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Prevalence And Risk Factors of Diabetic Retinopathy: A Clinical-Based Cross Sectional Study in Madinah's Tertiary Diabetic Centre , Saudi Arabia

Medical Science

KEYWORDS : Diabetes Mellitus, Diabetic retinopathy, Prevalence, Risk factors, Saudi Arabia

*** Abdulrahman Hamzah Badawi**	College of Medicine, Taibah University, Madinah, Saudi Arabia
Maan Al-Barry	College of Medicine, Taibah University, Madinah, Saudi Arabia
Mohammed Abusayf	King Abdulaziz University Hospital, King Saud University, Riyadh, Saudi Arabia
Mohammed Rashwan	College of Medicine, Taibah University, Madinah, Saudi Arabia
Abdulaziz Alghamdi	College of Medicine, King Abdulaziz University, rabigh, Saudi Arabia
Ahmad Alsebaee	College of Medicine, Taibah University, Madinah, Saudi Arabia

ABSTRACT

Background and objectives: There is a gap in knowledge in Saudi literature about the prevalence of diabetic retinopathy (DR) and its risk associated factors. This cross-sectional study aimed to assess the prevalence of DR in diabetic patients and its associated risk factors.

Materials and Methods: The present study analyzed data from 103 diabetic patients attending Prince Abdul-Aziz bin Majed Diabetes care centre, Madinah, KSA in the period from January to June 2015. Diagnosis of DR in the studied patients was established by ophthalmologists through history and ophthalmic examination. The data were analyzed by appropriate statistical methods, and multivariate logistic regression analyses were used to estimate the risk.

Results: The prevalence of DR among the studied diabetic subjects was 16.5% (95% CI= 9.33-23.67%). The risk of DR were positively associated with patients' age > 60 years (odds ratio (OR)= 8.10; 95% confidence interval (CI)= 1.40-12.0), poor control of diabetes (OR= 17.5; 95% CI=1.65-26.93), > 5 years duration of diabetes (OR= 6.50; 95% CI= 0.60-13.69), and associated severe hypertension (OR= 4.30; 95% CI= 1.4-13.04), and to less extent type II of DM, female sex, smoking and obesity. A significant reduced risk, however, was found among married patients and those with high level of education.

Conclusion: The study revealed a relatively high prevalence of DR in the studied diabetic patients. The study suggested some risk factors to influence the development of DR among the studied patients. Large sample studies are needed to confirm these findings

Introduction

Diabetes Mellitus (DM) is a major public health problem worldwide. DM represents a group of metabolic disorders and characterized by chronic hyperglycemia resulting from defects in insulin action and/or secretion (1,2).

In Saudi Arabia, the prevalence of DM was reported to be 5.7% in males and 4.8% in females (3), with as a significant increase among age group from 30 to 70 years to reach a high level of 23.7%. These figures make Saudi Arabia among those countries with high prevalence of DM (4). The macrovascular and microvascular complications associated with poor control of DM are often the causes of increased morbidity and mortality among diabetic patients. Of these complications, diabetic retinopathy (DR) is one of the most frequently-occurring microvascular complications, and it is the most important leading cause of blindness among diabetic patients in both developed and developing countries (5-7).

The prevalence of diabetic retinopathy in Saudi Arabia was as high as 31.3% (8). The risk factors associated with DR were investigated in several studies. Among these factors; age of patient, disease duration, disease control, and medical associated conditions were the most important predictors of DR among diabetic patients (8-11).

Prevention of DR among diabetic patients and improvement of their quality of life are possible through identification of the predictors of this serious complication (11). However, there is still gap of knowledge about this issue in the reviewed Saudi literature. Accordingly, this study aimed to assess the DR existence and to investigate for the risk factors associated with this complication among group of Saudi diabetic patients attending Prince Abul-Aziz bin Majed Diabetes Care Centre in Madinah city, Saudi Arabia.

Methods

The present cross sectional study included 103 diabetic patients attending Prince Abul-Aziz bin Majed Diabetes care centre in Madinah city, Saudi Arabia during the period from January to June 2015. The prevalence of DR was assessed, and a nested case-control approach was designed to investigate the risk factors associated with DR among the studied patients. Patients with DR were considered as the study cases whilst those patients without DR were considered as the controls.

The diagnosis of DR in the studied patients was conducted in the ophthalmology clinics by the clinic attending ophthalmologist staff in Prince Abdul-Aziz bin (specifically, visual acuity and fundus examination results). The fundus examination findings were based on the direct ophthalmoscopy, indirect ophthalmoscopy, and the retinal examination with a +90 diopter volk lens and biomicroscope. All eyes were dilated before funduscopy. The presence and grading of DR was according to the International

clinical DR and macular edema disease severity scale (12).

Data were collected from each studied patient through a structured validated questionnaire. The questionnaire included socio-demographic data (age, sex, marital status and education), life-style data (smoking status, height and weight), diabetes related data (type of diabetes, duration of diabetes mellitus, diabetes control using HBA1c, and family history of DM), medical associated conditions (hypertension and history of Ischemic heart disease (IHD)). The diabetes control among the studied patients was done by Glycosated hemoglobin (HBA1c). This used reference was according to the ADA guidelines and definitions; where a level > 7.0% was considered as a poor control of diabetes mellitus (13). The blood pressure was also measured in each studied patient. Identification of hypertensive patients was according to the 7th Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (14).

All data analyses were done by the use of statistical analysis system (SAS) software package (15). The data were compared between DR and none DR patients by using chi square and Fischer exact tests as appropriate. P value ≤ 0.05 was considered as an indicator of statistically significant difference. The multivariate logistic regression analyses were done to estimate the odds ratios and their 95% confidence intervals (CI) for the association of DR with the studied risk factors. The confidentiality and privacy of the collected data were ensured where the data was manipulated and analyzed anonymously. Finally, approval was taken from the officials of the studied hospital.

Results

The prevalence of DR was 16.5% ± 17.7% among the studied 103 diabetic patients. The majority of them were of non proliferative type representing 88.2% (15/17) of the diagnosed DR, and only two cases were of proliferative DR type. The higher prevalence of DR was among type II DM patients, where the prevalence was 17.8% (16/90) in type II and 7.6% (1/13) in Type I DM. The mean age of the studied patients was 51.5 ± 15.2 years, and the mean duration of DM among them was 7 ± 3.4 years. The socio-demographic and lifestyle characteristics of the studied patients with and without DR were presented in Table 1. Statistically significant differences between diabetic patients with and without DR regarding their age, marital status, education, family history of diabetes and smoking were observed. Diabetic patients with DR were older, divorced and widow, less educated, smokers, and with positive family history of DM. No statistically significant differences between DR and non DR patients, however, were found for the studied patients' sex and body mass index.

Table 2 presented the adjusted odds ratio (OR) and their 95% confidence interval (CI) for the association of DR with the studied socio-demographic and lifestyle factors The risk of DR is found to increase by increasing age. The risk of DR was increased by 3.5 and 8 times among patients aged 50-60 years and > 60 years old, respectively. There has also been a significant increased risk among these patients with positive family history of DM with an adjusted OR of 2.90 (95% CI= 1.03-5.12). The risk of DR among the studied patients was also higher among female patients, smokers and obese patients, although not significant. On the other hand, however, the risk of DR was found to significantly reduce among married highly educated patients. The highest reduction was observed among highly educated patients (OR= 0.40; 95% CI= 0.22-0.93).

Table 3 showed the association of DR with the studied diabetes mellitus related factors and medical disorders. The higher risk observed in this study was among patients with poor diabetic control. Among these patients, the risk was significantly increased by 17.5 fold (95% CI= 1.65-26.95). There has been also an increased risk patients with > 5 years duration of DM (OR= 6.5; 95% CI= 0.60-13.69), although not significant. Also, the presence of hypertension was an important risk factor increasing the risk of DR among the studied patients, particularly among those with severe hypertension. The adjusted risk was 4.30 (96% CI= 1.4-13.04) among patients with severe hypertension.

Discussion

Diabetic retinopathy is a common microvascular complication in diabetic patients, and it is known to be associated with impairment of quality of life among them. The present cross sectional study revealed a relatively high DR prevalence among the studied 103 diabetic patients (16.5%). The prevalence was significantly higher in type II compared to type I diabetic patients (17.8% vs. 7.6%). In similar Saudi studies, the prevalence of DR in Riyadh city, however, was as high as 31.3% (8). Also, in Al Hasa district of Saudi Arabia, the prevalence of DR among 473 diabetic subjects was as high as 30% (16). A similar high rate was also reported in Taif region, Saudi Arabia, where Al Ghamdi et al. (17) reported that the prevalence of any DR in diabetic patients was 34.6%, and may be related to the high number with poor glycemic control. A higher rate of DR among diabetic patients was also reported worldwide. Yau et al. (18) provides worldwide estimates using data from 22,896 individuals with diabetes in 35 studies that used photographic methods of detection, and the overall prevalence was 34.6%.

In regional Arabic countries, the prevalence of DR showed great variations. The rate in Jordan study was much higher (64.1%) that that reported in the present study. The higher rate reported in Jordan study could be due to longer duration of DM and use of fundus fluorescein angiography (FFA). In other studies, the DR prevalence was 19%, 14.5% and 17%, that partially agreed with our study (20-22) to evaluate the prevalence of DR by using direct and indirect ophthalmoscopes. In Egypt, the prevalence of DR in diabetic patients was as high as 42.2% (23). These variations, however, could be attributed to the different lifestyles, accessibility of diabetic care, time when the study conducted, and variation in tribes of Arab population.

In the present study, a number of the studied factors were found to be significantly associated with increased risk of DR. Among these factors; patient's age, duration of DM, poor control of DM, and associated hypertension showed the higher risk of DR among the studied patients. Although not significant, overweight and obesity were also found to increase the risk of DR. Other studied factors, however, were found to reduce the risk, and these factors were the marriage and the high level of education. All these results have strongly contributed to the results previous (24) and recent Saudi studies (8,16,17) reported an association of DR with all the above mentioned factors. Unlike other similar studies (19,25), the risk of DR in this study was higher among female patients. Female patients in this study were older, hypertensive high proportion of them showed poor diabetes control. Less access of female patients to diabetes care center during different stages of diabetes in Saudi could have resulted in this observation.

The higher risks of DR among this study cohort were observed among patients > 60 years, poor diabetes control and long duration of diabetes and associated hypertension. The UK Prospective Diabetes Study revealed that, better blood sugar control does reduce DR risk as well as does reduce progression of retinopathy (26). It have also supported the role of good glycogenic control in the early stages of the diabetes in delaying the onset of diabetic retinopathy and halting the rate of progression (27). Most of related studies have evident that the control blood glucose level among diabetic patients is an important factor in preventing DR among them. According to these findings, it is pertinent here to note that the control hyperglycemia among diabetic patients, through screening and regular follow-up, is therefore recommended to reduce the risk of DR. Type II DM and hyper-

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tension have also appeared in this study to play role in the risk of DR. A strong association of DR among type II diabetes and hypertension has also been suggested by a longitudinal study (28). In another large study, systolic blood pressure was found to be significant predictor of progression both in mild retinopathy and proliferative retinopathy diabetic patients aged from 5 to14 years (29).

The present study has revealed that marriage and high educational level to have protective effects in the development of DR among the studied diabetic patients. Consistent with these findings, a recent Chinese study has examined the risk of DR in association with lifestyle factors and reported low risk among those married, educated and physically active subjects (30). These results might suggest a positive role of higher educational and family income levels on self care knowledge and practice of diabetic patients (31).

The present study appeared to have a number of strengths. The study questionnaire was comprehensive, including relatively large number of risk factors not previously touched in any similar Saudi study. To the best of our knowledge, this study is the first to study the prevalence of DR and its associated risk factors among diabetic patients in Al-Madinah region. Moreover, the present study used $HbA1_c$ as a reference of diabetic control in the studied diabetic patients. HbA1c is better than the fasting blood glucose level used as an indicator of diabetes control in other previous studies. HbA1c is known to quantify the quality of DM control.

The included small sample size, however, limit the stratification of DR risk by its type (proliferative vs. non proliferative) as there have been only 2 subjects diagnosed with proliferative retinopathy. Moreover, small numbers of subjects found in categories of some studied risk factors have limit the precision of the estimated measures as shown by the observed wideness of their confidence intervals However, these defects appeared to have minimal effects on the observed associations of DR with patients' age and almost all studied DM related risk factors.

In conclusion, this study revealed a considerable high prevalence in the studied diabetic patients attending Prince Abdul-Aziz bin Majed Diabetes care centre in Madinah, Saudi Arabia. Socio-demographic, lifestyle factors, as well as diabetes related and medical associated factors were found to influence the risk of DR, particularly among type II diabetic patients. However, because of the cross-sectional nature of this study, its small sample size and used clinic-based data, the generalization of these study findings to general population is difficult. Confirmation of these results necessitates the need to conduct more studies with large samples and including diabetic patients from many diabetic care centers.

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Tables of the study

Table 1. Comparison of sociodemographic and lifestyle characteristics between the studied diabetic patients with and without diabetic retinopathy (DR)

Characteristics	patients with DR (Cases) n= 17		patients without DR (Controls) n= 86		P-value
	No.	%	No.	%	
Age (years)					
< 50	1	4.2	23	95.8	
50-60	6	14.2	36	85.8	
> 60	10	27.0	27	73.0	0.04*
Sex					
Male	6	13.6	38	86.4	
Female	11	18.6	48	81.4	0.49
Education					
Illiterate	10	27.8	26	72.2	
Less than secondary	5	18.5	22	81.5	
Secondary and higher	5	12.5	35	87.5	0.01*
Marital status					
Single	2	15.3	11	84.7	
Married	9	11.6	68	88.4	
Divorced andwidow	6	46.7	7	53.3	0.01*
Family history					
No	6	10.2	53	81.1	
Yes	11	25.0	33	84.7	0.03*
Smoking status					
Never smoker	4	6.5	59	93.5	
Current smoker	13	32.5	27	67.5	0.02*
Body mass index (BMI)					
< 25	4	13.3	26	86.7	
25- < 30	5	16.1	26	83.9	
> = 30	8	19.1	34	80.9	0.81

*Significant

Table 2. Adjusted odds ratio (OR) and 95% confidence interval (CI) for the association of sociodemographic and lifestyle factors with DR in the studied diabetic patients.

Sociodemographic and lifestyle factors	patients with DR (Cases)	patients without DR Controls)	OR*	95% CI
Age (years)				
< 50	1	23	1.00	Ref.
50-60	6	36	3.50	1.1-9.5
> 60	10	27	8.10	1.4-12.0
Sex				
Male	6	38	1.00	Ref.
Female	11	48	1.50	0.50-3.40
Education				
Illiterate	10	26	1.00	Ref.
Less than secondary	5	22	0.56	0.20-1.50
Secondary and higher	5	35	0.40	0.22-0.93
Marital status				
Single	2	11	1.00	Ref.
Married	9	68	0.70	0.26-0.98
Divorced and widow	6	7	0.45	0.20-1.95
Family history				
No	6	53	1.00	Ref.
Yes	11	33	2.90	1.03-5.12
Smoking status				
Never smoker	7	59	1.00	Ref.
Current smoker	10	27	3.10	0.57-7.50
Body mass index (BMI)				
< 25	4	26	1.00	Ref.
25- < 30	5	26	1.20	0.65-4.00
> = 30	8	34	1.50	0.48-4.50

*OR of each studied variable is adjusted by other ones included in this table.

Table 3. Adjusted odds ratio (OR) and 95% confidence inter-

val (CI) for the association of diabetes mellitus related factors and hypertension with DR in the studied diabetic patients.

Studied factors	patients with DR (Cases)	patients without DR Controls)	OR*	95% CI
Duration of diabetes				
≤5 years	7	71	1.00	Ref.
>5 years	10	15	6.50	0.60-13.69
Diabetic control**				
Appropriate control	3	60	1.00	Ref.
Poor control	14	16	17.5	1.65-26.95
Type of diabetes				
Type 1	1	12	1.00	Ref.
Type II	16	74	2.50	0.40-7.90
Associated hypertension				
Normotensive	2	20	1.00	Ref.
Mild and moderate	7	49	1.40	0.55-3.78
Severe	8	19	4.30	1.4-13.04

*OR is adjusted by age, sex and education, and marital status.

** Poor control if HBA1c is more than 7%.

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