

Effect of an Educational Intervention on Knowledge and Awareness of Patients with Diabetic Retinopathy

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Abstract: Background: Diabetic retinopathy is a serious and common complication of long standing and poorly controlled diabetes mellitus that causes irreversible blindness. Raising awareness about diabetes mellitus and diabetic retinopathy is an important element for early diagnosis and controlling of this blinding disease. **Purpose:** To examine the effectiveness of an educational nursing intervention on knowledge and awareness of patients with diabetic retinopathy. **Design:** A quasi experimental design was used. It was conducted in outpatient clinic of Kafr El-Sheikh New Ophthalmology Hospital. **Sample:** A convenience sample of 140 patients with diabetic retinopathy was included. **Instruments:** I- An interviewing questionnaire was used that include socio-demographic data. II- Knowledge Assessment Questionnaire. **Results:** The present study revealed that the educational intervention for patients with diabetic retinopathy leaded to a highly significant improvement ($p < 0.0001$) in the different categories of total knowledge about diabetes mellitus and diabetic retinopathy. The post intervention s' good knowledge responses increased from zero% pre-intervention to 94.3% for post intervention. **Conclusion:** Implementing of a designed nursing intervention has a significant role in improving knowledge and awareness among studied patients with diabetic retinopathy. **Recommendations:** The nursing roles should be directed toward improving knowledge and awareness of patients with diabetic retinopathy for good controlling of diabetic retinopathy and its subsequent complications

Key words: *Awareness, Knowledge, Diabetes Mellitus, and Diabetic Retinopathy.*

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Introduction

Diabetes mellitus (DM) is a chronic progressive metabolic disorder characterized by hyperglycemia mainly due to absolute (Type 1 DM) or relative (Type 2 DM) deficiency of insulin hormone. Diabetes is a disease that affects the body's ability to produce or use insulin effectively to control blood sugar (glucose) levels. Too much glucose in the blood for a long time can cause damage in many parts of the body. Diabetes can damage the heart, kidneys and blood vessels. It damages small blood vessels in the eye as well. About ninety percent of vision loss from diabetes can be prevented and early detection is the key. (Centers for Disease Control and Prevention, 2022).

Diabetic retinopathy (DR) is the most common ophthalmic complication of DM and is one of the leading causes of vision impairment and vision loss. It can be defined as a chronic progressive, potentially sight-threatening disease of the retinal microvasculature accompanied by prolonged hyperglycemia. The severity and progression of DR are strongly associated with prolonged duration of DM, poor glycemic control, hypertension, and hyperlipidemia (Baumal & Duker, 2018; Wong & Sabanayagam, 2019).

In Egypt, the prevalence of chronic diabetes complications ranged from 8.1 % to 41.5 % for retinopathy (Bos & Agyemang, 2016). Visual impairment secondary to diabetic retinopathy represents a major public health problem which affects negatively on patients' life. Improving patient's knowledge and awareness about the disease, engaging them in self-care practices, and helping them in adopting a healthy life style are very essential to prevent progress of the disease and to

prevent visual impairment (Shaban, 2018; Abid, 2022).

The majority of patients with diabetes can significantly reduce the chances of developing long-term complications as DR by improving their knowledge. Raising awareness about DR is an important element for early diagnosis and treatment of this blinding disease. Nurses in both primary and secondary care settings need to understand the condition as they can play a vital role in reducing its incidence and complications. (Li Yang, 2017).

The nursing roles should be directed toward educating patients with diabetic retinopathy about the nature of the disease to raise their awareness, emphasize the importance of follow up for controlling of DR progression and describing in detail, because this can reduce the risk of its subsequent complications as loss of vision. To control or prevent vision loss, appropriate health education is necessary to encourage those at risk to seek timely and appropriate care. Also, this will require developing educational materials that are regionally and culturally appropriate with an understanding of the current knowledge, attitudes, and practices in the community. (Khalaf, 2019)

Significance of the study

The global prevalence of diabetes had reached pandemic proportions. With the 9th edition of the International Diabetes Federation (IDF) reporting, a prevalence of diabetes was 9% (463 million adults) in 2019 and there will be at least 592 million diabetes cases worldwide in 2035. In 2020, the worldwide number of adults with diabetic retinopathy as estimated to be 103.12 million respectively; by 2045, the numbers are estimated to increase to

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reach 160.50 million. (Teo et al., 2021). In Egypt, diabetes is growing to be a public health problem due to many causes such as increased prevalence of central obesity, health illiteracy, limited health care budget, that increases the frequency of diabetes complications. Therefore, DR as a micro vascular complication of diabetes becomes more prevalent in the Egyptian population. It is estimated in 2014 that, 42 % of diabetic patients have retinopathy and 5 % of them are legally blind (Khan & Hamdy, 2016).

Purpose of the Study:

The present study aimed to examine the effectiveness of an educational intervention on knowledge and awareness of patients with diabetic retinopathy

Research hypothesis:

The patients with diabetic retinopathy will have improvement in their awareness and knowledge about diabetes mellitus and diabetic retinopathy after the educational intervention more than before the educational intervention.

Methods:

Research design:

A quasi experimental design was used to fulfill the purpose of the study

Study Settings:

The study was conducted in outpatient clinic of Kafr El-Sheikh New Ophthalmology

Sampling:

A convenience sample of 140 patients with diabetic retinopathy was included in the study. knowledge, health profile and symptoms among liver cirrhotic patients, we used Epi website (Open

Source Statistics for Public Health)*. Our assumptions were:

Sample Size for Frequency in a Population Population size (for finite population correction factor or fpc)(N): 1000

Hypothesized % frequency of outcome factor in the population (p): 40% +/-5

Confidence limits as % of 100(absolute +/- %)(d): 5%

Design effect (for cluster surveys-DEFF): 0.3

Sample Size (n) for Various Confidence Levels

Confidence Level (%) Sample Size

95% 81

80% 41

90% 62

97% 94

99% 117

99.9% 153

99.99% 178

Equation

Sample size $n = [DEFF * Np(1-p)] / [(d$

2

$/Z$

2

$1-\alpha/2$

$*(N-1)+p*(1-p)]$

Results from OpenEpi, Version 3, open

source calculator--SSPropor

We used 95% confidence intervals,

with a sample size of 80

liver cirrhotic patients.

Reference: *Epi website (Open

Source Statistics for Public Health):

<http://www.openepi.com/SampleSize/SSC>

[ohort.htm](http://www.openepi.com/SampleSize/SSC) (Reviewed on 10th

November,2017).

Sample size and power of the study

:In order to calculate the sample size required to study the effect of a designed nursing intervention protocol on knowledge, health profile and symptoms among liver cirrhotic patients, we used Epi website (Open Source Statistics for Public Health)*. Our assumptions were:

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Sample size $n = \frac{[DEFF * N * p(1-p)]}{[(d)^2$

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November,2017).

Inclusion criteria:

The subjects were recruited based on the following criteria:

- Both sexes.
- Patients who are diagnosed with type 2 diabetes mellitus.
- Patients who are diagnosed with diabetic retinopathy at the first stage.

- Patients who have no pathologic diseases or chronic diseases in the eye.
- Patients are not diagnosed with medical disorders that affect patient's vision such as hypertension, hypotension, and hepatic disorders to avoid any pathological changes.

Data Collection Instruments:

The study included the following Instruments:

Instrument 1: A structured interviewing questionnaire prepared by the researchers which included the following parts:

- **Part one:** Socio demographic data about the patient as name, age, sex, occupation, level of education and residence.
- **Part two:** Health-relevant data, this part included questions related to patients 'medical history; as the onset of diabetes, currently prescribed treatment of diabetes, duration of the disease, previous hospitalization and causes of hospitalization as diabetic foot or diabetic coma.

Instrument II: Knowledge Assessment Questionnaire, it was constructed by the researcher based on related literature to evaluate gain of knowledge after implementation of the intervention it contained two parts:

- **Part one: Patient's knowledge about diabetes mellitus (Awareness):** It included 16 questions for assessing patient's knowledge about diabetes mellitus as definition, signs and symptoms,

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risk factors, complications and management.

- **Part two: Patient's knowledge about diabetic retinopathy:** It included 10 questions to assess patient's knowledge about diabetic retinopathy as definition, types, causes, signs and symptoms, risk factors, duration, complications and management.

Scoring system:

The questionnaire contained, items related to the diabetic patients' socio-demographic criteria, their medical history, as well as 26 knowledge assessment items, each was three points Likert scale (0 – 2) as (0) for Don't know/wrong answer, (1) for incomplete correct answer, and (2) for complete correct answer. The patients' knowledge about diabetes and diabetic retinopathy were evaluated giving a score of 0-52. The total score of each patient was categorized into "Poor Knowledge" when he/she achieved 0 – 17 points of the total score, and those who had 18 - 35 points were considered as "Fair knowledge", and those who had 36– 52 points were considered as "Good knowledge".

Validity of the instruments:

To determine the Face and Content validity, along with the instruments developed by the researcher, the objectives, hypothesis, definition, and scoring key and evaluation criteria were submitted to 5 Experts. Suggestions and recommendations given by the experts were accepted and necessary corrections were done to modify the instruments.

Reliability of the instruments:

Test – re test reliability was applied by the researcher for testing the internal consistency of the instruments. It was done by administration of the same

instruments to the same subjects under similar condition on one or more occasions, answers from repeated testing were compared.

Administrative Approval and Ethical Consideration

- An approval of ethical committee was obtained
- Official permission was obtained from the head of Kafr El-Sheikh New Ophthalmology Hospital by submission of a formal letter from the dean of faculty of nursing, Menoufia University.
- Consent was taken from every patient before inclusion in the study.
- Patients were assured that all their own data are highly confidential
- The ethical issues consideration included explaining the purpose and nature of the study, stating the possibility to withdraw at any time.

Pilot study:

A pilot study was carried out on fourteen patients with DR (10% of the total sample) and they were excluded from the total studied patients in order to test the applicability, feasibility, correctness, and clarity of the study tools. It also, provided an estimate of the time needed for answering the questionnaire sheets. Based on the findings of the pilot study, the necessary modifications were done. Then, the reliability of the study tools was assessed to measure the internal consistency of the study tools.

Data Collection Procedure:

- Patients were divided to small groups according to their places and time. A schedule for educational sessions was developed, and each participant selected the suitable time. At the end of the educational intervention,

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- 10- 20 minutes were allotted for discussion.
- At the initial interview in the outpatient clinic of Kafr El-Sheikh New Ophthalmology Hospital, the researcher introduced herself, to initiate the line of communication, and explain the nature and the purpose of the study to the studied patients
 - After the pre-test, the researcher administrated educational intervention for subjects. The nursing intervention plan was developed and implemented by the researcher based on patients' knowledge.
 - Data was collected for the current study started from November, 2020 and completed at May, 2022.
 - The researcher demonstrated the contents of the designed protocol of nursing intervention in the form of small group of patients teaching sessions, three sessions in addition to preliminary session, these sessions were repeated to groups, the duration of each session ranged from 45 – 60 minutes, including 15 minutes for discussion and feedback, each session usually started by a summary of what had been taught in the previous session and the objectives of the new session.
 - The first session: started by acquiring a designed part of knowledge related to diabetes mellitus as definition, types, causes, complications, treatment, also knowledge about diabetic retinopathy as definition, types, causes, signs and symptoms, management options and its complications.
 - An open channel communication was achieved between the researcher and patients to assure understanding, answer any question and to confirm information.
 - The component of a designed educational intervention was implemented to studied patients that contained an integrated package of instructions and guidelines related to health knowledge about DM and DR
 - The second session: concerning with teaching the patient about healthy diet, personal hygiene, physical exercises, self-monitoring of blood glucose (BG) and the normal values of BG.
 - Each patient obtained a copy of the designed illustrated nursing intervention booklet included all content.
 - A follow up was performed monthly for patients under study by telephone, and every 3 months in the outpatient clinic of Kafr El-Sheikh New Ophthalmology Hospital. In the follow up phase, the researcher could be informed by the effect of the nursing intervention for modifying the incorrect or incomplete knowledge. In addition, to assess the change of knowledge and answer any question raised by the patients.
 - After implementation of the designed intervention the researcher collect post intervention data by using the previous mentioned Instrument after one year and compared the result of pre and post-test to assess the effect of nursing intervention.

Statistical Analysis: -

Data was entered and analyzed by using SPSS (Statistical Package for Social Science) statistical package version 22. Graphics were done using Excel program. Quantitative data were presented by mean (X) and standard deviation (SD). It was analyzed using student t- test for comparison between

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two means, and ANOVA (F) test for comparison between more than two means. Level of significance was set as P value <0.05 for all significant tests.

RESULTS

Table (1) shows that, more than half of the studied diabetic patients aged between 50 to <60 years (50.7%), and more than one third of them aged 60 to 70 years (38.6%)., Approximately 65% of patients are females (63.6%), more than two thirds (67.8 %) are intermediate educated, regard to marital status, results show that only 6% are single and 67.9% are married , 60% of them are living in rural areas, more than half of them are employees, and 45% of them have enough income. It is interesting that less than one fifth of them are smokers (17.1%).

Table(2) shows distribution of medical data among studied diabetic patients. Approximately three quarters of studied patients have family history of diabetes mellitus (74.3%), and more than half of them suffered diabetes since >15 years (53.6%). Approximately half of patients know that diabetes can cause diabetic retinopathy from ophthalmology doctor. Regarding follow up of diabetes in outpatient clinic, only 18.6 % of the total patients make regular checkup. Concerning admission to hospital due to diabetes complications, majority of patients claimed that they did not admit to hospitals due to diabetes complications (95.7%). Also, regarding the type of diabetic medications, more than half of studied patients have taking both insulin and tablets (51.4%). About half of them were trained on insulin injection by family members and only 16.4% can take insulin by themselves

Table (3) reveals assessment of diabetic patient's knowledge about diabetes Mellitus pre - intervention.

Majority of patients showed either Wrong answer & I don't know or Incomplete correct answer which ranged from 0 % to 91.4% & 0 and 95.7% respectively. Unfortunately, the correct and complete response was the lowest percentage which ranged from 0 to 29.3% The Mean patient's total diabetes knowledge score was 10.2 ± 4.1 .

Table(4) reveals assessment of diabetic patient's knowledge about diabetic retinopathy pre - intervention. Majority of patients show either Wrong answer & I don't know or Incomplete correct answer which range from 42.9 % to 95.7 % & 4.3% to 57.1% respectively. Unfortunately, the correct and complete response are the lowest percentage which range from 0 to 7.9. % The Mean patients total diabetic Retinopathy knowledge score is 8.2 ± 3.1 .

Table (5) and figure (1) highlight the efficacy of the educational intervention for the knowledge of diabetic patients. Post intervention program reveals a highly significant improvement ($p < 0.0001$) in the different categories of total knowledge about DM and Diabetic Retinopathy. The post program' good knowledge responses increase from zero% pre-intervention to 94.3% for post intervention. In addition, the mean total knowledge score among studied patients, increases from 13.2 ± 3.6 pre intervention to 48.5 ± 7.1 post intervention and this difference is highly significant statistically ($P < 0.0001$). This result approves the hypothesis of current study which stated. "The patients with diabetic retinopathy will have improvement in their awareness and knowledge about diabetes mellitus and diabetic retinopathy after the educational intervention more than before the educational intervention".

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Table (1): Distribution of the studied diabetic patients according to their Socio -demographic characteristics (n = 140)

| Socio demographic data | | Frequency | |
|------------------------|---------------------|-----------------|------------|
| | | N0. | % |
| Age (years) | < 50 Y | 15 | 10.7 |
| | 50 -< 60 Y | 71 | 50.7 |
| | 60 - 70 Y | 54 | 38.6 |
| Mean ± SD | | 57.1 ±4.6 Years | |
| Gender | Females | 89 | 63.6 |
| | Males | 51 | 36.4 |
| Education | Illiterate | 18 | 12.9 |
| | Primary education | 9 | 6.4 |
| | Moderate education | 95 | 67.8 |
| | High education | 18 | 12.9 |
| Job | Employee | 71 | 50.7 |
| | Technician | 15 | 10.7 |
| | No work or retired | 54 | 38.6 |
| Marital status | Single | 6 | 4.2 |
| | Married | 95 | 67.9 |
| | Widowed or divorced | 39 | 27.9 |
| Income | Enough and reserve | 18 | 12.9 |
| | Enough | 63 | 45 |
| | Not enough | 59 | 42.1 |
| Residence | urban | 56 | 40 |
| | rural | 84 | 60 |
| Smoking | Smoker | 24 | 17.1 |
| | Nonsmoker | 116 | 82.9 |
| Total | | 140 | 100 |

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Table (2): Distribution of the studied diabetic patients ‘according to their medical data (n = 140)

| Medical data | | Frequency | |
|--|------------------------------------|-----------|------|
| | | N0. | % |
| Family History of Diabetes: | Yes | 104 | 74.3 |
| | No | 36 | 25.7 |
| Duration of diabetes: | 5-<10 Y | 6 | 4.3 |
| | 10 - < 15 Y | 59 | 42.1 |
| | ≥ 15 years | 75 | 53.6 |
| Way of knowing that DM. leads to DR: | | | |
| | From medical doctor | 35 | 25 |
| | From Ophthalmology doctor | 69 | 49.2 |
| | From Media and books | 18 | 12.9 |
| | From family and friends | 18 | 12.9 |
| Admission to hospital due to D. complications? | | | |
| | Yes | 6 | 4.3 |
| | No | 134 | 95.7 |
| Follow up of DM. in outpatient clinics? | | | |
| | No follow up | 18 | 12.9 |
| | When feel sick | 96 | 68.5 |
| | Regular Follow up | 26 | 18.6 |
| Type of DM. Medication: | Take insulin | 45 | 32.2 |
| | Take oral tablet | 23 | 16.4 |
| | Take insulin and tablets | 72 | 51.4 |
| Persons instruct you about the insulin injection: | | | |
| | Take tablet and don't take insulin | 23 | 16.4 |
| | Doctor or nurse | 12 | 8.6 |
| | Family members | 69 | 49.3 |
| | Watching others | 36 | 25.7 |
| Who give you insulin injection? | | | |
| | Take tablet and don't take insulin | 23 | 16.4 |
| | By my self | 69 | 49.3 |
| | Another (family member) | 48 | 34.3 |
| Total | | 140 | 100 |

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Table 3: Distribution of the studied patients regarding their knowledge about diabetes mellitus pre intervention(n=140)

| The diabetic Patients 'knowledge about the Diabetes before intervention | Wrong answer & I don't know | | Incomplete correct answer | | Complete correct answer | |
|---|-----------------------------|------|---------------------------|------|-------------------------|------|
| | No | % | No | % | No | % |
| Definition of diabetes. | 18 | 12.9 | 104 | 74.2 | 18 | 12.9 |
| Types of diabetes. | 104 | 74.3 | 36 | 25.7 | 0 | 0 |
| Causes of diabetes. | 0 | 0 | 128 | 91.4 | 12 | 8.6 |
| Symptoms of diabetes. | 128 | 91.4 | 12 | 8.6 | 0 | 0 |
| Normal range of blood glucose. | 104 | 74.2 | 18 | 12.9 | 18 | 12.9 |
| Complications of diabetes. | 6 | 4.3 | 134 | 95.7 | 0 | 0 |
| Prevention of complications of diabetes. | 18 | 12.9 | 122 | 87.1 | 0 | 0 |
| Types of diabetic coma. | 110 | 78.6 | 30 | 21.4 | 0 | 0 |
| . Causes of hypoglycemic coma. | 98 | 70 | 42 | 30 | 0 | 0 |
| Singes and symptoms of hypoglycemic coma. | 74 | 52.9 | 66 | 47.1 | 0 | 0 |
| Prevention of hypoglycemic coma | 107 | 76.4 | 33 | 23.6 | 0 | 0 |
| Causes of hyperglycemic coma. | 35 | 25 | 99 | 70.7 | 6 | 4.3 |
| Symptoms of hyperglycemic coma. | 56 | 40 | 84 | 60 | 0 | 0 |
| Prevention of hyperglycemic coma. | 104 | 74.3 | 36 | 25.7 | 0 | 0 |
| Sits of insulin injection in the human body. | 128 | 91.4 | 12 | 8.6 | 0 | 0 |
| Preservation of insulin vial at home. | 99 | 70.7 | 0 | 0 | 41 | 29.3 |
| Total Knowledge Mean Score about diabetes | 10.2 ± 4.1 | | | | | |

Table 4: Distribution of the studied patients regarding their knowledge about diabetic retinopathy pre intervention(n=140)

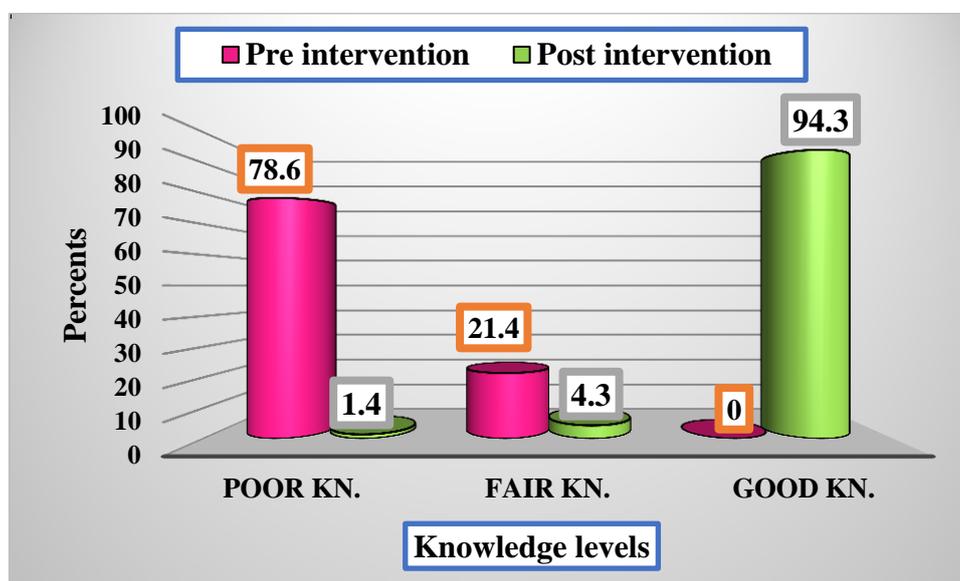
| The diabetic Patients 'knowledge about the Diabetic Retinopathy before intervention | Wrong answer & I don't know | | Incomplete correct answer | | Complete correct answer | |
|---|-----------------------------|------|---------------------------|------|-------------------------|-----|
| | No | % | No | % | No | % |
| Definition of diabetic retinopathy. | 60 | 42.9 | 80 | 57.1 | 0 | 0 |
| Causes of diabetic retinopathy. | 72 | 51.4 | 68 | 48.6 | 0 | 0 |
| Risk factors that increase the incidence of diabetic retinopathy. | 128 | 91.4 | 12 | 8.6 | 0 | 0 |
| Period of time after diagnoses of diabetes can develop retinopathy. | 134 | 95.7 | 6 | 4.3 | 0 | 0 |
| Types of diabetic retinopathy. | 134 | 95.7 | 6 | 4.3 | 0 | 0 |
| Frequency of eye examination per year with diabetic retinopathy | 111 | 79.2 | 18 | 12.9 | 11 | 7.9 |
| Symptoms of diabetic retinopathy. | 69 | 49.3 | 65 | 46.4 | 6 | 4.3 |
| Complications of diabetic retinopathy. | 116 | 82.9 | 24 | 17.1 | 0 | 0 |
| Methods of controlling of diabetic retinopathy. | 63 | 45 | 71 | 50.7 | 6 | 4.3 |
| Methods of diabetic retinopathy management. | 119 | 85 | 21 | 15 | 0 | 0 |
| Total Knowledge Mean Score about diabetic Retinopathy. | 8.2 ± 3.1 | | | | | |

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Table 5: Distribution of the studied patients regarding knowledge levels, and total knowledge about diabetes mellitus and diabetic retinopathy, pre and post intervention (n=140).

| Knowledge aspects | Pre intervention program | | | | | | Post intervention program | | | | | | Test of significant | |
|--------------------------------|--------------------------|--------------|--------------|--------------|--------------|------------|---------------------------|--------------|--------------|--------------|--------------|------------|-----------------------|--------------|
| | Poor Kn. N0. | Poor Kn. (%) | Fair Kn. N0. | Fair Kn. (%) | Good Kn. N0. | Good Kn. % | Poor Kn. N0. | Poor Kn. (%) | Fair Kn. N0. | Fair Kn. (%) | Good Kn. N0. | Good Kn. % | χ ² | P |
| Kn. About DM | 92 | 65.7 | 48 | 34.3 | 0 | 0 | 3 | 2.1 | 5 | 3.6 | 132 | 94.3 | 109.4 | <0.0001 |
| Kn. About diabetic Retinopathy | 120 | 85.7 | 20 | 14.3 | 0 | 0 | 0 | 0 | 8 | 5.7 | 132 | 94.3 | 179.8 | <0.0001 |
| Grand total Kn. | 110 | 78.6 | 30 | 21.4 | 0 | 0 | 2 | 1.4 | 6 | 4.3 | 132 | 94.3 | 138.8 | <0.0001 |
| Mean grand total Kn. | 13.2 ± 3.6 | | | | | | 48.5 ± 7.1 | | | | | | t= 30.2 paired t test | <0.0001 (HS) |

Fig.1: Levels of grand total knowledge among diabetic patients (n=140).



Discussion:

Regarding the distribution of medical data among studied diabetic patients, it was found that, approximately three quarters of studied patients had family history of diabetes mellitus. This result was in agreement with Aly. (2022) who conducted a study entitled "Impact of Diabetic Retinopathy Prevention Instructional Scheme on Patient's Performance" and found that, 82% of participants have family history of diabetes mellitus. This result also was congruent with Baiuomy& Abou Shousha (2021) who found that

83.3% and 80.0% from participants in both control and case groups had family history of diabetes mellitus. Moreover, this study was in line with Jahan& Al Moqbali (2018) who stated in their study "Knowledge, attitude and barriers towards self-care practices in patients with diabetes mellitus in North Batinah, Sultanate of Oman" that, more than two thirds of the study participants had family history of diabetes. These results indicated that family history of diabetes mellitus is a

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strong risk factor for the prevalence of DM.

Concerning duration of the disease, it was found that, more than half of patients had DM for more than 15 years. This result was in agreement with a result of Valizadeh et al., (2016) who stated at their study "Determining the prevalence of retinopathy and its related factors among patients with type 2 diabetes in Kerman, Iran" that, more than half of their patients had diabetes for more than 15 years. But this result was not in agreement with the result of Rossaneis et al., (2016) who found that, more than half of the participants received the diagnosis less than 10 years earlier, this deference may be due to deferent sample size.

In the present study, approximately half of patients know that diabetes can cause diabetic retinopathy from the physician, and this result was in agreement with Aly (2022) who stated in his study that the main source of information about DM and DR is the doctor.

Regarding follow up of diabetes in outpatient clinic, the current study found that only about fifth of the total patients make regular checkup and the large percentage of them did not make adequate health checkup, this result was in agreement with Mostafa (2022) who found that, only 22% of studied patients performing adequate health checkups.

Concerning previous hospitalization, the current study found that more than three quarter of patients claimed that they did not admit to hospitals due to diabetes complications. This result was agreed with Abid (2022) who found that 74% of participants did not admit to hospitals due to diabetes complications

Regarding the treatment of diabetes, the present study found that, little more than half of studied patients had been

taking both insulin and oral hypoglycemic tablets, less than one fifth taking oral tablet, and about third of them taking insulin, this result was not in line with Jahan& Al Moqbali (2018) who found that, 24.1 of studied patients received oral tablets and insulin, 59% of participants received oral tablets, and 16.9% received insulin.

Regarding assessment of diabetic patients' knowledge about diabetes mellitus pre-intervention, the current study revealed that, the majority of patients showed either wrong answer & I don't know or incomplete correct answer. Unfortunately, the correct and complete response was the lowest percentage. The Mean patient's total diabetes knowledge score pre-test was 10.2 ± 4.1 . The current result was in agreement with CHOWDHRY& TAHIR (2021) who carried out a study named "Is lack of patient knowledge a cause of poorly controlled diabetes mellitus?" to evaluate the awareness of the diabetic patients regarding their own disease and concluded that, "The awareness of diabetic patients regarding their disease was very low and only 30 % patients had good knowledge regarding their disease". This result revealed poor patients' knowledge about diabetes mellitus pre-intervention,

Regarding assessment of diabetic patients' knowledge about diabetic retinopathy pre - intervention the current study found that majority of patients showed either wrong answer& I don't know or incomplete correct answer. Unfortunately, the correct and complete response was the lowest percentage. The Mean patients total diabetic retinopathy knowledge score was 8.2 ± 3.1 .

This result indicated that there was poor patients' knowledge about diabetic retinopathy pre-intervention.

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This result was in agreement to that of Srinivasan NK et al., (2017) who observed in their study "Diabetes and diabetic retinopathy: knowledge, attitude, practice (KAP) among diabetic patients in a tertiary eye care center" that, 95.5% of studied sample had poor knowledge about diabetic retinopathy. Regarding patient's knowledge post intervention, the educational intervention revealed a highly significant improvement in the different categories of total knowledge about DM and DR. The post intervention good knowledge responses increased from zero% pre-intervention to 94.3% for post intervention. These findings were matched with Duan et al., (2017) who stated in the study named "Influencing factors on compliance of timely visits among patients with proliferative diabetic retinopathy in southern China: a qualitative study" that the majority of participants' knowledge about DM and DR improved after the intervention. This comes in contrast with Najee & Shakir (2019) who conduct a study entitled "Effectiveness of an Instructional Program on Knowledge of Type 2 Diabetic Patient Toward Ocular Self-Care at Diabetic and Endocrine Center in Al-Nasiriya City" and found that, diabetic retinopathy knowledge has increased after three months post-implementation of the educational program.

Moreover, Khalaf et al., (2019) in a study named "Does a diabetic retinopathy educational program raise awareness among elderly diabetic patients" found that, the mean score of knowledge of the studied population; 5.34 ± 1.0 in pre-test, which indicated poor knowledge, improved in post-test to 16.66 ± 1.8 . This implies that a significant proportion of diabetic patients have poor and unfair knowledge and practices about DR and

there was a need for educational program about DR to prevent its complications (Seneviratne, 2016).

Furthermore, there was a highly statistically, significant difference within studied patients pre, and post-intervention, the mean total knowledge score among studied patients, increases from 13.2 ± 3.6 pre intervention to 48.5 ± 7.1 post intervention and this difference was highly significant statistically. This result approved the hypothesis of current study which stated "The patients with diabetic retinopathy will have improvement in their awareness and knowledge about diabetes mellitus and diabetic retinopathy after the educational intervention more than before the educational intervention" and the results highlighted the efficacy of the nursing intervention program post intervention for the knowledge of diabetic patients.

Conclusion:

In the light of the present study finding, it can be concluded that the implementation of the educational intervention for patients with diabetic retinopathy, lead to improvement of their knowledge and their awareness about diabetic retinopathy.

Recommendations

Based on the finding of the present study, the following recommendations are proposed:

- The nursing roles should be directed toward educating patients with diabetic retinopathy and their care givers about the nature of the disease.
- Follow up program of patients with diabetic retinopathy should be applied and organized at hospitals, for the proper management application, educating patients and

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care giver, prognosis of patients with diabetic retinopathy, protecting and promoting vision of patients with diabetic retinopathy.

- Further researches will be needed for training of nurses especially the new nurses, about the proper care of patients with diabetic retinopathy, and improving the awareness of the nurses about the nature of this disease, different forms of management, complications, and its prognosis.

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