

Awareness of diabetic retinopathy in Egyptian diabetic patients attending Kasr Al-Ainy outpatient clinic: A cross-sectional study

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Abstract

Background: Diabetic retinopathy (DR) is a sight-threatening microvascular complication of diabetes.

Objectives: The objectives of this study were to assess the awareness of diabetic patients about the screening for diabetic retinopathy and to detect the presence of different stages of retinopathy among a sample of patients attending the Diabetic clinic in Kasr Al-Ainy hospital.

Methods: This study is a cross sectional study in which 100 adult diabetic patients were interviewed and visual acuity, retinopathy status, and presence of other ocular diseases were assessed.

Results: It was found that there is general awareness of diabetic retinopathy among the majority of the study participants; however there is little awareness as regards the importance of screening. The main barrier for performing fundus examination was lack of awareness of its importance. Around half of the participants had performed one fundus examination after diagnosis of diabetes. Ophthalmic examination revealed that 47% of the study participants had no DR at the time of the examination, 22% had non-proliferative retinopathy and 31% had proliferative retinopathy. Only 16% of the participants had diabetic maculopathy.

Conclusion: Awareness creation is crucial for decreasing diabetic eye complications.

Key words: Egypt, diabetic retinopathy, awareness, fundus examination, screening.

Introduction

Diabetes is a complex, chronic illness requiring continuous medical care with multifactorial risk-reduction strategies beyond glycemic control (1). The International Diabetes Federation (IDF) in 2013 estimated that there were 382 million diabetic patients worldwide; 80% of them lived in low- and middle-income countries and the number will increase to be 592 million by the year 2035. The Diabetic population in Egypt was estimated to be 7.5 million in 2013 and it is projected to reach 13.1 million by the year 2035 (2).

Diabetic retinopathy (DR) and diabetic macular edema (DME) are common microvascular complications of diabetes and may have a debilitating impact on visual acuity, eventually leading to blindness. Other eye disorders including glaucoma and cataracts occur earlier and more frequently in people with diabetes. The current management strategy for DR/DME requires early detection and optimal glycemic control to slow the progression of disease (3).

An initial dilated and comprehensive eye examination should be performed shortly after the diagnosis for all type 2 diabetic patients. Subsequent examinations for type 1 and type 2 diabetic patients should be repeated annually in the absence of retinal changes, otherwise shorter intervals are recommended (4).

Having a high prevalence of diabetes and its complications in Egypt, there is a strong need to assess the awareness of consequences or the end organ damage due to diabetes mellitus among diabetics. In addition, there is a great need to estimate the likelihood of diabetics to seek medical advice for the assessment of the consequences of diabetes, like diabetic retinopathy. Therefore, in our study, we have made an attempt to assess the awareness of diabetic retinopathy and detect the retinopathy changes among a sample of diabetic patients.

Methods

This cross-section observational study was conducted in the Diabetic Clinic in Kasr Al-Ainy hospital from February 2011 till February 2012.

Sample selection:

Purposive non-probability sampling technique was used in which 100 diabetic patients attending the Diabetic Clinic in Kasr Al-Ainy hospital were included in the study. All adult patients with type 2 diabetes who agreed to participate were enrolled in the study. Any patient with other ophthalmic diseases obscuring retinal view or affecting the quality of digital photography was excluded from the study.

Study tool

A structured questionnaire was designed to assess patient awareness regarding the importance of screening for DR, its frequency and causes of non-adherence. The content validation of the questionnaire was done by two experts. The questionnaire was tested on 10 diabetic patients in

order to check the clarity of the structured questionnaire and to estimate the time needed to complete the questionnaire. It was found that most of the patients were illiterate, so the questionnaire could not be self-administered and was completed by interviewing.

Data collection

The first step:

Following consent, participants completed an interview, that included:

- Demographic characteristics including: Age, gender, marital status, number of children, level of education, employment status, insurance and its type.
- Medical data including: Smoking status, previous eye diseases and operations, age of onset of diabetes, its duration and treatment.
- Self-perception regarding diabetes control.
- Chronic diseases and drug intake including aspirin and vitamin B complex.
- Family history of diabetes.
- Previous fundus examination including: Frequency, time of first and last fundus examination and causes of non-adherence to previous fundus examination.
- The awareness of the patients including: awareness about diabetic complications, awareness about the importance of screening of DR, available treatment options for DR and the source of their knowledge.

The second step:

Complete ophthalmological examination was done including:

- Visual acuity measurement: using WHO classifications for grading of VA, which classified to, in the best eye (WHO, 1992):
 - Blindness: < 3/60.
 - Severe visual impairment: <6/60 - 3/60.
 - Visual impairment: <6/18 - 6/60.
 - Normal: 6/6 - 6/18.

- Anterior segment examination by slit-lamp and measurement of the intra-ocular pressure using applanation tonometry.
- Fundus examination using indirect-ophthalmoscope was done to reveal peripheral abnormalities. A fundus camera (Topcon, USA) was used to take colored fundus photographs and fluorescein angiography. Photographs were evaluated for the presence of non-proliferative DR, proliferative DR, clinically significant macular edema and previous retinal laser treatment. Overall retinopathy and maculopathy levels were assessed based on the International Clinical Diabetic Retinopathy and Diabetic Macula Edema Disease Severity Scale (6).

The third step:

Blood glucose measurement was done either by fasting blood sugar, 2 hour post prandial or HBA1c to assess the state of diabetes control.

Statistical analysis

The data were coded and entered using the statistical package for social science (SPSS) version 15. The data were summarized using descriptive statistics: mean, standard deviation, minimum and maximum values for quantitative variables, number and percentage for qualitative variables. Statistical difference between groups was tested using: Chi square test, independent sample test and ANOVA test while non-parametric tests were used for quantitative variables which were not normally distributed. P value less than 0.05 was considered statistically

significant. Pearson's correlation coefficient was used to assess the correlation between the quantitative variables. Correlation was mild if correlation coefficient (r) was less than 0.3, moderate if $0.7 > r > 0.3$, powerful if more than 0.7.

Ethical approval

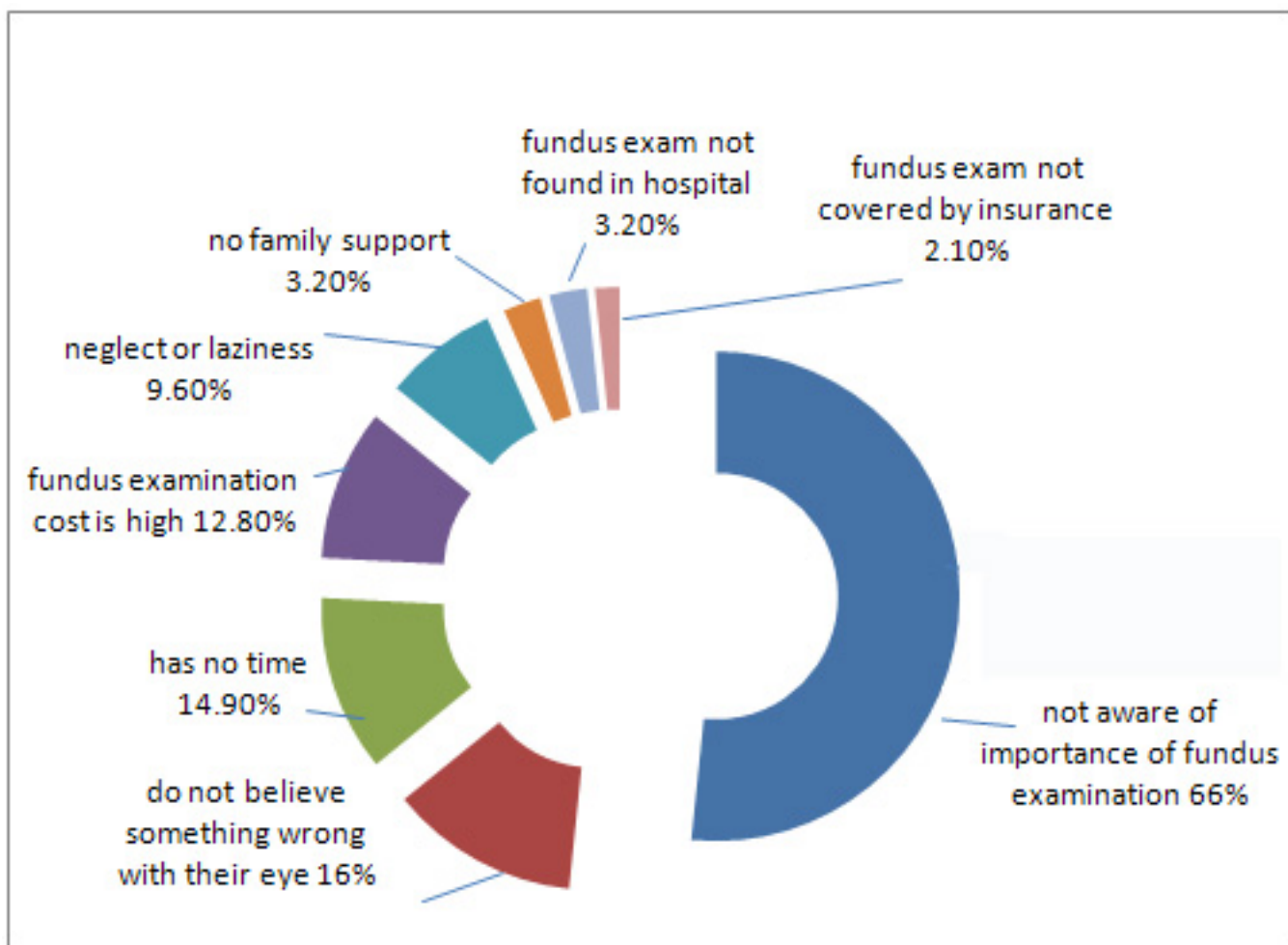
Ethical approval was obtained from the Research Committee of Cairo University. Informed written consent was taken from all participants after explaining the steps of the study to them.

Methods

Around half of the participants were 50 to 60 years old and 71% of them were females. Seventy percent of the participants were illiterate and 74% were unemployed. Most of the study participants (88%) had no health insurance (Table 1).

Table 1: Socio-demographic characteristics of the diabetic patients attending diabetic clinic in 2011

Variable	Number (100)	Percent (%)
Age group (years):		
30 -	3	3
40 -	24	24
50 -	52	52
≥60	21	21
Gender:		
Male	29	29
Female	71	71
Marital status:		
Married	90	90
Widow	5	5
Single	3	3
Divorced	2	2
Number of children for married patients (total= 97):		
0-1	5	5.2
2-5	62	63.9
>5	30	30.9
Education:		
Illiterate	70	70
Not completing primary (read & write)	5	5
Primary and preparatory	10	10
Secondary	8	8
Above secondary	7	7
Work:		
Not working	74	74
Working:	26	26
• Employee	6	6
• Manual Worker	20	20
Health insurance:		
Has no insurance	88	88
Has insurance	12	12
Smoking:		
Non smoker	86	86
Smoker	14	14

Figure 1: Reasons stated by the study participants for not attending for the screening of DR

The range of age of onset of diabetes was from 34 - 68 years; the mean was 44.24 ± 7.94 years. The range of the duration of diabetes was from 0.5 to 30 years; the mean was 11.13 ± 6.61 years. Family history of diabetes was positive in 65% of the participants.

Around half of the participants (51%) were taking anti-hyperglycemic drugs for control of diabetes; 22% were on insulin and 27% were on combined insulin and oral hypoglycemic drug. Vitamin B complex was taken by only 26% of the participants for associated diabetic neuropathy, and only 9% of them were taking Aspirin for associated ischemic heart diseases.

Regarding history of previous ophthalmic diseases, thirty-six percent had history of cataract (33 of them were treated by cataract operation), 16% had history of retinal affection (treated by retinal laser or injection), 16% had recurrent eye infections, 4% had glaucoma and 2% had pterygium.

Awareness regarding diabetes complications

Most of the participants (79%) were aware of diabetic complications on various body organs while 85% of them were aware of diabetes complications on the eye. From those, 38.8% of the participants were aware that diabetes may cause blindness or diminution of vision, 35.3% were aware that diabetes may cause retinal affection and 31.8% were aware that diabetes may cause cataract. Only 10.6%

and 5.9% mentioned glaucoma and recurrent eye infections as eye complications of diabetes. Less than half of them (42.4%) didn't know what the exact effect of diabetes on the eye is, although they knew that diabetes affects the eye. Table 2 shows the relation between awareness of diabetic eye complications and some variables.

Awareness regarding screening of DR

Most of the participants were not aware of the importance of frequent screening of DR (75%), while 20% of them didn't know the routine screening frequency. When asked about the importance of regular screening for DR in well-controlled diabetes, 65% stated that they did not know, while 15% of the participants thought that there is no need. Most of the participants didn't know whether there is available treatment for DR or not (88%).

The sources of the participants' knowledge were mainly from the physicians (71%); the ophthalmologist (27.3%), the family physician (21.6%), the endocrinologist (18.2%) and the internal medicine specialist (13.6%). The patients' friends or relatives were the second source of their knowledge (20.5%). Mass media had a less important role in their knowledge (11.4%).

Only 67% of the participants attended for previous fundus examination (Table 3). From those, 7.5% did fundus examination at the time of diagnosis of diabetes while 41.8%

Table 2: Relation between awareness of diabetic eye complications and importance of screening and some variables

Awareness	Aware of diabetic eye complications (total= 100)					Aware of importance of screening of DR (total= 100)					Total
	Not-aware (total= 15)		Aware (total= 85)		P value	Not-aware (total= 75)		Aware (total= 25)		P value	
	No.	%	No.	%		No.	%	No.	%		
Age (years):											
30 - <40	1	33.3	2	66.7	0.8	3	100	0	0	0.6	3
40 - <50	3	12.5	21	87.5		17	70.8	7	29.2		24
50 - <60	8	15.4	44	84.6		38	73.1	14	26.9		52
≥ 60	3	14.3	18	85.7		17	81	4	19		21
Gender:											
Male	2	6.9	27	93.1	0.2	24	82.8	5	17.2	0.2	29
Female	13	18.3	58	81.7		51	71.8	20	28.2		71
Education											
▪ Illiterate	13	18.6	57	81.4	0.3	54	77.1	16	22.9	0.2	70
▪ Not completing primary	0	0	5	100		2	40	3	60		5
▪ Primary & preparatory	2	20	8	80		9	90	1	10		10
▪ Secondary	0	0	8	100		5	62.5	3	37.5		8
▪ Above secondary	0	0	7	100		5	71.4	2	28.6		7
Family History											
Negative	6	17.1	29	82.9	0.6	30	85.7	5	14.3	0.06	35
Positive	9	13.8	56	86.2		45	69.2	20	30.8	*	65
Retinal affection or treatment					0.1					0.1	
No	15	17.9	69	82.1		66	78.6	18	21.4		84
Yes	0	0	16	100		9	56.3	7	43.8		16
Treatment											
▪ OHG**	10	19.6	41	80.4	0.03	38	74.5	13	25.5	0.2	51
▪ Insulin	5	22.7	17	77.3	*	19	86.4	3	13.6		22
▪ Combined insulin & OHG	0	0	27	100		18	66.7	9	33.3		27
Control of diabetes											
Not-controlled	7	10	63	90	0.02	48	68.6	31.4	0.02	*	70
Controlled	8	26.7	22	73.3		27	90	10			30

* P value significance <0.05; **OHG: oral hypoglycemic drugs

had the fundus examination 10 years later. The time of 1st fundus examination was directly proportionate to both the age of the participants (**P value: 0.01, person correlation: 0.29**) and duration of diabetes (**P value: <0.001, person correlation: 0.91**), and inversely proportionate to age of onset of diabetes (**P value: <0.001, person correlation: -0.48**) and these data were statistically significant.

Around half of the participants (50.7%) had performed one fundus examination after diagnosis of diabetes. The number of fundus examinations was directly proportionate to both HBA1C (P value: 0.04, person correlation: 0.48), and degree of DR (P value: 0.01, person correlation: 0.31) and these data were statistically significant.

Ophthalmic examination

Ophthalmic examination revealed that 11% of the participants were blind, 6% had severe visual impairment, 46% percent had visual impairment and 37% were normal. Also, 54% of the participants had cataract and 2% had glaucoma at the time of the examination.

Around half of the study participants (47%) had no DR at the time of the examination, 22% had non proliferative retinopathy and 31% had proliferative retinopathy. Only 16% of the participants had diabetic maculopathy. Table 4 shows that 65% of males and 47.9% of females were affected by DR while 51.7% and 22.5% had proliferative retinopathy respectively and these findings were statistically significant.

Regarding the effect of smoking, 29.1% of non-smokers and 42.9% of smokers had proliferative retinopathy. On the other hand, 56.9% of the participants who were taking

OHD had no DR, and 92.2% of them had no diabetic maculopathy. More than half of the participants (56.7%) who were well-controlled had no retinopathy and the majority of them (90%) had no maculopathy. The prevalence of DR in both hypertensive and non-hypertensive participants was nearly equal. But all these data were statistically insignificant.

DR was directly proportionate to duration of diabetes (P value: 0.01, person correlation: 0.29), and inversely proportionate to age of onset of diabetes (P value: 0.03, person correlation: -0.24) and these data were statistically significant.

Figure 2 (page 28) shows a sample of the result of fundus examination done to the study participants. Figure 2-A belongs to a 55-year-old male patient with 16-year-duration of type 2 diabetes. His last fundus examination was 11 years ago. His fundus picture reveals proliferative retinopathy. On the other hand, Figure 2-B belongs to a 56-year-old male patient with 7-year-duration of type 2 diabetes. He has not performed any fundus examination before. His fundus picture reveals non proliferative retinopathy with diffuse macular edema.

Perception gap of diabetes control

Regarding self-perception of diabetes control, 41% of the participants thought that they were controlled, 32% of them thought that they were not controlled, 24% of them stated that they were sometimes controlled and only 3% of them stated that they didn't know whether their blood glucose was controlled or not.

Table 3: Causes of patients' attendance for previous fundus examination and frequency of their fundus examination (diabetic clinic in 2011)

Previous fundus examinations	No. (total=67)	%
Causes of previous fundus examination:		
Retinal assessment or treatment	33	49.3
Other causes	34	50.7
Time of 1st fundus examination after diagnosis of diabetes		
At onset of diagnosis	5	7.5
Within 1 st year	2	2.9
>1-5 years	10	14.9
>5-10 years	22	32.8
> 10 years	28	41.8
Number of fundus examinations:		
1 time	34	50.7
2-10 times	26	38.8
11-24 times	7	10.4
Time of last fundus examination (before this study):		
3 years ago	2	3
2 years ago	9	13.4
1 year ago	10	14.9
6 months ago	46	68.7

Table 4: Effect of some variables on diabetic retinopathy of diabetic patients attending diabetes clinic in 2011

Retinopathy		Retinopathy (total= 100)				Maculopathy (total= 100)			Total
		R ₀ (total= 47)	R1 (total= 14)	R2 (total= 8)	R3 (total= 31)	P value	M ₀ (total= 84)	M ₁ (total= 16)	P value
Gender:									
Male	No.	10	2	2	15	.03*	25	4	1.0
	%	34.5	6.9	6.9	51.7		86.2	13.8	
Female	No.	37	12	6	16		59	12	71
	%	52.1	16.9	8.5	22.5		83.1	16.9	100
Smoking:									
Not-smoker	No.	43	12	6	25	0.4	73	13	0.6
	%	50	14	7	29.1		84.9	15.1	
Smoker	No.	4	2	2	6		11	3	14
	%	28.6	14.3	14.3	42.9		78.6	21.4	100
Diabetic treatment:									
OHD	No.	29	6	5	11	0.1	47	4	0.6
	%	56.9	11.8	9.8	21.6		92.2	7.8	
Insulin	No.	8	2	1	11		16	6	22
	%	36.4	9.1	4.5	50		72.7	27.3	100
Combined	No.	10	6	2	9		21	6	27
	%	37	22.2	7.4	33.3		77.8	22.2	100
Aspirin intake:									
No	No.	41	13	8	29	0.59	76	15	0.59
	%	45.1	14.3	8.8	31.9		83.5	15.5	
Yes	No.	6	1	0	2		8	1	9
	%	66.7	11.1	0	22.2		88.9	11.1	100
Diabetes control									
Uncontrolled	No.	30	10	8	22	0.2	57	13	0.2
	%	42.9	14.3	11.4	31.4		81.4	18.6	
Controlled	No.	17	4	0	9		27	3	30
	%	56.7	13.3	0	30		90	10	100
Associated hypertension									
No	No.	26	4	4	20	0.1	44	10	0.4
	%	48.1	7.4	7.4	37		81.5	18.5	
Yes	No.	21	10	4	11		40	6	46
	%	45.7	21.7	8.7	23.9		87	13	100

* P value significance <0.05

R0= no retinopathy

R1= mild/moderated non-proliferative retinopathy

R2=severe non-proliferative retinopathy

R3= proliferative retinopathy

M0= no maculopathy

M1= maculopathy

Figure 2: A Sample of the result of fundus examination done to the study participants

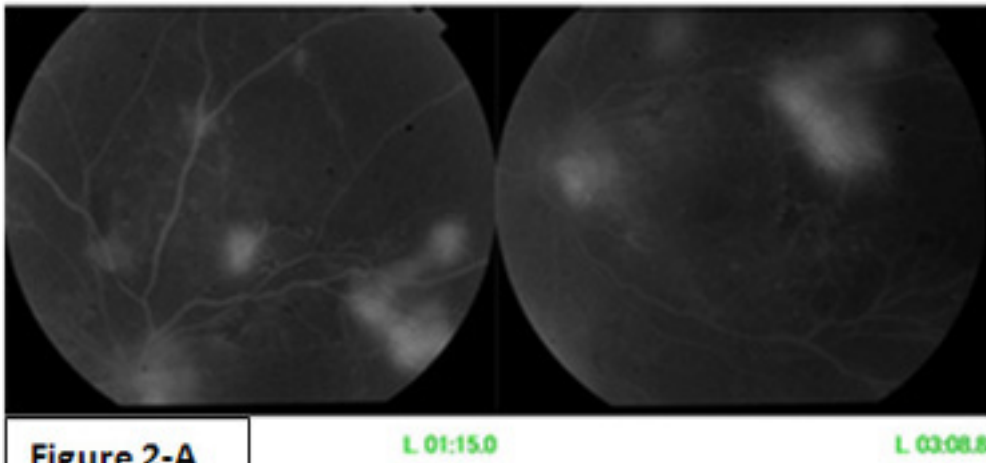
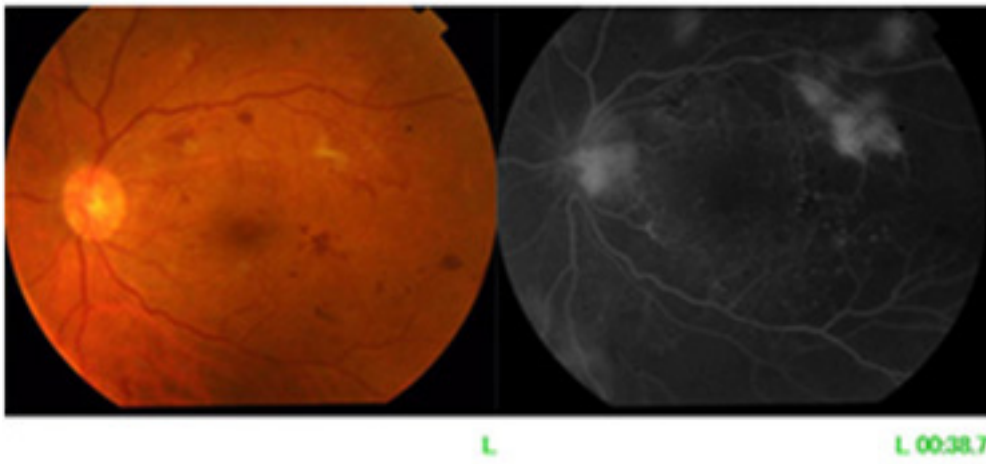


Figure 2-A

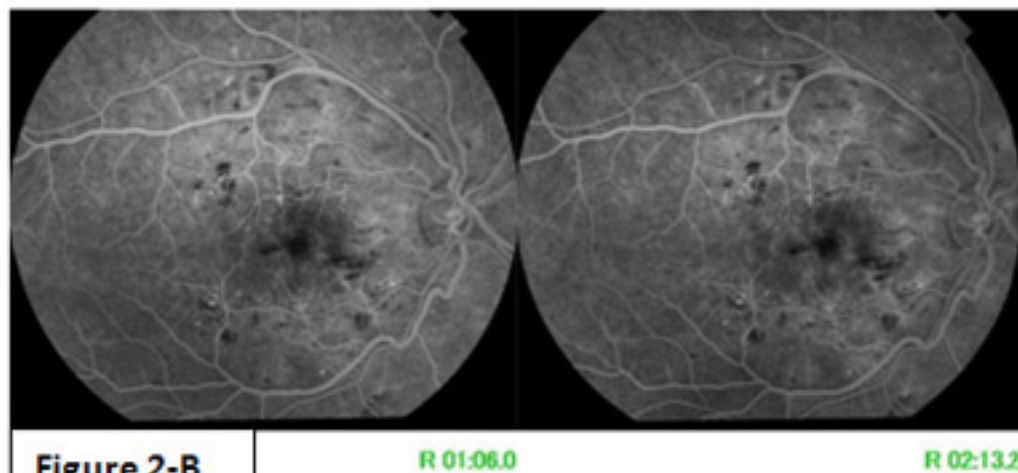
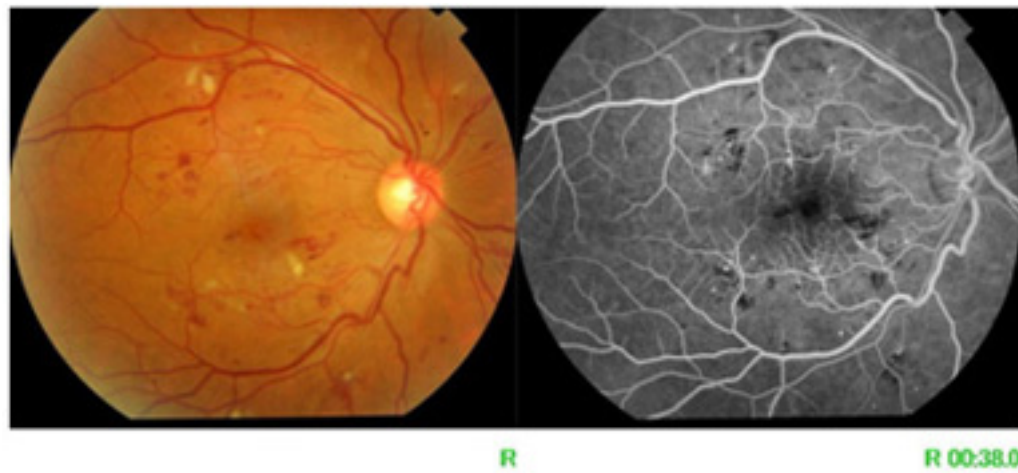


Figure 2-B

Table 5: Distribution of diabetic patients attending diabetic clinic regarding perceived glycemic control and its relation to objective glycemic control (2011)

Controlled (by test)		Controlled (Subjective) (total=100)					Total
		Not controlled (total=32)	Sometimes (total=24)	Controlled (total=41)	I don't know (total=3)	P value	
Not controlled	No.	30	17	21	2	0.001	70
	%	42.9	24.3	30	2.9		100
Controlled	No.	2	7	20	1		30
	%	6.7	23.3	66.7	3.3		100

Assessment of blood glucose level of the study participants revealed that only 30% of them were controlled. It was found that 66.7% of the participants who thought that they were controlled were actually controlled. And 42.9% of them who thought that they were not controlled were actually not controlled. And these relations were statistically significant (Table 5).

Discussion

DR is increasingly becoming a major cause of blindness throughout the world. In addition to loss of productivity, it has negative impact on the patient's quality of life leading to additional socioeconomic burden on the community. Lack of health education and dominance of wrong beliefs adversely affect the progression of diabetic eye complications among the Egyptian patients. Around half of the study participants had DR at the time of the examination; 22% had non-proliferative retinopathy and 31% had proliferative retinopathy. Only 16% of the participants had diabetic maculopathy. This percent is higher than other studies done in Malaysia (31.4%), Emirates (19%), and China (25%) (7,8,9). Therefore there is an urgent need to increase awareness and knowledge of Egyptian diabetic patients regarding diabetic eye complications as well as the importance of routine eye evaluations, so as to detect early ocular complications. In the current study, 79% of the patients were aware of diabetic complications on various body organs and 85% were aware of diabetic complications on the eye. However, 36% of the patients do not know the exact effect of diabetes on the eye, although they know that diabetes affect the eye, and only 33% of them knew that diabetes causes blindness or diminution of vision.

This percentage of awareness of diabetic eye complications was higher compared to other studies from Nepal (63.3%) and India (37%) (10, 11), and was closer to other studies from Malaysia (86.1%) and Nigeria (84.3%) (12, 13). On the other hand, the percentage of awareness of blindness as a complication of DR was lower compared to another study from Nigeria (80.5%) (13).

Providing health education to diabetic patients is crucial to increase the patients' compliance to the routine screening and to deal with the patient's faulty beliefs. In our study, only 25% of the patients were aware of the importance of screening of DR while 20% had a faulty belief that there is no need for regular screening if diabetes is well controlled. Also, most of the participants didn't know whether there is available treatment for DR or not (88%). This finding was worrisome especially when compared to the earlier study from India (11), in which over 90% of individuals were aware of the importance of screening of DR, approximately one-third were under the impression that control of blood sugar is enough to avoid visiting an ophthalmologist and around half of participants knew about the availability of laser treatment to treat DR.

In the current study, the main source of information was the physician (71%); 27.3% from the ophthalmologist, 21.6% from the family physician, 16% from the endocrinologist and 12% from the internal medicine specialist. The second source of awareness was from family members and friends (18%), especially that 65% of cases had a positive family history of diabetes. Mass media (such as magazines and radio) and reading played a less important role in disseminating information among our study participants (10%). This may be due to the fact that most of them were illiterate (70%). On comparing our results with that of Thapa et al (10), it was found that only half of the patients had received their information from physicians and family members were the second source of the patients' awareness. This finding emphasizes that health education provided by trained professionals and aggressive health campaigns promoted via the media regarding diabetic eye complications could help in dispersing information regarding this potentially blinding disease.

Lack of awareness leads to delay in seeking medical advice; this was evidenced by the low percentage of study participants who have done previous fundus examination (67%) especially during the 1st year of diagnosis of diabetes (10.4%). Also, the frequency of fundus examination is directly proportionate to HBA1c level and to the severity

of DR. This highly suggests that diabetic patients don't seek medical advice unless they suffer from severe visual impairment, which leads to the fact that they perform fundus examination for diagnosis rather than screening. This was also reported by Mohammed & Waziri in 2009 (13), where patients tend to wait until they suffer from visual complaints before screening.

In the present study, although the duration of diabetes was 10 ± 6.6 years, 33% of the patients had never had a fundus evaluation prior to this study. This result is slightly lower than in the study of Thapa et al, 2012 (10), in which half of the patients had never had fundus examination before the study. However, this result is higher than the study of Mohammed and Waziri, 2009 (13), where only 15.7% had ever had retinopathy screening. This emphasizes the crucial need of providing health education shortly after the diagnosis of diabetes especially in a community with low literacy as the case in our study. Health education sessions should highlight the important of screening and follow up visits.

In the current study, the main barrier to do fundus examination was being unaware of its importance (66%), in agreement with a study conducted in Malaysia (12) where the main barrier for diabetic eye screening was lack of understanding of diabetic eye disease.

In the present study, the patients' awareness at the age 30 to <40 years was the least, while the patients' awareness at the age 40 to <50 years was the highest, but this result is insignificant. Also, awareness of illiterate participants was the least and the awareness increased with the increase in the level of education, but this result was insignificant due to the small number of educated patients. On comparing these figures with that of Rani et al, 2008 (11), it was found that the awareness of the patients was higher at the age > 45 years and lower at the age from 35 to 45 years and it increased with the increase in the level of education. This supports the importance of providing health education regarding DR screening especially to illiterate patients.

In the current study, 51% of the patients were taking OHD for control of diabetes; 22% were on insulin and 27% were on combined insulin and OHD. The patients who were taking combined treatment for diabetes were more aware than other patients, and this result was statistically significant. This represents an indirect relationship as the patients on combined treatment for diabetes had higher exposure rate to medical health facilities which had a positive impact on their health literacy. In addition, awareness was higher among patients with positive family history of diabetes than patients with negative family history, and this result was statistically significant. This highly suggests that increasing the health awareness of all the family members of the patients is an important step to battle against DR.

In our study, it was found that DR is directly proportionate to duration of diabetes and inversely proportionate to age of onset of diabetes and these data were statistically significant. Also Herman et al, in 1994 (14) reported that

retinopathy was associated with the duration of diabetes and hyperglycemia. The same finding was also reported in another study conducted in Egypt (15). This highlights the necessity of creating awareness among diabetics of the importance of routine eye evaluations, so as to detect early ocular complications that may arise from diabetes mellitus.

Limitations of the study:

The findings of this study can't be generalized beyond the studied cases because the sample was collected from one clinic and the number of cases is too limited for broad generalizations.

Conclusion

Awareness creation is the corner-stone of any program aimed at reducing Diabetic Retinopathy. It was found that there was general awareness of diabetic retinopathy among the majority of the study participants; however there was little awareness of the importance of the screening. Around half of the participants had performed only one fundus examination after diagnosis of diabetes. The main barrier for performing the fundus examination was lack of awareness of its importance. Physicians should provide patient centered care to address the patient barriers, provide individual care for each patient and give health education to motivate patients and increase adherence to the screening examination.

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