

Effect of Intervention Guidelines on Nurses' Performance Regarding Glaucoma Surgery

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Abstract:

Background: Glaucoma is a leading cause of irreversible visual impairment worldwide. Ophthalmic nurses play a critical role in managing glaucoma surgery patients. **Aim of study:** This study aimed to evaluate the effect of intervention guidelines on nurses' performance regarding glaucoma surgery at Zagazig University Hospitals. **Design:** A quasi experimental design was utilized in this study. **Setting:** Data was collected from department of ophthalmology and ophthalmology outpatient clinic at Zagazig University Hospitals. **Subjects:** The study was conducted on Convenience sample of all available nurses working in ophthalmology department (40 nurses) **Tools of data collection:** Two tools were used for collection of data, first, structured interview questionnaire for nurses, Second tool was an observational check list to assess nurses' practice regarding glaucoma surgery. **Results:** 72% of nurses aged below 45 years, 95% of them were married, 77% of them had diploma in nursing, 57% of them had more than ten years of experience in ophthalmology department, 95.5% of them didn't have training course regarding glaucoma surgery. There were statistically significant improvements in mean differences scores of studied nurses' knowledge and practice regarding glaucoma post intervention compared to pre intervention. **Conclusion:** It can be concluded that the intervention guidelines significantly improved nurses' knowledge and practice regarding glaucoma surgery. **Recommendations:** It is recommended that periodic evaluation and validation of the training given and training programs should be included both theoretical and practical.

Keywords: Intervention Guidelines, Nurses' Performance, Glaucoma Surgery.

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Introduction:

Glaucoma is a substantial public health problem, with a large negative impact on quality of life and the utilization of health care resources. Glaucoma refers to a group of eye conditions with a characteristic pattern of progressive damage to the optic nerve. Raised intraocular pressure (IOP) is the best characterized risk-factor, but IOP can also be normal. Globally, glaucoma is considered the leading cause of irreversible vision loss and one of the leading causes of blindness overall (Lund et al., 2021).

Glaucoma is recognized as the “silent thief” because the majority of patients remain unaware of their disease until they observe changes and a decline in vision. Glaucoma is a chronic disease that requires lifetime care. Uncontrolled glaucoma may lead to blindness. Longterm treatment of glaucoma cannot compensate for the losses and cannot improve vision. However, treatment can prevent the advancement of the damage and aggravate the patient’s condition. The objective of glaucoma treatments is to maintain visual performance. Ophthalmology indicators, such as visual acuity and visual field assessment, are used to evaluate treatment outcomes (Hassankhani H, Haririan H & Heidarnejad F, 2020)

According to World Health Organization (2019), globally at least 2,2 billion people have a vision impairment and glaucoma is the leading cause of global irreversible blindness. Worldwide, an estimated 60 million people have optic neuropathy due to glaucoma. Vision impairment and blindness caused by glaucoma are irreversible but effective treatments and surgical interventions are available which can either delay or prevent progression of the disease. According to the Egyptian Society for glaucoma disease, the incidence of glaucoma in Egypt is about 0.5% to 1% of the total population (Iman& Eissa, 2018).

In managing glaucoma, it should be kept in mind that it can be a life-long treatment, and generally may include both surgical and medical managements. Glaucoma patients usually present with high intraocular pressure (more than 22 mmHg) with one of the clinical features. Thus, the cornerstone of management in most cases is to lower the increased intraocular pressure by 22.5%. Unfortunately, visual damages that have occurred due to the disease are irreversible. Initially, the clinician shall aim the management towards preventing any further damage and thus lowering the permanent visual loss in these patients (Schuster et al., 2020).

Indeed, ophthalmic nurses play a crucial role in achieving required postoperative outcomes if they provide comprehensive, standardized, and systematic nursing care pre, and post glaucoma surgery. So, intervention guidelines is an important and potentially powerful tool that can have beneficial effects as improvement in patient knowledge, self-care, quality of care, cost reduction, transparency of treatment (Eldesoky & Awad, 2020).

The nurse plays a significant role in providing care to glaucoma surgical patients and her role begins in the preoperative stage throughout proper evaluation of the patient that leads

to reduction of the cancelled surgical operations at the date of operation. Additionally, she is responsible for providing patients with necessary information and meeting their physical and psychological needs. For the success of the postoperative phase, the nurse should emphasize on minimizing patient's pain and discomfort, involving the patient and his family in postoperative care, preventing complications as possible, and providing complete discharge instructions (Abid, Hassanin & Salama, 2018).

Significance of the study:

Glaucoma is an eye disease caused by optic nerve damage. It results in lifelong irreversible damage to the eyes such as a decrease in both visual acuity and effective field of view. As the disease progresses, the patient's intraocular pressure (IOP) continues to rise, which may give rise to optic atrophy and visual field defects, and even blindness in severe cases (Chen et al., 2021).

Applying the intervention guideline pre, and post glaucoma surgery will be very useful in enhancing nursing care, promoting work quality, helping patient to actively participate in nursing process, creating a reliable professional environment, promoting cooperation and communication among nurses, decreasing incidence of surgical complications, and enhancing nursing effect during recovery period. No one can neglect that, nurses are in a strategic position for implementing intervention guidelines that could improve patient outcome and prepare them adequately for self-care at home after hospital discharge (Abid, Hassanin & Salama, 2018).

Despite the importance of the intervention guidelines for above reasons, there is no existing intervention guidelines to manage preoperative and postoperative care in ophthalmology. So, there is an urgent need to conduct this study to evaluate effect of intervention guidelines on nurses' knowledge and practice regarding glaucoma surgery.

Aim of the study: Was to evaluate the effect of intervention guidelines on nurses' performance regarding glaucoma surgery at Zagazig University Hospitals.

Research Hypothesis:

- Nurses' knowledge post intervention guidelines will be improved than pre intervention guidelines.
- Nurses' practice regarding glaucoma surgery will improve post intervention guidelines than pre intervention guidelines.

Research design: A quasi experimental design was conducted to achieve the aim of the study.

Setting: The study was conducted in department of ophthalmology (20 bed capacity for each) and ophthalmology outpatient clinic at Zagazig University Hospitals, which located in the second floor. It consisted of five rooms for patients, one room for physicians and one room for nursing staff.

Subjects: Convenience sample of 40 nurses who working in ophthalmology department and caring for patients with glaucoma surgery.

Tools of data collection:

Tool I: A Structured interview questionnaire for Nurses (Silverthorn, 2016, Billings & Hensel, 2017& Matteson & Passmore, 2020). (Appendix I): (pre- post test): was designed by the researcher after revising of related literature and opinions of expertise for content of validity to assess nurses' knowledge regarding glaucoma and care of patients after glaucoma surgery and consisted of 60 questions as the following parts:

Part 1: Demographic characteristics of nurses: consisted of six closed ended questions and one open ended question about age, marital status, level of education, general years of experience, years of experience in ophthalmology department and training courses related to care of patients after glaucoma surgery. This part was used only once because the included nurses in the pre-test were the same in the post-test.

Part 2: Nurses' knowledge regarding glaucoma surgery (pre/ post test): It was consisted of 54 questions in the form of multiple choice question (MCQ) to assess nurses' knowledge regarding patients with glaucoma surgery. It included four sections:-

First section:- Nurses Knowledge regarding anatomy and physiology of the eye. It was consisted of 10 MCQ questions about: layers of the eye, functions of outer layers of the eye, function of middle layer of the eye, definition of orbit, definition of cornea, function of iris, definition of conjunctiva, definition of retina, definition of pupil and definition of crystalline lens.

Second section:- Nurses Knowledge regarding glaucoma. It was consisted of nine MCQ about; definition of glaucoma, causes of glaucoma, normal range of intraocular pressure, most common types, signs and symptoms, complications and treatment.

Third section:- Nurses' knowledge regarding nursing care of the patient before and after glaucoma surgery included two parts:

I. Nurses' knowledge regarding nursing care of the patient before glaucoma surgery. It consisted of five MCQ questions about; preoperative nursing intervention, instilling eye drops, health education and psychological preparation before surgery.

II. Nurses' knowledge regarding nursing care of the patient after glaucoma surgery. It consisted of 14 MCQ questions about; purpose of postoperative nursing intervention, postoperative patient position, postoperative complications, signs and symptoms of infection, precautions to prevent endophthalmitis, nursing role about washing and cleaning the eye, signs and symptoms of increased intraocular pressure, precautions to prevent increase intraocular pressure, suitable intervention for severe pain, suitable time for movement after surgery, diet regimen after surgery.

Fourth section:- Nurses' knowledge regarding Nursing instructions for the patient before discharge (Discharge plan). It consisted of 16 MCQ questions about; precautions to prevent ophthalmitis, eye dressing changes, Eye drops instillation and ointment applications, when to use eye shield, precautions to reduce straining and constipation, diet regimen, right time of performing exercise after surgery, allowed and forbidden activities after surgery, maximum weight allowed for the patient to lift after discharge, the purpose of avoiding lifting heavy weights, symptoms that require consultation to ophthalmologist immediately, the first visit for follow up after surgery and the purpose of follow up.

The scoring system

The rating scale was graded according the items of interviewing questionnaire. The answers of respondents nurses were evaluated using model key answer prepared by the researcher, total score of knowledge was 100% graded. The total knowledge score was classified as the following: each correct answer =one (1) and incorrect answer and don't know=zero (0).The scores then transformed into score percent as the following:

$$\text{Score \%} = (\text{the observed score} / \text{the maximum score}) \times 100$$

The score % of knowledge then transformed into categories as the following:

Unsatisfactory level of knowledge: for those who had score % < 60% of the maximum score.

Satisfactory level of knowledge: for those who had score % ≥ 60% of the maximum score.

Tool II: Observational Checklist to Assess Nurses' Practice regarding care of Patients with Glaucoma Surgery (Jensen, 2015, Taylor, Lillis & Lynn, 2015 & Marely & Sheets, 2018) (Pre/ Post test): It included two parts;

- **The first part was about preoperative nursing intervention steps to glaucoma patients** it included 44 steps. It consisted of seven steps about: obtaining patient's health history, three steps for assisting the physician in patient's physical examination , three steps for ensuring patient's doing of necessary preoperative investigations, nine steps for providing preoperative health teaching to the patient and his or her family, three steps for check surgical consent form and ensure it, 13 steps for prepare the patient physically before the surgery, six steps for provide preoperative psychological care to the patient and his or her family.
- **The second part was about postoperative nursing intervention steps to glaucoma patients.** It consisted of four observational checklists.
 1. Checklist for instilling eye drops and ointment application:- consisted of 17 steps.
 2. Checklist for eye dressing:- consisted of 17 steps.
 3. Checklist for eye care:- consisted of 13 steps.

4. Checklist for relieving postoperative glaucoma pain:- consisted of six steps.

Scoring System:

AS for practice, also score 1 was given if the patient correctly did the practice and score 0 if not. The scores then transformed into score percent as the following:

$$\text{Score \%} = (\text{the observed score} / \text{the maximum score}) \times 100$$

The score % of practice then transformed into categories as the following:

1. Unsatisfactory level of practice: for those who had score % < 60% of the maximum score.
2. Satisfactory level of practice: for those who had score % ≥ 60% of the maximum score.

Administrative and ethical consideration:

An official permission was obtained from the Dean of the faculty of Nursing and from the director of Zagazig University Hospital before conducting the study. Additional oral consents were taken from the nurses who participated in the study after explaining its purpose. They were given an opportunity to refuse the participation, and they were assured that the information would be used for research purposes only. All ethical issues were taken into consideration during all phases of the study. The ethical research considerations in this study included the following: The research approval was obtained before intervention guidelines implementation, the objectives and the aims of the study were explained to the participants, the researcher confirmed the anonymity and confidentiality of subjects, and subjects were allowed to choose to participate or not and they had the right to withdraw from the study at any time without penalty. The researcher confirmed that the data and information collected would be confidential.

Pilot study:

A pilot study for tools of data collection was carried out on four nurses and four patients within selected criteria in order to test for clarity, relevance, comprehensiveness, understandable, feasible, applicability and ease for implementation. The results of the data obtained from the pilot study helped in modification of the tools, items were then corrected or added as needed.

Field work:

After an official permission was taken from the dean of the faculty of Nursing, from the manager of Zagazig University Hospitals and from the head of ophthalmology department, the implementation phase for data collection started as following: The selection of nurses and patients, the collection of data, and the implementation of the intervention guidelines lasted over a period of 11 months, starting from June 2021 to April 2022. The questionnaire was designed by the researcher. Data used was collected every day from the ward of ophthalmology, Sednawy Hospital in the morning and afternoon where the intervention guidelines were implemented, at Zagazig

University Hospitals, from 9:00 am to 1:00 pm. Nurses were grouped; each group included 4-5 nurses. It was necessary for the researcher to introduce herself for the nurses and explain the purpose of the study.

Each interview took approximately 30 minutes in each theoretical session and 45 minutes in each practical session. The data was collected in a simplified Arabic language. The intervention guidelines consisted of twelve sessions; one third of the sessions (5) were theoretical, and two thirds (13) were practical. The total time of intervention guidelines duration took (28) weeks: 8 weeks in the pre intervention guidelines phase, (4) weeks in the theoretical part and (16) weeks in the practical part.

The sessions began with one session for assessment of nurses' condition (interviewing the nurses regarding demographic characteristics and identification), and one session for demonstrating the importance of the intervention guidelines and for assessing the nurses' knowledge and practice by filling questionnaire of knowledge and observational checklist and patient assessment before the intervention guidelines. In each session, ten minutes pre and post are directed for re-demonstration and implanted in simplified way by using pictures and booklet, through group discussion, to identify self reflection, evaluate with feedback and oral exam. In the practical session as the same with implementation and in the 18th session (post test) included the reassessment of nurses' knowledge, practice after applying the intervention guidelines. Questionnaires were filled by the nurses and observation of practice sheets were filled by the researcher in pre and post phase.

Content validity& Reliability:

Content validity was used for the modified tools and the designed booklet to determine whether the tools covered the aim or not. It developed by a jury of five experts, three from faculty of Nursing, Zagazig University and two ophthalmologists. Reliability was done by using Cronbach test and retest. It was used to examine whether the questionnaire had internal consistency or not. The knowledge and practice tools had good internal consistency or not, the test was done. The agreement percentage was 97%.

Statistical analysis:

All collected data were organized, categorized, tabulated, entered, and analyzed by using SPSS (Statistical Package for Social Sciences); a soft-ware program version 20, which was applied to frequency tables and statistical significance. Associations were assessed by using the arithmetic mean, standard deviation (SD), chi-square, t-test, Z test, and coefficient correlation (r) to detect the relations between variables.

Non significant (NS) $p > 0.05$

Significant (S) $p \leq 0.05$

Highly significant (HS) $P < 0.001$

After data were collected it was revised, coded and fed to statistical software IBM SPSS version 20. The given graphs were constructed using Microsoft excel software.

All statistical analysis was done using two tailed tests and alpha error of 0.05. P value less than or equal to 0.05 was considered to be statistically significant.

The following statistical tests were used:

A. Descriptive statistics: included the mean with standard deviation for the numeric data while percent to describe the frequency of each category for categorical data. Regarding skewed data (with outliers), median with range were used.

B. Analysis of numeric data

1. One-Sample Kolmogorov-Smirnov Test: a procedure compares the observed cumulative distribution function for a variable with a specified theoretical distribution which was the normal distribution at the current data (testing for distributional assumption for numerical data) then the following statistical analysis was done:

a. Repeated Measures ANOVA: it is a parametric statistical test that used to compare the means for quantitative data (mean score or mean value) over different study phases for each group for variable which follow a normal distribution.

C. Analysis of categorical data

1. Mont Carlo exact test and Fishers exact test: they are alternatives for the Pearson's chi square test to test for association between sample characteristics and knowledge or practice categories at different groups at different phases of the study if there were many small expected values or to test if there is an association between knowledge and practice levels.

2. Friedman test: it is a non parametric test used to test for differences at knowledge, practice levels or categories of other variables over study phases within each study group.

D. Correlation analysis: correlation is used to test the nature and strength of relation between two quantitative variables (knowledge and practice scores). The correlation coefficient (rho) is expressed as sign of the coefficient indicates the nature of relation (positive / negative) while the value indicates the strength of relation as follow: Weak correlation for rho less than 0.25, intermediate correlation for rho of value between 0.25-0.74 and strong correlation for values between 0.75-0.99.

Results:

The demographic characteristics of the nurses in the study sample **Table 1:** Revealed that nearly three quarters of the nurses (72.5%) aged below 45 years with mean \pm SD 38.37 ± 8.61 year. The most of studied nurses were married (95%). More than three quarters of studied nurses had Diploma in nursing (77.5%). Furthermore, more than two thirds of nurses had general experience more than 15 years (67.5%) with mean \pm SD 19.30 ± 8.47 , while more than half of nurses had more than ten years of experience in ophthalmology department (57.5%) with mean \pm SD 13.61 ± 9.83 . Additionally, the most of nurses didn't have Training course in the care of glaucoma surgery patient (95%).

Table 2: As regard to total nurses' knowledge, there was increase in satisfactory nurses' knowledge post intervention (92.5%) compared to pre intervention (2.5%). Also, table shows a highly statistically significant differences in nurses' knowledge pre and post intervention with ($P < 0.001$).

Table 3: As regard to level of nurses' practice, the study finding clarified that reveals that there was highly statistically significant increase in total satisfactory nurses' practice with Mean \pm SD 93.50 ± 15.82 post intervention compared to pre intervention with Mean \pm SD 25.87 ± 14.89 . Also there was highly statistically significant difference in nurses' practice pre and post intervention with ($P < 0.001$).

Table 4: showed that there was no statistically significant relation between satisfactory nurses' knowledge and their demographic characteristics in pre and post intervention phase

Table 5: shows that there was statistically significant relation between satisfactory nurses' practice and their qualifications with ($P 0.025$).

Discussion:

Regarding demographic characteristics, results of the present study revealed that nearly three quarters of the nurses aged below 45 years old. The finding of the present study is supported by **Chen et al., (2021)** in study on "The influence of comprehensive nursing intervention on the compliance of glaucoma patients with their doctors' advice, at Hainan Medical University" who found that the mean age of the studied nurses was ranged from 45 to 60 years old. On the other hand **Taha, (2021)** in study about "Effectiveness of Nursing Intervention Protocol on Nurses' Performance and Patients' Self-Care after Cataract Surgery, at Faculty of Nursing, Benha University" found that the greater part of nurses' age ranged between 20-42 years old.

Regarding to qualification of studied nurses, Related to marital status, the present study revealed that the most of the studied nurses were married. In the same line with, **Abdullah et al., (2021)** in study about "Educational Nursing Intervention: Its Effect on the Nurses' Performance, Patients' Daily Living Activities, Needs and Selected Visual Problems of Cataract Surgery, at Faculty of Nursing, Menoufia University", found that all nurses in the study sample were married females.

Regarding education, the present study revealed that more than three quarters of studied nurses had Diploma in nursing representing the higher percentage in relation to other educational levels. The result of the present study is inconsistent with **El Shafaey et al., (2018)** in study about "Effect of Implementing Teaching Program on Knowledge and Practice of Nurses and Clinical Outcomes of Patients Post Cataract Surgery, at Faculty of Nursing, Tanta University", who showed that, more than three quarters of the studied nurses had Diploma in nursing. Similarly **Abdullah et al., (2021)**, found that two thirds of the studied nurses had bachelor education.

Related to years of experience in ophthalmic department, the present study revealed that more than half of nurses had more than ten years of experience in ophthalmology department. The present finding is in consistent with, **Abdullah et al., (2021)**, who found that two thirds of the studied nurses had experience less than ten years in ophthalmic department.

Related to training courses, the present study revealed that the most of studied nurses didn't receive training course in the care of glaucoma surgery patient. In the same line, **El Shafaey et al., (2018)**, found that all studied nurses did not have any previous training courses. Also **Abid, Hassanin & Salama, (2018)**, in study on "Effect of Implementing Nursing Guideline on Nurses' Performance Regarding Patients Undergoing Cataract or Glaucoma Surgery, Mansoura University", stated that the majority of the studied nurses did not reported attending previous training courses related to nursing ophthalmic care. This result might be because of shortage of the nursing staff which might influence on attending the training courses to prevent interruption of the work or this might be due to lacking of nurses' motivation as they felt that attending the training courses had no value for them and not affecting their salary.

Regarding total nurses' knowledge about glaucoma throughout study phases, there was highly statistically significant improvement in total nurses' knowledge post intervention compared to pre intervention. This might be related to the provision of educational booklet and / or verbal information, added to curiosity of the studied subjects. The previous result was supported by **El-Mowafi, (2019)** who showed that score of knowledge was improved post immediate implementation of the program to good level with highly statistically significant improvement. On the same line with **Kareem & Hamza, (2019)** in study about "Effectiveness of Educational Program on Nurses' Knowledge regarding Pre and Post-Operative Nursing Management india", who revealed that there was an improvement in the nurses' knowledge after application of the education program than before application.

These findings disagree with **Chang & Thiel (2020) & Von Vogelsang, et al., (2020)** who reported that; insufficient knowledge is a factor among nurses who care for patients undergoing cataract surgery.

As regards to total score for the studied nurses' practice throughout the study phases, the results of present study revealed that, there was a highly statistically significant increase in total score of satisfactory nurses' practice level post intervention guidelines compared to pre intervention. These

findings may be as a result of continuous demonstration, re-demonstration, and practical content of the instructions booklet which was given to the studied subjects with the continuous explanations, reinforcement and feedback. The result of this study in the same line with **Abdullah et al., (2021)** who cleared that there was a highly statistically significant improvement in mean total nurses' performance related to caring of patients undergoing cataract surgery.

Regarding relation between nurses' knowledge and their demographic characteristics. The result of the present study showed that there was no statistically significant relation between satisfactory nurses' knowledge and their demographic characteristics pre and post intervention. This finding is in the same line with **Abid, Hassanin & Salama, (2018)**, who reported that there was no statistical significant relation between nurses' age and their knowledge. This finding disagree with **Fashafsheh et al., (2015)** in study on "Knowledge and Practice of Nursing Staff towards Infection Control Measures in the Palestinian Hospitals", who stated that there was a highly significant difference between nurses' knowledge and their age group and years of experience.

Regarding relationship between total practice score and demographic characteristics, there was a statistical significance difference between nurses' practice and their qualification. This finding might explain that baccalaureate degree education and attending training courses have great positive indicators for improving nurses' practice. This finding agree with **El Shafaey et al., (2018)**, who found that there was statistical significance difference between nurses' practice and their level of education. Inconsistent with, **Elkasby, Abd El-Aziz & Mohamed, (2021)**, in study on "Effect of Eye Care Learning Package for Mechanically Ventilated Patients on Critical Care Nurses' Performance, at Faculty of Nursing, Mansoura University", who revealed that there was a positive statistical significant relationships between CCNs' practices with the age.

Conclusion:

Based on the findings of the present study it can be concluded that the intervention guidelines significantly improved nurses' knowledge and practice regarding glaucoma surgery.

Recommendations:

In view of the main results of the study the following recommendations were derived and suggested, Lectures and seminars should be organized about glaucoma service pathway with the help of ophthalmology consultants and professors for ophthalmology nurses. Complete manual procedures should be in Arabic language, easily used and available to all nurses. Knowledge and competence of nursing staff should be periodically evaluated, documented and up to date if necessary. Periodic evaluation and validation of the training given and training programs should be included both theoretical and practical.

Table 1: Frequency and Percentage Distribution of Demographic Characteristics of the Studied Nurses (n=40).

Demographic Characteristics	No.	%
Age (year)		
≤45years	29	72.5
>45years	11	27.5
Mean± SD	38.37±8.61	
Range	25-55	
Marital status		
Married	38	95.0
Not married	2	5.0
Qualification		
Diploma in nursing	31	77.5
Technical health institute	5	12.5
Bachelorous in nursing	4	10.0
Postgraduate	0	0.0
Years of experience generally		
≤15years	13	32.5
>15years	27	67.5
Mean± SD	19.30±8.47	
Range	2-35	
Years of experience in ophthalmology department		
≤ 10 years	17	42.5
>10 years	23	57.5
Mean± SD	13.61±9.83	
Range	1-35	
Training course in the care of glaucoma surgery patient		
Yes	2	5.0
No	38	95.0

Table 2 Total score of nurses' knowledge regarding glaucoma throughout study phases (n= 40).

	Study phase				^{MC} p
Nurses' knowledge	Pre		Post		
	No.	%	No.	%	
	1	2.5	37	92.5	
Satisfactory					<0.001**
Unsatisfactory	39	97.5	3	7.5	

Mean± SD	21.87±7.58	51.02±10.96
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MC: McNemar test

**: statistically highly significant (p<0.001)

Table 3 Total score of nurses' practice regarding glaucoma throughout study phases (n= 40).

Practice	Study phase				MC p
	Pre		Post		
	No.	%	No.	%	
Satisfactory	1	2.5	38	95.0	<0.001**
Unsatisfactory	39	97.5	2	5.0	
Mean± SD	25.87±14.89		93.50± 15.82		

MC: McNemar test

**: statistically highly significant (p<0.001)

Table 4 Relation between total satisfactory nurses' knowledge and their demographic characteristics throughout study phases

Nurses' characteristics	demographic	Total Satisfactory knowledge ≥60%				χ ² (¹ p-value)	χ ² (² p-value)
		Pre intervention (n=1)		Post intervention (n=37)			
		No	%	No	%		
Age per years							
	≤45years	1	100.0	27	73.0	FET	FET (0.99)
	>45years	0	0.0	10	27.0	(0.99)	
Marital status							
	Married	1	100.0	36	97.3	FET	FET
	Not married	0	0.0	1	2.7	(0.99)	(0.146)
Qualification							
	Diploma in nursing	1	100.0	30	81.1	0.298	3.708
	Technical health institute	0	0.0	4	10.8	(0.862)	(0.157)
	Bachalerous in nursing	0	0.0	3	8.1		
	Postgraduate	0	0.0	0	0.0		
Years of experience generally							
	≤15years	0	0.0	11	29.7		FET
	>15years	1	100.0	26	70.3	FET (0.99)	(0.242)
Years of experience in ophthalmology department							

≤ 10 years	0	0.0	15	40.5	FET	FET
>10 years	1	100.0	22	59.5	(0.99)	(0.565)
Training course in the care of glaucoma surgery patient						
Yes	1	100.0	2	5.4	FET	FET (0.99)
No	0	0.0	35	94.6	(0.051)	

χ^2 : Chi square test FET: Fisher exact test non-significant($p>0.05$), p1: for pre-intervention, p2: for post-intervention

Table 5 Relation between total satisfactory nurses' practice level and their demographic characteristics throughout study phases

Nurses' demographic characteristics	Total Satisfactory practice ≥60%				χ ² (¹ p-value)	χ ² (² p-value)
	Pre	intervention	Post	intervention		
	(n=1)		(n=38)			
	No	%	No	%		
Age per years						
≤45years	0	0.0	27	71.1	FET	FET (0.99)
>45years	1	100.0	11	28.9	(0.275)	
Marital status						
Married	1	100.0	37	97.4	FET	FET
Not married	0	0.0	1	2.6	(0.99)	(0.099)
Qualification						
Diploma in nursing	1	100.0	31	81.6	0.298	7.368
Technical health institute	0	0.0	4	10.5	(0.862)	(0.025*)
Bachalerous in nursing	0	0.0	3	7.9		
Postgraduate	0	0.0	0	0.0		
Years of experience generally						
≤15years	0	0.0	11	28.9	FET	FET (0.99)
>15years	1	100.0	27	71.1	(0.99)	
Years of experience in ophthalmology department						
≤ 10 years	0	0.0	15	39.5	FET	FET
>10 years	1	100.0	23	60.5	(0.99)	(0.174)
Training course in the care of glaucoma surgery patient						
Yes	0	0.0	2	5.3	FET	FET (0.99)
No	1	100.0	36	94.7	(0.99)	

χ^2 : Chi square test FET: Fisher exact test non-significant($p>0.05$), *: significant ($p<0.05$), p1: for pre-intervention, p2: for post-intervention

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