Effect of an Educational Intervention on Knowledge and Self-Care Practices of Patients with Diabetic Retinopathy

Doaa Awad Abid , (2) Wafaa Gameel Mohamed Ali , (3) Walaa Nasreldin Othman

(1) M.Sc in Nursing, Faculty of Nursing, Mansoura University, Egypt

(2) Professor of Medical-Surgical Nursing Department, Faculty of Nursing, Mansoura University, Egypt

(3) Assistant Professor of Medical-Surgical Nursing Department, Faculty of Nursing, Mansoura University, Egypt

1.ABSTRACT

Background: Diabetic retinopathy is considered a common and specific microvascular complication of DM that develops over a period of time and causes irreversible blindness. **The study aimed to**: Evaluate the effect of an educational intervention for diabetic retinopathy patients on improving their knowledge and self-care practices**. Method**: Quasi-experimental research design was utilized in this study. **Sample**: A purposive sample of 100 patients from Mansoura Ophthalmic Hospital was included in this study and the sample had been divided equally into study and control groups. **Tools**: Data were collected using two tools; first tool was a structured interview questionnaire sheet and the second tool was self-care practices checklist. Main results: There were highly statistically significant differences among the study and control groups regarding their total knowledge and total self-care practices post implementing the educational intervention and at follow-up phases. **In conclusion**: Applying the educational intervention was effective in improving patients' knowledge and self-care practices. **Recommendations**: Ophthalmic nurses should be fully aware of their educational roles in preventing progression of the disease, collaboration between DM follow-up clinics and eye clinics in screening for DR was strongly recommended and this study should be replicated on a large sample to generalize its results.

 Keywords: Diabetic Retinopathy, Educational Intervention, Self-Care Practice.

2.Introduction:

Diabetic retinopathy is the most common complication of diabetic eye disease in which damage occurs to small blood vessels of the eye retina due to prolonged high blood glucose. The elevated levels of the blood glucose cause blockage of the tiny blood vessels that nourish the retina leading to cutting off its blood supply. As a result, the eye attempts to grow new blood vessels. But these new blood vessels don't develop properly and can leak easily (Nentwich & Ulbig, 2015).

The prevalence of DR and its associated vision problems is expected to grow in both developed and developing countries because the prevalence of DM continues to increase. Almost all Type 1 diabetics and nearly two-third of all Type 2 diabetics have some degree of DR over a period of time. DR is estimated to affect roughly 93 million people and approximately one-third of them is estimated to have vision threatening DR (Baumal & Duker, 2017).

Diabetic retinopathy is one of few ophthalmic diseases that have defined preventive measures to delay progression of the disease and consequently vision loss. The first of these preventive measures is to maintain adequate glycemic control which is often considered a self-care practice carried out by the patient (Gale et al., 2017).

Self-care practices are defined as the ability of individuals, families and communities to promote and maintain health, to prevent disease, and to cope with illness with or without the support of a health care provider (World Health Organization [WHO], 2014). Self-care practices of DR should focus on self- monitoring of glucose level in blood, regular health checkups, compliance with treatment regimen, proper intake of eye medications, performing eye care correctly, appropriate dietary intake, and regular physical activity (Shaban, 2018).

Self –care practices are learned, purposeful, and continued behavior. So, the nurse should provide regular health education to DR patients to make them knowledgeable about the disease which aids them to modify their wrong self-care practices, cope with their health problems, improve their compliance with prescribed treatment, and consequently improve their life quality (Dinesh, Kulkarni & Gangadhar, 2016).

2.1. Significance of the Study

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' functional status and daily living activities. Making patients knowledgeable about the disease, engaging them in self-care practices, and helping them in adopting a new life style are very essential to achieve treatment goals, to keep the disease under control, and to prevent complications (Shaban, 2018). Very limited studies were conducted about how to improve self-care practices of diabetic retinopathy patients, so there is an urgent need to conduct this study.

2.2. Aim of the Study

The aim of this study was to evaluate the effect of an educational intervention for diabetic retinopathy patients on improving their knowledge and self-care practices.

2.3. Research Hypothesis

The research hypothesis was that knowledge regarding DR and self-care practices among the study group will be improved post application of the educational intervention more than those among the control group.

3. Subject and Method

3.1. Research design and setting

A quasi-experimental research design using control group was used to conduct this study at Mansoura Ophthalmic Hospital.

3.2. Study sample

A purposive sample of 100 patients was included in this study and they had been divided equally into two groups (study and control groups). Inclusive criteria included: adult patients, both sexes, diagnosed with DR, mentally oriented, free from communication problems, agree to participate in the study, and available for telephone follow-up. Exclusive criteria included: patients with cataract, advanced glaucoma, ocular ischemic syndrome, retinal artery or retinal vein occlusion, optic neuritis, age-related macular degeneration, vision-threatening uveitis, any previous eye injury that affect retina and patients with completely vision loss.

3.3. Tools of data collection

Two tools were used in this study:

Tool I: A structured interview questionnaire sheet; It was developed by the researcher after extensive reviewing of the related literatures (Denniston & Murray, (2014); Nordquist, (2017); Pouncey & Frith, (2013); Sayin, Kari & Pekel, (2015) to collect the necessary data for the study. It consisted of three parts: Part 1: Socio-demographic characteristics that included questions related to personal characteristics of the studied patients such as (sex, age, level of education, occupation, and marital status…etc.). Part 2: Health relevant data that included questions related to patients': ocular history, medical history and family history. Part 3: Diabetic retinopathy Patients' knowledge questionnaire: it assessed knowledge of patients regarding DR at pre & post intervention phase, and at follow-up and it included questions covering the following items: (meaning of DR, sign & symptoms, risk factors, types, diagnosis, treatments, complications, prevention).

Scoring system; Knowledge tool was a 8-itme questionnaire. The patient response for each item was either: Correct and complete answers given score (2), Correct and incomplete answers given score (1) and don't know answers which were considered "incorrect answers" and given score (0). The total score, ranged from 0 to 16, was the sum of the responses for the 8 questions and the total score was categorized as:

- Poor: if the score was < 50 % from the maximum score.
- Fair: if the score was 50 % to 75 % from the maximum score.
- Good: if the score was > 75 % from the maximum score.

Tool II: Self-care practices checklist; this tool assessed self-care practices of DR patients at pre & post intervention phase, and at follow-up. It consisted of two parts: Part 1: This part was adapted from Shaban (2018) and the necessary modification was done by the researcher. It was concerned with self-care practices of DR patients through asking them questions regarding, self-monitoring of blood glucose level, regular health checkups, compliance with treatment regimen, appropriate dietary intake, and regular physical activities. Part 2: This part was developed by the researcher after extensive reviewing of the related literatures (Judith & McCann, (2009); Shaw, (2016). It was concerned with self-care practices of DR patients through observing them during; hand washing, instilling eye drops, applying eye ointment, and performing eye care.

Scoring system; each statement or step of patients' self-care practices was given score (1) for done correctly or given score (0) for done incorrectly or not done. The scores of each area of practices were summed-up to give the total score. After that, the total score was divided by the number of area's items, and then converted to be a percent score. For each area of self-care practices and for the total, the score was categorized as the following: -

- Inadequate: if the score was ≤ 60 % from the maximum score.
- Adequate: if the score was > 60 % from the maximum score.

3.4. Validity of the tools: After the tools were designed by the researcher, its content-validation was evaluated by a panel of five experts; two experts were lecturers in the field of Ophthalmology and the other three experts were assistant professors from Nursing Faculty in Mansoura University who reviewed the tools for clarity, relevance, comprehensiveness, and some modifications were done accordingly for their suggestions and comments.

3.5. Reliability of the tools: the reliability of knowledge assessment questionnaire and patients' self-care practices checklist part 1 & part 2 were estimated using the Cronbach's Alpha test to be (α = 0.913, 0.893 & 0.886 respectively) and they were considered "very good".

3.6. Pilot study: Before starting data collection, a pilot study was performed on 10 patients constituting about 10 % of the sample calculated for the main study, and then they were excluded later from the main study sample. The purpose of the pilot study was to test clarity, feasibility, objectivity of the tools and to help in estimating the required time to fill the tools. Based on results of the pilot study, necessary modifications were made.

3.7. Fieldwork: collection of data was conducted over a period of 14 months which started from October 2019 to December 2020. The study was implemented through the following four phases.

⊠Phase 1: Assessment phase

The researcher introduced herself to the participants and explained the objectives of the study to them. If the participants agreed to participate in the study, they were asked to sign a consent form. Then, the pre-test assessment was done for each of them. It should be noted that, the researcher visited the clinic twice a week: on Monday for the study group and on Thursday for the control group and this process was repeated every week for both groups until reaching the desired sample size.

⊠ Phase2: Planning phase (program development phase)

In the light of relevant literature, an educational program was developed by the researcher under the supervisors' guidance.

Identified needs, requirements and deficiencies were translated into objectives of the program and set in the form of a booklet.

⊠Phase 3: Implementation phase

➢ The study group:

Once after reaching sample size and after developing the program, the researcher encouraged the participants in the study group by telephone to come and meet the researcher. Basically, most participants returned back to the hospital to receive their treatments whether laser therapy, vitreous injection or just follow-up where the researcher could meet them and introduce the educational program. It was given in form of four sessions, each session took between 30 – 60 minutes, participants were divided into subgroups and number of each group varied.

➢ The control group:

They didn't receive the program, but they received the usual care from the ophthalmogist and the nurse at the clinic. The usual care consisted of checking up patients' eyes to follow their conditions, assessment effect of following the prescribed treatment regimen and making regular routine appointment for regular assessment.

⊠Phase 4: Evaluation phase

Each participant in both groups was evaluated three times during the study period. The first evaluation (pre-test) was done at the assessment phase, the second evaluation (post-test) was done one month post the implementation phase for the study group and immediately post the implementation phase for the control group, and the third evaluation (follow up) was done after three months of the second evaluation. The same data collection tools were used in the three evaluations.

3.8. Administrative design and ethical considerations: Before collecting the data, the researcher obtained an official permission to start and complete the study from the director of Mansoura Ophthalmic Hospital at which the study was conducted and this was after explaining the aim of the study and all relevant ethical considerations were taken during this study including; obtaining an approval from the Ethical Committee of the Faculty of Nursing, Mansoura University to conduct this study, obtaining a written informed consent from each participant in the study after full explanation of the study purpose, and maintaining the privacy and confidentiality of the participants during data

collection. Also, voluntary participation was given to them, as they had the right to refuse the participation or withdraw at any time they want from the study. Anonymity, privacy, safety, and confidentiality were being assured throughout the whole study.

3.9. Statistical design: All statistical analyses were performed using SPSS for windows version 20.0 (SPSS, Chicago, IL). Categorical data were expressed in number and percentage. Chi-square test was used for comparison of variables with categorical data. All continuous data were normally distributed and were expressed in mean ±standard deviation (SD). The student's t test was used for comparison between two for variables with continuous data. Correlation co-efficient test was used to test for correlations between two variables with continuous data. The reliability (internal consistency) of the knowledge questionnaire, self-care practice part 1, self-care practice part 2 were calculated. Statistical significance was set at p < 0.05.

3.10. Difficulties of the study: Using lengthy questionnaire in data collection tools, therefore, a lot of time was consumed during data collection. Scheduling teaching days was very difficult during coronavirus pandemic period.

4. Results

Table (1): revealed that, there was no statistically significant difference between the study and control groups regarding their all socio-demographic characteristics as (P > 0.05), therefore, the two groups were homogenous in their socio-demographic characteristics.

Table (2): showed that, there was no statistically significant difference between the two groups regarding their health relevant data as (P > 0.05), therefore, the two groups were homogenous in their health relevant data.

Figure (1): illustrated that, at the pre-intervention phase; just 36% of patients in both study and control groups had a good total knowledge level with no statistically significant difference between the two groups as P > 0.05.

Figure (2): illustrated that, at the post-intervention phase; 80% of patients in the study group vs. 38% of them in the control group had a good total knowledge level with highly statistically significant difference between the two groups as P < 0.001.

Figure (3): illustrated that, at the follow-up phase; 76% vs. 38% in the study and control groups respectively had a good total knowledge level with highly statistically significant difference between the two groups as P < 0.001.

Figure (4): showed that, at the pre-intervention phase; just 18% of patients in the study group compared with 16% of them in the control group had an adequate overall self- care practices level with no statistically significant difference between the two groups as P > 0.05.

Figure (5): showed that, at the post-intervention phase; slightly more than half (52%) of patients in the study group vs. 20% of them in the control group had an adequate overall self-care practices level with highly statistically significant difference between the two groups as P < 0.001.

Figure (6): showed that, at the follow-up phase; 46% vs. 24% of patients in the study and control groups respectively had an adequate overall self-care practices level with statistically significant difference between the two groups as P=0.021.

Table (3) illustrated that, pre-intervention; there were statistically significant relations between DR patients' sex, education level, occupation and income with their total knowledge as (P = 0.023, <0.001, <0.001 and 0.006 respectively).

Table (4) demonstrated that, pre-intervention; there were statistically significant relations between DR patients' education level, occupation, residence and income with their total self-care practices as (P = 0.002, 0.011, <0.001 and 0.005 respectively).

Table (5) showed that; there was highly statistically significant correlation between total knowledge and total self-care practices scores at the pre, post and follow-up phases as (p= <0.001)

. **Table 1. Socio-demographic characteristics of DR patients among the study and control groups (n=100).**

	Study group		Control group		Chi square test	
	N (50)	%	N (50)	%	χ^2	P
Age (years)						
30 – >40	6	12.0	8	16.0		
40 – >50	8	16.0	13	26.0		
50 – 60	36	72.0	29	58.0	2.230	0.328
Mean ±SD	50.9 ±7.9		49.4 ±8.6		0.969	0.335^
Sex						
Male	16	32.0	21	42.0		
Female	34	68.0	29	58.0	1.073	0.300
Marital Status						
Single	3	6.0	3	6.0		
Married	33	66.0	35	70.0		
Divorced	2	4.0	6	12.0		
Widowed	12	24.0	6	12.0	4.059	0.255
Level of education						
Illiterate	18	36.0	23	46.0		
Basic education	7	14.0	10	20.0		
Secondary education	19	38.0	12	24.0		
University education	6	12.0	5	10.0	2.811	0.422
Occupation						
Employee	8	16.0	14	28.0		
Worker	14	28.0	12	24.0		
Housewife	25	50.0	20	40.0		
Not working	3	6.0	4	8.0	2.111	0.550
Residence						
Rural	35	70.0	32	64.0		
Urban	15	30.0	18	36.0	0.407	0.520
Living condition						
Alone	2	4.0	3	6.0		
With the family	48	96.0	47	94.0	0.211	0.646
Income / month						
Insufficient	15	30.0	13	26.0		
Sufficient	35	70.0	37	74.0	0.198	0.656

(^) P value based on Student's t test

χ2: Chi- square test

Table 2. Health relevant data of DR patients among the study and control groups (n=100)

	Study group		Control group		Chi square test	
	N(50)	%	N(50)	%	χ^2	p
A) Ocular history						
Duration of diabetic retinopathy (years)						
< 5	28	56.0	33	66.0		
5 – 10	20	40.0	14	28.0		
>10	2	4.0	3	6.0	1.669	0.434
Current symptoms						
Blurred vision	36	72.0	39	78.0	0.480	0.488
Floaters in field of vision	29	58.0	27	54.0	0.162	0.687
Dark spots appear in field of vision	16	32.0	23	46.0	2.060	0.151
Drop of vision	10	20.0	12	24.0	0.231	0.622
Others	17	34.0	12	24.0	1.213	0.274
Treatment of DR						
Laser treatment	35	70.0	28	56.0	2.102	0.147
Vitreous injection	13	26.0	16	32.0	0.437	0.509
Follow-up	8	16.0	10	20.0	0.271	0.603
Complications of DR						
No	35	70.0	32	64.0		
Vitreous hemorrhage	10	20.0	12	24.0		
Retinal detachment	2	4.0	4	8.0		
Glaucoma	3	6.0	2	4.0	1.183	0.757
Currently wearing eye glasses	30	60.0	26	52.0	0.649	0.420
B) Medical history:						
Current treatment of diabetes						
Oral hypoglycemic agents	32	64.0	35	70.0		
Insulin injections	18	36.0	15	30.0	0.407	0.523
Duration of diabetes (years)						
<10	5	10.0	2	4.0		
10 – 15	14	28.0	19	38.0		
>15	31	62.0	29	58.0	2.110	0.348
Have any chronic diseases	44	88.0	42	84.0	0.332	0.564
If yes, what are the diseases?						
Hypertension	30	68.2	26	61.9	0.373	0.542
High cholesterol level	18	40.9	10	23.8	2.861	0.091
Heart disease	3	7.1	5	11.4	0.454	0.501
Kidney disease	12	27.3	15	35.7	0.711	0.399
Liver diseases	2	4.5	2	4.8	0.002	0.962
Diseases of the digestive system	8	18.2	5	11.9	0.660	0.417
Rheumatoid arthritis	2	4.8	3	6.8	0.166	0.684
Osteoporosis	4	9.1	3	7.1	0.109	0.741
History of previous hospitalization	17	34.0	13	26.0	0.762	0.383
If yes, what is the reason						
Occurrence of a hypoglycemic coma	4	23.5	2	15.4	0.584	0.445
Occurrence of a hyperglycemic coma	5	29.4	4	30.8	0.054	0.817
For surgery	8	47.1	7	53.8	0.278	0.598
C) Family history:						
Family history of diabetes						
No	18	36.0	23	46.0		
Yes	32	64.0	27	54.0	1.033	0.309
Family history of diabetic complications						
No	25	78.1	23	85.2		
Yes	7	21.9	4	14.8	0.481	0.488
Family history of diabetic retinopathy						
No	5	71.4	3	75.0		
Yes	2	28.6	1	25.0	0.016	0.898

$\chi2$: Chi- square test

$\chi2$: Chi- square test

DR: Diabetic Retinopathy

Poor: score < 50.0%

Fair: score 50.0 % - 75.0%

Good: score > 75.0%

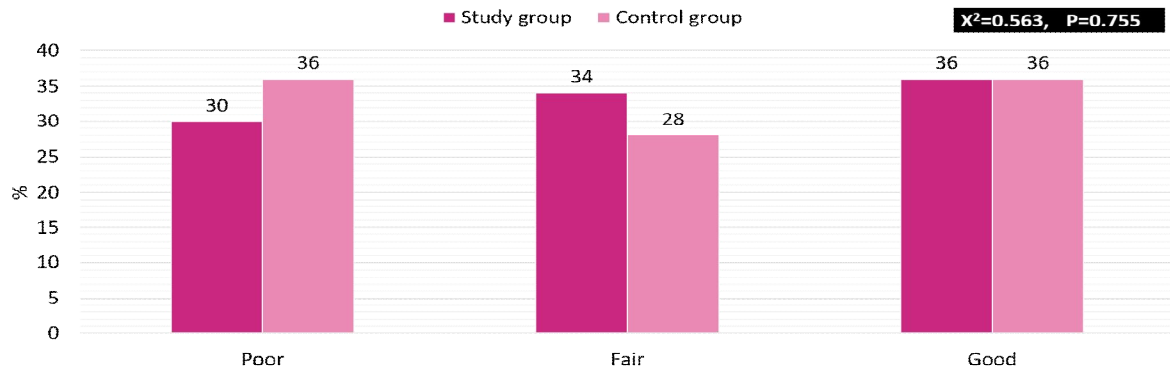**Figure 1. Comparison of DR patients in the study and control groups regarding their overall knowledge level at the pre- intervention phase (n= 100).**
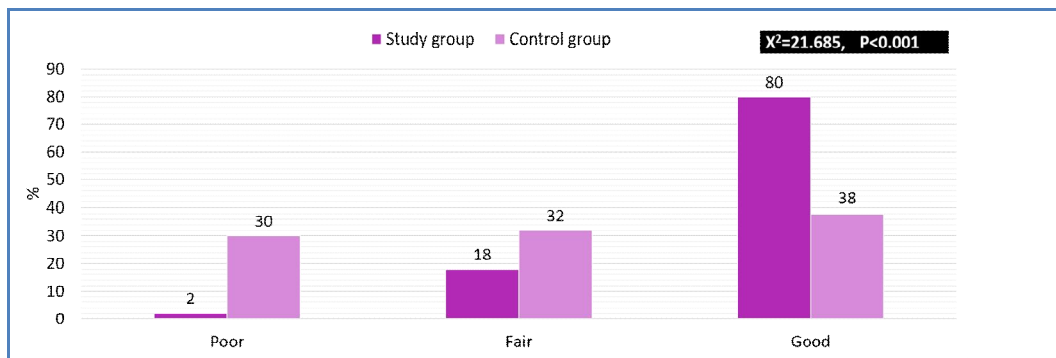

Figure 2. Comparison of DR patients in the study and control groups regarding their overall knowledge level at the post- intervention phase (n= 100).

$\chi 2$: Chi- square test   Poor: score < 50.0%

P value is highly significant if < 0.001   Fair: score 50.0 % - 75.0%
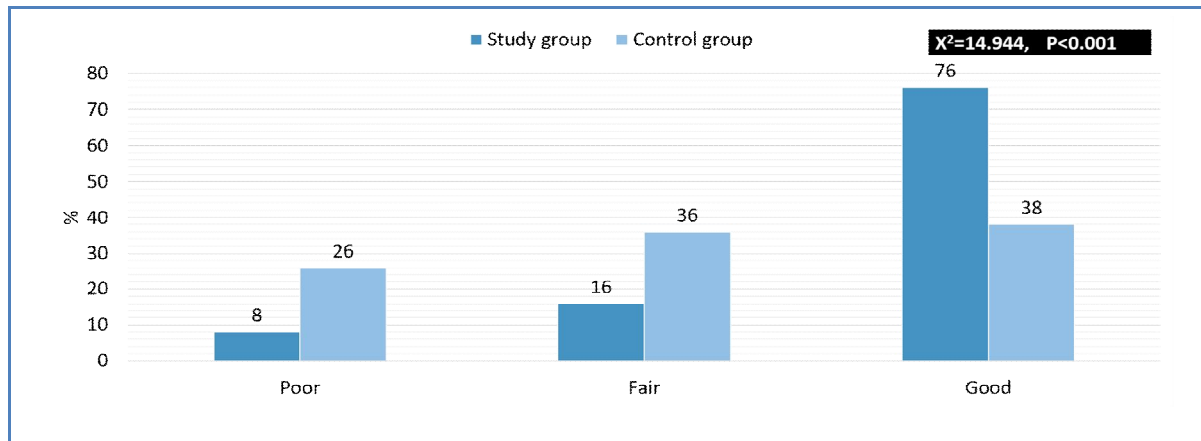
Good: score > 75.0%

Figure 3. Comparison of DR patients in the study and control groups regarding their overall knowledge level at the follow-up phase (n= 100).

$\chi 2$: Chi- square test   Poor: score < 50.0%

P value is highly significant if < 0.001   Fair: score 50.0 % - 75.0%
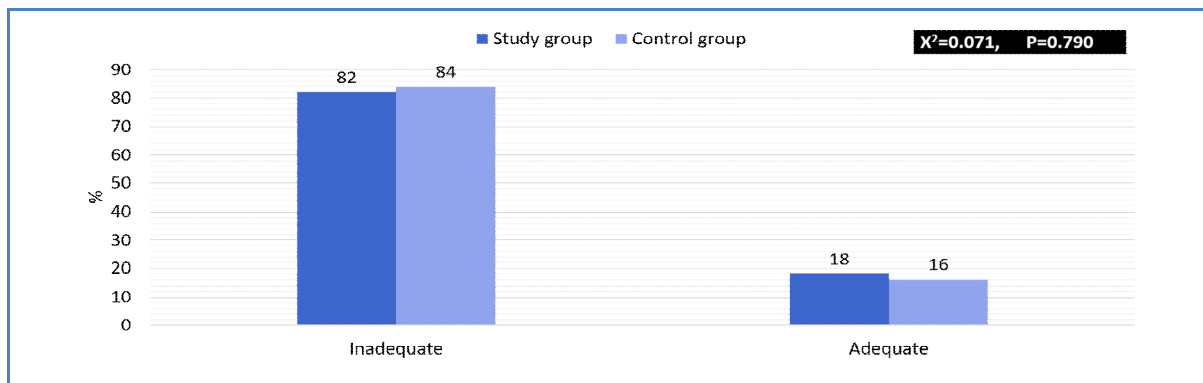
Good: score > 75.0%

Figure 4. Comparison of DR patients in the study and control groups regarding their overall self-care practices level at the pre-intervention phase (n= 100).

$\chi2$: Chi- square test

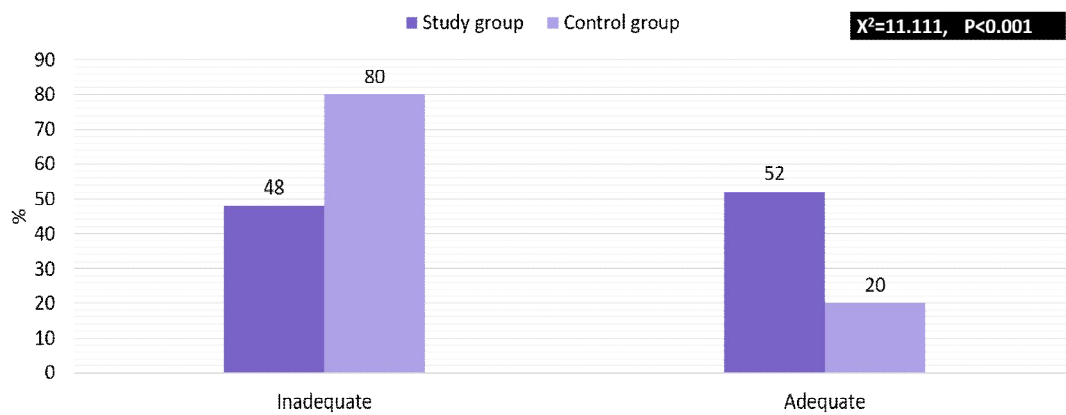Inadequate: score $\leq$ 60.0%

Adequate: score > 60.0%

Figure 5. Comparison of DR patients in the study and control groups regarding their overall self-care practices level at the post-intervention phase (n= 100).

$\chi2$: Chi- square test

Inadequate: score $\leq$ 60.0%

P value is highly significant if < 0.001
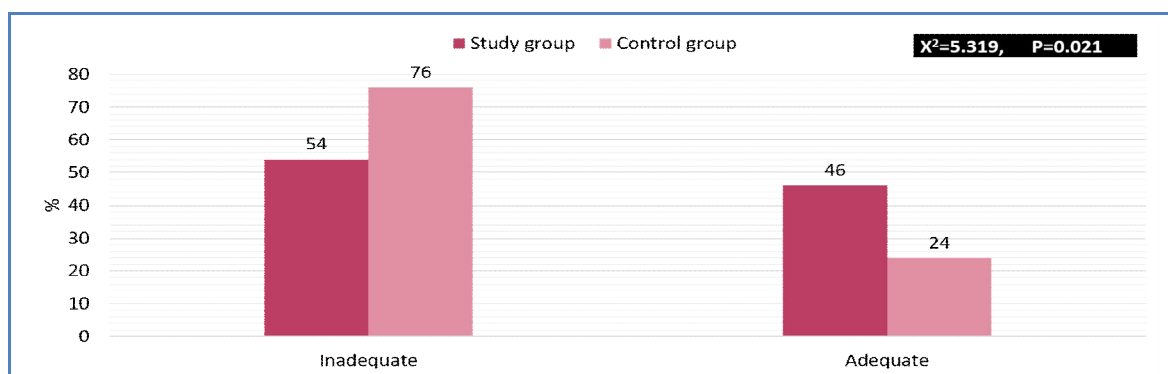
Adequate: score > 60.0%

Figure 6. Comparison of DR patients in the study and control groups regarding their overall self-care practices level at the follow-up phase (n= 100).

$\chi2$: Chi- square test

Inadequate: score $\leq$ 60.0%

P value is significant if < 0.05

Adequate: score > 60.0%

Table 3. Relation between socio-demographic characteristics of the total research sample with their total knowledge at the pre-intervention phase (n= 100).

	Poor (n=33)		Fair (n=31)		Good (n=36)		Chi square test	
	N	%	N	%	N	%	X^2	P
Age (years)								
30 – >40	4	12.1	2	6.5	8	22.2		
40 – >50	4	12.1	6	19.4	11	30.6		
50 – 60	25	75.8	23	74.2	17	47.2	8.668	0.070
Sex								
Male	6	18.2	14	45.2	17	47.2		
Female	27	81.8	17	54.8	19	52.8	7.513	0.023*
Marital Status								
Single	2	6.1	2	6.5	2	5.6		
Married	19	57.6	21	67.7	28	77.8		
Divorced	3	9.1	2	6.5	3	8.3		
Widowed	9	27.3	6	19.4	3	8.3	4.680	0.585
Level of education								
Illiterate	21	63.6	14	45.2	6	16.7		
Basic education	4	12.1	8	25.8	5	13.9		
Secondary education	7	21.2	8	25.8	16	44.4		
University education	1	3.0	1	3.2	9	25.0	24.947	<0.001**
Occupation								
Employee	3	9.1	1	3.2	18	50.0		
Worker	7	21.2	10	32.3	9	25.0		
Housewife	22	66.7	15	48.4	8	22.2		
Not working	1	3.0	5	16.1	1	2.8	34.456	<0.001**
Residence								
Rural	23	69.7	22	71.0	22	61.1		
Urban	10	30.3	9	29.0	14	38.9	3.586	0.166
Living condition								
Alone	3	9.1	0	0.0	2	5.6		
With the family	30	90.9	31	100.0	34	94.4	2.818	0.244
Income / month								
Insufficient	15	45.5	9	29.0	4	11.1		
Sufficient	18	54.5	22	71.0	32	88.9	10.097	0.006*

(*) P value is significant if < 0.05   Poor: score < 50.0%

(**) P value is highly significant if < 0.001   Fair: score 50.0 % - 75.0%

χ2: Chi- square test   Good: score > 75.0%

Table 4. Relation between socio-demographic characteristics of the total research sample with their total self-care practices at the pre-intervention phase (n= 100).

| | Total self-care practice pre-intervention | | | | Chi square test | |
| | Inadequate (n=83) | | Adequate (n=17) | | | |
	N	%	N	%	X^2	P
Age (years)						
30 – >40	11	13.3	3	17.6		
40 – >50	15	18.1	6	35.3		
50 – 60	57	68.7	8	47.1	3.202	0.202
Sex						
Male	29	34.9	8	47.1		
Female	54	65.1	9	52.9	0.889	0.346
Marital Status						
Single	6	7.2	0	0.0		
Married	55	66.3	13	76.5		
Divorced	6	7.2	2	11.8		
Widowed	16	19.3	2	11.8	2.250	0.522
Level of education						
Illiterate	40	48.2	1	5.9		
Basic education	15	18.1	2	11.8		
Secondary education	21	25.3	10	58.8		
University education	7	8.4	4	23.5	14.529	0.002*
Occupation						
Employee	14	16.9	8	47.1		
Worker	23	27.7	3	17.6		
Housewife	42	50.6	3	17.6		
Not working	4	4.8	3	17.6	11.159	0.011*
Residence						
Rural	61	73.5	6	35.3		
Urban	22	26.5	11	64.7	12.682	<0.001**
Living condition						
Alone	4	4.8	1	5.9		
With the family	79	95.2	16	94.1	0.034	0.855
Income / month						
Insufficient	28	33.7	0	0.0		
Sufficient	55	66.3	17	100.0	7.965	0.005*

(*) P value is significant if < 0.05   Inadequate: score ≤ 60.0%

(**) P value is highly significant if < 0.001   Adequate: score > 60.0%

χ2: Chi- square test

Table 5. Correlation among total knowledge and total self-care practices through study phases.

	r	P
Pre-intervention	0.643	<0.001**
Post-intervention	0.767	<0.001**
Follow up	0.759	<0.001**

(**) P value is highly significant if < 0.001

r= Correlation Coefficient

5. Discussion

Diabetic retinopathy patients are at risk of developing visual impairment that negatively affects patients' functional status and daily living activities. However, vision-threatening DR can be prevented by giving the appropriate treatment to patient's side by side with providing them with well-prepared educational program that should aim to increase their compliance to self-care practices (Li, Gu & Guo, 2019). Therefore, this study was carried out to test the hypothesis that implementing the educational intervention for DR patients would improve their knowledge and self-care practices.

Knowledge of the studied groups during different phases of educational intervention:

Pre-implementing the educational intervention; our findings revealed that, most of patients in the study and control groups had a deficient knowledge about their disease. This was noticed in the total knowledge level with no statistically significant difference between both groups.

In agreement with this present study finding, a Chinese study by Duan et al. (2020) who studied "Knowledge and practices regarding DR among diabetic patients registered in a chronic disease management system in eastern China" and revealed that, the awareness of DR among patients was very low. Similarly, another study by Beaser, Turell and Howson (2018) revealed low levels of knowledge about DR before the educational program. On the same line, a study in South India by Hussain et al. (2016) demonstrated that, the patients who had been diagnosed with DR had poor knowledge and awareness about their disease.

On the contrary, a study in Saudi Arabia by Alsaidan and Ghoraba (2019) who studied " Awareness of DR among patients with type 2 diabetes mellitus in primary health care in security forces hospital Riyadh, Saudi Arabia" and revealed high level of awareness about DR. Moreover, N. R. Almalki, T. M. Almalki and Alswat (2018) reported that, almost two-thirds of diabetic patients had a good level of knowledge about DR.

The deficient pre-intervention knowledge among DR patients in this current study might be due to many factors such as patients' low level of education in both groups, limited health literacy in developing countries like Egypt, gap between healthcare providers and patients as well as less participation of media in awareness creation about DR.

Post-implementing the educational intervention and at follow up phases; there were statistically significant differences between the study group compared with the control group in the total knowledge level. This indicated the effectiveness of the educational intervention that was given to the study group in improving their knowledge, achieving one of the objectives of the current study. A similar positive effect of an educational intervention was reported by Khalaf et al. (2019) who reported that, the educational program significantly helped DR patients in improving their awareness about their disease. Also, S. S. Mohamed, R. F. Mohamed and S. H. Mohamed (2019) reported the same results. The success of our educational intervention might be attributed to the simplicity of its content, relevant of the information, as well as the instructional process that took into consideration educational level and health status of patients.

Self-care practices of the studied groups during different phases of educational intervention:

Pre-implementing the educational intervention; our findings revealed that, majority of DR patients in both study and control groups had inadequate level in performing their self-care practices with no statistically significant difference between both groups.

A similar result was reported in a study of Al-Yahya, Alsulaiman, Almizel, Barri and Al Adel (2020) who studied "Knowledge, Attitude, and Practices (KAP) of Diabetics towards diabetes and DR in Riyadh, Saudi Arabia" and revealed that, the overall practices score of DR patients was below the accepted range. On the same line, ALHargan et al. (2019) reported that, self-care practices of DR patients were found to be low. On the contrary, a Sudanese study by Farag et al. (2020) revealed that, most patients had an acceptable level of practice.

The possible explanation for inadequate self-care practices level for both groups at the pre-intervention phase could be due to low educational level of patients that leaded to having a deficient level of knowledge about DR and consequently about proper self-care practices. Also, it might be because according to the researcher's observation, many healthcare providers weren't completely discussing self-care practices with their patients because of work pressure and their belief that self-care practices were mostly the patients' responsibility.

However, there was a statistically significant difference between both groups in their overall self-care practices at the post and follow-up phases, indicating the effectiveness of the educational intervention that was given to the study group in improving their self-care practices, achieving the second objective of the current study. A similar positive effect of an educational intervention was reported by Shaban (2018) who demonstrated in their study, success of the intervention in improving overall self-care practices of DR patients. Also, Adams (2016) demonstrated a marked improvement in self-care practices among the test group compared with the control group at the post and follow-up phases.

Relation between socio-demographic characteristics of the total research sample and their total knowledge at the pre-intervention phase:

Our study revealed that, there was a statistically significant relation between DR patients' sex and their total knowledge as it was evident that, the total knowledge score was higher among males than females. In the same line with our result Alsaidan and Ghoraba (2019) found that, males had more awareness about DR than females. Also, Memon et al. (2015) found the same result. However, this result was incongruent with that of Geethadevi et al. (2018) who found that, females were more knowledgeable about DR than males. Our result might be because most of females in our study were housewives and they had lower interactions compared with males who were working and thus they were prone to gain more knowledge about DR from different sources.

The results of the current study showed that, there was a statistically significant relation between DR patients' educational level and their total knowledge as it was evident that, the total knowledge score was higher among those with higher educational level. This was congruent with a study of Geethadevi et al. (2018) who found that, good knowledge was positively associated with higher educational level. In addition, Seneviratne and Prathapan (2016) reported the same result. All these results supported the proposition that, education is important in creating health awareness and increasing patients' information about their disease.

Regarding occupation, our study revealed that, there was a statistically significant relation between DR patients' occupation and their total knowledge as it was evident that, the total

knowledge score was higher among employees. This was in the same line with Mohamed, Abdalla and Ali (2018) who stated that, employees were significantly higher in gaining knowledge about DR compared with unemployed as well as those had manual worker jobs. This might be due to the higher level of education among employees than others. On the contrary, Venugopal, Lal, Fernandes and Gavde (2020) reported no association between DR patients' knowledge and their occupation.

Also, the results of the current study showed that, there was a statistically significant relation between DR patients' income and their total knowledge as it was evident that, the total knowledge score was higher among those who had sufficient monthly income. This agreed with the result of Assem et al. (2020) who stated that, higher monthly income level was significantly associated with good knowledge. However, in the study of Venugopal et al. (2020), there was no association between patients' knowledge and their income. The possible explanation for our finding could be because patients with sufficient monthly income might have more exposure to mass media (such as internet and magazines) that could increase their knowledge about disease than those who had insufficient income.

Relation between socio-demographic characteristics of the total research sample and their total self-care practices at the pre-intervention phase:

Our study revealed that, there was a statistically significant relation between DR patients' education level and their total self-care practices as it was evident that, the total self-care practices score was higher among those who had higher education level. This was congruent with a study by RobatSarpooshi et al. (2020) who stated the same relationship. Also, our finding was in agreement with a study by Mohebi et al. (2018) who stated that, patients' performance of self-care was predicted by having higher education levels. Our result might be due to the fact that, patients with higher education levels have better judgment and decision-making capability for adhering to self-care behaviors. In another word, they had a high sense of self-care, autonomy and regularly take care of themselves from less educated patients.

However, in a study of Molalign, Weharei, Kidanu, Gebrekidan and Gebregiorgis (2021), there was no association between the higher the educational status and adherence to self-care practices. This difference could be because regardless of patients' educational status, they might adhere to self-care practices based on the

information they received from health care providers or the media.

In addition, our study revealed that, there was a statistically significant relation between DR patients' occupation and their total self-care practices as it was evident that, the total self-care practices score was higher among employees. This was in the same line with Mohammed, Hegazy, Ali and Abu El-fadl (2021) who stated that, performing self-care practices among employees was significantly higher compared with the unemployed. This might be because working patients had self-autonomy and high self-esteem to care for themselves.

The results of the current study showed that, there was a statistically significant relation between DR patients' residence and their total self-care practices as it was evident that, the total self-care practices score was higher among those who lived in urban areas. This agreed with the result of Khalaf et al. (2019) who stated that, self-care practices of DR patients was higher in urban than rural participants. The possible explanation for the findings could be because the health services are more available in urban areas than rural ones. Additionally, the difference between rural and urban cultures can play a role.

Also, the results of the current study showed that, there was a statistically significant relation between DR patients' income and their total self-care practices as it was evident that, the total self-care practices score was higher among those who had sufficient monthly income. This agreed with the result of Mutyambizi, Pavlova, Hongoro and Groot (2020) who stated that, higher monthly income was significantly associated with good self-care practices. However, in the study of Mohammed-Ali and Hamza (2016), there was no association between patients' monthly income and their self-care practices. The possible explanation for our finding could be because patients with sufficient monthly income might have more exposure to health centers, mass media (such as internet and magazines) and higher people interaction than those who had insufficient income.

Correlation between total knowledge and total self-care practices scores through the study phases:

Our results showed that, there were statistically significant correlations between patients' total knowledge and total self-care practices. This indicated when patients acquired higher knowledge about their diseases, they engaged more in their self-care practices which could improve health outcomes. In congruence with this, an Iranian study by Babazadeh et al. (2017) emphasized on the importance of knowledge among diabetic patients in promoting their self-care practices. Also, Kugbey, Asante and Adulai (2017) highlighted that, perception of illness played a vital role in a engaging patients in their self-care practices.

6. Conclusion

Based on the findings of this study; total knowledge and overall self-care practices of the study group were improved post implementing the educational intervention and at the follow-up phase compared with the control group, indicating the effectiveness of the educational intervention and achieving the ultimate goal of the current study

7. Recommendations

In the light of the findings of the present study, the following recommendations were suggested.

- Collaboration between DM follow-up clinics and eye clinics in screening for DR was strongly recommended for early detection of DR.

- Health care providers involving the ophthalmic nurses should be fully aware of their educational roles in preventing progression of the disease.

- This study should be replicated on a large sample to generalize its results.

8. References

Adams, O. T. (2016). Influence of diabetes self-care on glycemic control among patients with type 2 diabetes mellitus attending family medicine clinic Offederal Medical Centre IDO-EKITI. Faculty of Family Medicine.

ALHargan, M. H., AlBaker, K. M., AlFadhel, A. A., AlGhamdi, M. A., AlMuammar, S. M., & AlDawood, H. A. (2019). Awareness, knowledge, and practices related to diabetic retinopathy among diabetic patients in primary healthcare centers at Riyadh, Saudi Arabia. *Journal of Family Medicine and Primary Care,* 8 (2), 373-377.

Almalki, N. R., Almalki, T. M., & Alswat, K. (2018). Diabetics retinopathy knowledge and awareness assessment among the type 2 diabetics. *Open Access Macedonian Journal of Medical Sciences*, 6 (3), 574.

Alsaidan, A. A., & Ghoraba, M. (2019). Awareness of diabetic retinopathy among patients with type 2 diabetes mellitus in primary health care in security forces hospital Riyadh, Saudi Arabia. *Journal of Family Medicine and Primary Care*, 8 (7), 2433.

Al-Yahya, A., Alsulaiman, A., Almizel, A., Barri, A., & Al Adel, F. (2020). Knowledge, Attitude, and Practices (KAP) of Diabetics towards diabetes and diabetic retinopathy in Riyadh, Saudi Arabia: Cross-sectional study. *Clinical Ophthalmology Journal*, 14, (3), 187-192.

Assem, A. S., Tegegne, M. M., Alemu, D. S., Woredekal, A. T., & Tefera, T. K. (2020). Knowledge about diabetic retinopathy, eye check-up practice and associated factors among adult patients with diabetes mellitus attending at debark hospital, Northwest Ethiopia. *BMC ophthalmology*, 20 (1), 1-11.

Babazadeh, T., Dianatinasab, M., Daemi, A., Nikbakht, H. A., Moradi, F., & Ghaffari-Fam, S. (2017). Association of self-care behaviors and quality of life among patients with type 2 diabetes mellitus: Chaldoran County, Iran. *Diabetes & Metabolism Journal*, 41 (6), 449.

Baumal, C., & Duker, J. (2017). *Current management of diabetic retinopathy*. St. Louis, MO: Elsevier, p. 2.

Beaser, R. S., Turell, W. A., & Howson, A. (2018). Strategies to improve prevention and management in diabetic retinopathy: qualitative insights from a mixed-methods study. *Diabetes Spectrum Journal*, 31 (1), 65-74.

Bos, M., & Agyemang, C. (2016). Prevalence and complications of diabetes mellitus in Northern Africa, a systemic review. *BMC Public Health*, 13 (1), 37.

Denniston, A., & Murray, P. (Eds.). (2014). *Oxford handbook of ophthalmology* (3rd ed.). New York, NY: Oxford University Press, p. 1-100.

Dinesh, P., Kulkarni, A., & Gangadhar, N. (2016). Knowledge and self-care practices regarding diabetes among patients with Type 2 diabetes in Rural Sullia, Karnataka: A community-based, cross-sectional study. *J Family Med Prim Care*, 5 (4), 847-852.

Duan, F., Zheng, Y., Zhao, Q., Huang, Z., Wu, Y., Zhou, G., & Chen, X. (2020). Knowledge and practices regarding diabetic retinopathy among diabetic patients registered in a chronic disease management system in eastern China. *PloS One*, 15 (8), 142-152.

Farag, O. E., Ali, S. A., Alabdeen, A. H. Z., Omer, A. M., Al Mrami, M. A., Elrayah, A. E. E., ... & Badi, S. A. (2020). Knowledge and self-care activities among Sudanese individuals with diabetes: a cross sectional survey. *Journal of Hospital Management and Health Policy*, 4 (2), 1-10.

Gale, R., Scanlon, PH., Evans, M., Ghanchi, F., Yang, Y., Silvestri, G., Freeman, M., Maisey, A., & Napier, J. (2017). Action on diabetic macular oedema: Achieving optimal patient management in treating visual impairment due to diabetic eye disease. *Eye*, 31 (1), 1-20.

Geethadevi, M., Thampi, B., Antony, J., Raghavan, R. R., Sasidharan, R., & Mohan, A. (2018). A study of knowledge, attitude and practice in diabetic retinopathy among patients attending a primary health care centre. *International Journal of Research and Medical Sciences*, 6 (1), 3020-3024.

Hussain, R., Rajesh, B., Giridhar, A., Gopalakrishnan, M., Sadasivan, S., James, J., ... & John, N. (2016). Knowledge and awareness about diabetes mellitus and diabetic retinopathy in suburban population of a South Indian state and its practice among the patients with diabetes mellitus: A population-based study. *Indian Journal of Ophthalmology*, 64 (4), 272-281.

Judith, A., & McCann, S. (2009). *Lippincott's nursing procedures (5th ed.)*. Philadelphia, PA: Lippincott Williams & Wilkins, p. 113-124.

Khalaf, F. R., Fahmy, H. M., Ibrahim, A. K., Mohamed, G. A., Eldeen, M. E. S. E., Elkady, A., & Hetta, H. F. (2019). Does a diabetic retinopathy educational program raise awareness among elderly diabetic patients?. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*, 12 (1), 1867-1875.

Kugbey, N., Asante, K. O., & Adulai, K. (2017). Illness perception, diabetes knowledge and self-care practices among type-2 diabetes patients: a cross-sectional study. *BMC Research Notes*, 10 (1), 1-7.

Li, J., Gu, L., & Guo, Y. (2019). An educational intervention on foot self-care behaviours among diabetic retinopathy patients with visual disability and their primary caregivers. *Journal of Clinical Nursing*, 28 (13), 2506-2516.

Memon, M. S., Shaikh, S. A., Shaikh, A. R., Fahim, M. F., Mumtaz, S. N., & Ahmed, N. (2015). An assessment of knowledge, attitude and practices (KAP) towards diabetes and diabetic retinopathy in a suburban town of Karachi. *Pakistan Journal of Medical Sciences*, 31(1), 183-187.

Mohamed, N. M., Abdalla, E. S., & Ali, H. H. (2018). Quality of life of elderly patients with cataract. *Zagazig Nursing Journal*, 14 (1), 118-132.

Mohamed, S. S., Mohamed, R. F., & Mohamed, S. H. (2019). Impact of educational intervention program on diabetic retinopathy patient's compliance. *American Journal of Nursing*, 7 (6), 1000-1008.

Mohammed, E. A. E., Hegazy, M. M., Ali, H. A. K., & Abu El-fadl, N. M. (2021). Effect of an educational program on self-care management for patients with sickle cell disease. *Journal of Nursing Science Benha University*, 2 (1), 124-146.

Mohammed-Ali, B. R., & Hamza, R. (2016). Assessment of self-care activities for patients' with diabetes mellitus type II. *International Journal of Scientific and Research Publications,* 6 (9), 425-434.

Mohebi, S., Parham, M., Sharifirad, G., Gharlipour, Z., Mohammadbeigi, A., & Rajati, F. (2018). Relationship between perceived social support and self-care behavior in type 2 diabetics: A cross-sectional stud*y. Journal of Education and Health Promotion, 7 (2), 11-16.*

Molalign, G., Weharei, M. A., Kidanu, H. T. M., Gebrekidan, K. G., & Gebregiorgis, B. G. (2021). Diabetes self-care practice and associated factors among type 2 diabetic patients in public hospitals of Tigray regional state, Ethiopia: A multicenter study. *PLoS ONE Journal*, 16 (4), e0250462.

Mutyambizi, C., Pavlova, M., Hongoro, C., & Groot, W. (2020). Inequalities and factors associated with adherence to diabetes self-care practices amongst patients at two public hospitals in Gauteng, South Africa. *BMC Endocrine Disorders*, 20 (1), 15.

Nentwich, M., & Ulbig, M. (2015). Diabetic retinopathy-ocular complications of diabetes mellitus. *World J Diabetes*, 6 (3), 489-499.

Nordquist, C. (2017). Diabetic retinopathy: Causes, symptoms, ad treatments. Available at https://www.medicalnewstoday.com/articles/183417.php

Pereira, D. M., Shah, A., May D'Souza, P. S., George, T., D'Souza, N., Suresh, S., & Baliga, M. S. (2017). Quality of life in people with diabetic retinopathy: Indian study. *Journal of Clinical and Diagnostic Research*, 11 (4), 1-14.

Pouncey, A., & Frith, P. (2013). How to take an ophthalmic history. *BUJO*, 1(1), 1-4.

RobatSarpooshi, D., Mahdizadeh, M., Siuki, H. A., Haddadi, M., Robatsarpooshi, H., & Peyman, N. (2020). The relationship between health literacy level and self-care behaviors in patients with diabetes. *Patient Related Outcome Measures*, 11 (3), 129-135.

Sayin, N., Kari, N., & Pekel, G. (2015). Ocular complications of diabetes mellitus. *World J Diabetes,* 6 (1), 92-108.

Seneviratne, B., & Prathapan, S. (2016). Knowledge on diabetic retinopathy among diabetes mellitus patients attending the Colombo South Teaching Hospital, Sri Lanka. *Journal of US-China Medical Science*, 13 (2), 35-46.

Shaban, M. (2018). Self-care practices among patients with diabetic retinopathy, unpublished Master thesis, Faculty of Nursing, Alexandria University.

Shaw, M. (2016). How to administer eye drops and ointment. *Nursing Standard Journal*, 30(39), 34-36.

Venugopal, D., Lal, B., Fernandes, S., & Gavde, D. (2020). Awareness and knowledge of diabetic retinopathy and associated factors in Goa: A hospital-based cross-sectional study. *Indian Journal of Ophthalmology*, 68 (2), 383.

World Health Organization. (2014). Self-care for health. Available at https://apps.who.int/iris/handle/10665/205887