may exhibit a significant improvement in their outcome's expectation compared to the control group". The results pointed out that the intervention program had a positive impact on the outcome expectation of the elderly participants at the post-intervention program phases compared to pre-intervention program phase. In addition, there is a statistically significant difference between the study group and the control group in their improvement in the outcomes' expectation at post-intervention compared to the pre-intervention program.

Discussion

To date, non-adherence with the medication regimen may increase unnecessary health care costs, social and economic burden, lead to delayed recovery and raise mortality. It is one of the common health-related problems and challenges among the elderly patients that describe the degree to which the elderly's behavior for taking the prescribed medication is inadequately adhering or noncompliance due to many barriers and low self-efficacy to carrying out this specific task. Medication adherence could help positively in health outcomes as relief of symptom, and decrease health care cost, reduced hospital stay. [(18)] Therefore, the aim of the study was to measure the impact of self-efficacy theory to improve medication adherence among older adults' patients with glaucoma.

The results of the present study revealed that 53.5% of the total screened elderly participants with glaucoma had non-adherent to medications. This result comes in agreement with Mahmoodi, et al.,(2019);Lee et.al.,(2018);Patton et al.,(2018);Ma, Yen, Chen, &

Liou,(2015); Pasina et al.,(2014) who specified that approximately 40-72% of older adults' persons had non-adherence to medications more than the other age groups.[18-20;49,50] However, this the result was inconsistent with Pagès-Puigdemont, Tuneu, Masip, Valls, Puig, & Mangues, (2019) who reported that about 54.5% of older adults were fully adhering to the prescribed medications worldwide and the adherence rate is ranged from 47% to 100% in several studies.[51] This non-adherence to medication among studied groups may be due to older adult people are likely to have similar barriers and challenges which are always associated with the aging process such as impairment of their functional capacity and cognitive impairment, present of multiple chronic illnesses with poly-medications, and patients' beliefs which result in low self-efficacy to keep continuity and reserve their medications intake to improve their vision health condition and prevent deterioration.

In relation to age group, the result of this study projected that non-adherence to glaucoma medications among the elderly participants have represented a higher percentage among the old-old group 74 years old more than a young-old group who 60 years. This finding was consistent with Mahmoodi, et al.,(2019);Lee et al.,(2018); Ma, et al.,(2015) ; Kharameh , Khoshravesh , Nouri , Abdolmalaki & Bakhshi,(2018); Sirey, Weinberger , Greenfield, & Bruce, (2013) reported that the rates of non-adherence to medication is high among older adults over the age of 60 years compared to any other age groups and increased gradually with advanced age where the glaucoma prevalence increases dramatically with age which may result in intensely the elderly population with glaucoma-related visual disability.[18,19,49,52,53] In addition, Al-Mansouri, Kanaan, Gamra, Khandekar, Hashim Al Qahtani, & Ahmed,(2011) revealed that glaucoma and different visual disabilities among subjected aged 40-49 years were not available as the visual acuity for the blindness and low vision study focused on the subjects 50 years or older. In other words, subjects among the age group of 60 years and older had a significantly higher risk of glaucoma compared with subjects in the 40-59 years age group (P =0.00001).[54] This could be explained that older Egyptian's adults may feel that they lived their life till the end and normally this is the aging process's consequences and taking more medications will not make a difference to their quality of life. Also, their non-adherence to medication is positively related to their level of education where most of the studied participants who are not educated; can't follow the written prescription of glaucoma medication administration.

In reference to gender, the finding of this study showed that male older adults' the participant had a higher percent of non-adherence to medication more than females among studied groups. In addition, gender is a high-risk factor of an adherent to medication in this study where the results displayed the difference among males and females (P=0.02). This result was agreed with Zucker & Prendergast (2020); Marcos-Marcos, Gasch-Gallén, Mateos, & Álvarez-Dardet,(2020); Chu,(2014); Soldin and Mattison,(2012); Al-Mansouri, et al.,(2011) who stated that gender-role characters and social stereotypes were described that the effect of medication adherence and it is important to consider the differences in the distribution of medicines, metabolism, efficacy, and side effects of prescribed medicines that have been reported for both gender, with a potential effect on medication adherence. [55-58,54] In addition, Rajpura & Nayak,(2014); Vaidya, Partha, & Karmakar, (2012); Emilsson, et al., (2011) who reported that women are more likely to seek preventive care and treatment than men.[59,60,61] According to Holt et al., (2013) study the results shown that sex-related differences in the effects of some medications used by the older population could stem from differences in medication adherence,

for the occasion that the effect anti-hypertension pills could cast on the sexual function of older men may lead to their low or non-adherence compared to the hypertensive older women. (62)

In contradictory, the finding in some studies was done by Segarra, Modamio, Fernandez & Marino, (2017); Manteuffel, Williams, Chen, Verbrugge, Pittman, & Steinkellner (2014); Holt, et al., (2013) found that gender-based differences in medication adherence is not still conclusive, but it is reported that among women are more used to multiple medications and non-compliance with the recommendations of health care providers which have a direct influence on women's decision to not comply with the prescribed medications compared to the men who had similar conditions of chronic illness.(63,64,62)

The results of the current study revealed that marital status was not a significant risk factor for the adherence to medication among older adults' participants who are suffering from glaucoma (P=0.78). This finding was consistent with Ma, et al., (2015) who reported that medications adherence behaviors of the elderly participants had no relationship with marital status.(49) Conversely, Mahmoodi, et al.,(2019) stated that the married study attendees had significantly better adherence to medication compared with single older adults.(18) This could be explained that older adult's married participants are struggling to accomplish different roles at the same time; self-management of their health problems, continue to work even after the retirement period. Also, considering their low socioeconomic status they may take less medication in order to avoid its cost burdens. Also, limited understanding of the disease process and treatment regimen, difficult access to medication, and lack of communication with the pharmacist may all contribute to medication non-adherence among married older adults.

Regarding educational level, the result of this study showed that the education level of the elderly participants was a significant risk factor for the adherence to medication among older adults' participants who are suffering from glaucoma (P=0.04). This result comes in agreement with Mayo-Gamble & Mouton, (2018); Jin, Kim, & Rhie,(2016); Wang, Lau, Loo, Chow, & Thompson, (2014) reported that older adults who have less health literacy are more likely to take less medication than those who are instructed. (65-67) In addition, Jin, et al., (2016); Wang, et al., (2014) depicted that the education level of elderly people is strongly associated with their medication adherence and the elderly people who had a high level of education is more adherence to their medication. (66,67) On the other hands, Vélez-Vélez, and Bosch,(2016); Woith, and Rappleyea,(2016) shown that the elderly patients who are understanding of their illness can enhance their ability to manage the disease and subsequently follow the medication regimen, because the illness perception or understanding their current disease is one of the important behavioral determinants of medication adherence.(68,69) This result is inconsistent with Ma, et al.,(2015) who mentioned that medications adherence behaviors of the elderly people had no relationship with their educational background.(49)

In this study, the results revealed that the living arrangement is a highly significant risk factor of an adherent of medication where the results displayed differ among the elderly who are living alone or with the family (P=0.03). This result is consistent with Mahmoodi, et al.,(2019) study which showed that living alone had a significant precipitator of medication adherence compared with the participants who are not living alone. The interpretation of this result may be due to the elderly who have family or children spouse those are the ones providing social and family support to take care of themselves and take medications on time. (18)

The results of the current study revealed that a family history of glaucoma was not a significant risk factor for adherence to medication among older adults' participants who are suffering from glaucoma. This result comes in agreement with McClelland, Bodle & Little, (2019); McMonnies, (2017) who stated that there is no significant association between glaucoma and family history. [70,71] This could be explained that patients may unaware of their family members who have been diagnosed with glaucoma, add to the difficulty to some extent to diagnose glaucoma cases, and also certain difficulties in completing the family history. In addition, if the family relationship is weak or absent, it is difficult to know if any family member of the first or second degree of blood the relation has a previous history of glaucoma.

In relation to chronic illness and poly medications, the result of this study showed a highly statistically significant association with adherence to medication (P=0.000). In addition, the risk factor of adherent to medication did differ among elderly patients who received poly-medications received for the treatment of the illness compared with the elderly who have received one or two medications for the management of the treatment (P=0.000). This finding is consistent with Sleath et al., (2011) who stated that elderly patients who used two or more glaucoma medication had worse visual field defect severity than patients on one medication.[72] On the other hands, this finding was agreed with Mahmoodi, et al.,(2019); Lee et al.,(2018); Kleinsinger,(2018); Zaugg, Korb-Savoldelli, Durieux & Sabatier ,(2018); Sabate,(2016) who showed that non-adherence to medication is a challenge for older adults, particularly who have multiple chronic illnesses with prescribed polypharmacy.[18,19,73-75] There are statistically significant correlated associated with lower medication adherence and a number of chronic illnesses and prescribed medications. These challenges may be due to physiological and cognitive impairment that associated with the aging process where almost 85 percent of older people have at least one chronic illness and 60 percent have at least two chronic illnesses.[76-78] Along with that, many older people cannot able coping with multiple chronic illnesses and also cannot able to learn or memories the instructions for managing a variety of medications particularly if they have multiple daily doses with difficult formulations to administrate treatment plan in the right time and right dose, whereby the elderly patients exposed to non-adherence to medication either intentional in nature i.e., they cannot able to carry out this specific task such as medication intake due to low self-efficacy or unintentionally i.,e. they have a loss of memory or forgetfulness.[79,80] Consequently, this age group of elderly people who are failed in non-adherence to medication have been associated with poor clinical outcomes and increases rates of rehospitalization and increases the burden on the healthcare system costs. [76-78]

The result of the current study pointed out that there was a significant difference between the mean score of self-efficacy in overcoming medication adherence barriers among study group after educational sessions at T2=fourth week, T3=eighth week, T4=twelfth week after intervention program at (P=0.059; P=0.000; P=0.000) respectively which reflects an increase in patients reported self-efficacy in overcome adherence barriers that associated with improvement of their adherence to medication behavior compared to the control group. This finding is consistent with Carpenter, et al.,(2016); Slota, et al.,(2015); Sleath, et al.,(2014) who displayed that self-efficacy in medication, adherence barriers have been significant association with better self-reported medication adherence over a 60-day period where the average of self-efficacy in overcoming adherence barriers was increased by 0.35 at ($p < 0.001$) after spending more time to

educate the patients about glaucoma and assess their views that have an effective improvement in their behavior to overcome adherence barriers and increase self-confidence. (81-83)

The findings in the current study proposed that there are highly statistically significant differences between total mean scores of the study group of the elderly patients who received the intervention program of glaucoma medication management that exhibited a significant improvement of their self-efficacy on the ability to carrying out the task technique of eye drop instillation correctly compared to control group (P=0.001; P=0.000; P=0.000) respectively. Similarly, this result was agreed with Carpenter, et al.,(2016); Michie, Atkins, & West, (2015); Lampert, Bruckner, Haefeli, & Seidling, (2019) who displayed that a high a significant association between improvement of self-efficacy to carry out tasks to use eye drops correctly and the patients' adherence to medication over a period of time where the average performance for eye drop installation was increased to 1.01 at p-value <0.001 in patient's self-report about their improvement of their self-efficacy of eye drops installation technique correctly. (84-86) On the other hands, Morgan, Woods, Iudicello, Grant, & Villalobos, (2019); Gross, Hosek, Richards, & Fernandez, (2016) stated that HIV patient who reported more frequent positive interactions with their health care providers had greater adherence to self-efficacy. (87-88) According to Mahmoodi, et al.,(2019) who showed that medication adherence self-efficacy to carry out a specific task had a significant association with drug adherence after the patients reported a significant increase in their confidence to overcome adherence-related barriers (p<0.001). (18) In addition, Patton, et al.,(2017); Richard & Street,(2013) who found a highly significant association between communication and patient adherence, theoretical models suggest that patient-provider communication are most likely affects adherence indirectly through patient-mediated variables like increased self-efficacy.(21,89) In contrast, Carpenter, et al.,(2016) who reported that the patients who asked more questions (p< 0.001) about their glaucoma medications reported less adherence self-efficacy than patients who asked a few medication questions (β=-.30, p<0.001). (81) This could be explained that although patients got satisfactory knowledge about their medication still they are internally convinced it will not return the irreversible corneal changes that already occurred as a result of glaucoma. Also, maybe they are utilizing other medication regimens such as complementary and herbal medicine for eye diseases.

Based on the result of the current study, the study group of the elderly participants who received the intervention program for glaucoma medication management has been a significant improvement in their outcome's expectation compared to the control group. This result was agreed with the Centers for Disease Control and Prevention (2018); Sleath, et al., (2010), who proposed the results in these previous studies on HIV, diabetes, asthma, and depression which found positive associations between self-efficacy and medication adherence and other disease-specific self-management behaviors.(90,22) According to Kelly, McCarthy, & Sahm, (2014); Bandura, (1977) social cognitive theory stated that if an individual believes that taking eye drops will help their glaucoma, then that individual is more likely to take the eye drops than someone who does not believe that they are helpful. (91,34)

Conclusion: To improve adherence to medication through this theory-based intervention that designed to be fit for each patient according to their barriers and needs which may enhance self-confidence and patients' beliefs to carry out glaucoma medication in a correct technique so taking time in this study to educate patients about their glaucoma and reassess their overcoming

barriers to being more effective methods for increasing medication self-efficacy which definitely reflect positively health outcomes on the patients' health condition.

Recommendation: The findings confirm the effectiveness of an intervention program based on self-efficacy theory in terms of improving glaucoma medication adherence among older adults. Glaucoma's medication principles should be discussed at regular intervals based on patients' needs and the barriers, they are facing.

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