Original Article

Prevalence and Risk Factors for Diabetic Retinopathy among Kuwaiti Diabetics

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ABSTRACT

Aim: To estimate the prevalence of diabetic retinopathy in a population attending a diabetic clinic in Kuwait and to evaluate the medical risk factors associated with its development and progression.

Patients and Methods: Fundi of 451 type 2 diabetic patients were examined by fundus photography. Retinopathy was graded according to EURODIAB IDDM complication study. Files were reviewed for clinical and social information about the patients. SPSS version 9 was used for analysis of the findings.

Results: The overall prevalence of retinopathy was 23.5%, mild retinopathy constituting 11.3%, moderate-severe retinopathy 11.08% and proliferative retinopathy 1.12%. Insulin treatment, duration of diabetes, age at examination, HbA1c, systolic blood pressure, cholesterol, triglyceride and microalbumin were found to be significantly related to the development and the progression of retinopathy.

Conclusion: Caring for diabetic patients should include screening for risk factors associated with retinopathy and controlling them to delay or prevent the development and / or progression of diabetic retinopathy.

KEYWORDS: diabetic retinopathy, risk factors, Kuwait

INTRODUCTION

Prevalence of diabetes mellitus, especially type 2 diabetes mellitus is rising worldwide[1]. Diabetes mellitus is a major health problem in Kuwait. The prevalence of type 2 diabetes was estimated to be 14.8% in 1998[2].

Diabetic retinopathy is the most frequent cause of visual impairment among adults aged 20-74 years in the United States. After twenty years of diabetes duration, nearly all type 1 diabetics and more than 60% type 2 diabetics have retinopathy[3]. In England and Wales, diabetic retinopathy remains the commonest cause of blindness among people of working age[4].

Diabetic retinopathy has few visual or ophthalmic symptoms until visual loss develops. Upto 21% of type 2 diabetics have retinopathy at the time of diagnosis[3]. Laser photocoagulation is effective in slowing the progression of retinopathy and reducing visual loss. However, treatment does not restore lost vision[5]. Therefore, it is important to examine the patients with type 2 diabetes at the time of diagnosis and then annually[3].

There are many factors influencing the occurrence and the progression of diabetic retinopathy. The UKPDS (UK Prospective Diabetes Study)[6] showed that intensive glucose control reduced the risk of a two-step change in retinopathy by 21% at 12 years follow up. Moreover, tight blood pressure control reduced the risk by 34%. Other studies showed that glycemic control played an important part in the development of microvascular complications[7].

The aim of this study was to estimate the prevalence rate of diabetic retinopathy in patients attending a diabetic clinic in Kuwait and to evaluate the medical risk factors underlying its development and progression.

PATIENTS AND METHODS

There is no national screening program for diabetic retinopathy in Kuwait. However, recently diabetologists were trained to perform direct fundoscopy and some diabetic clinics were supplied with fundus cameras in an attempt to detect conditions that need direct attention by retina specialists.

Patients seen in a fundus clinic attached to a primary care diabetic clinic in Rabia Area in Farwania Governorate were recruited from March 2002 to December 2002. A total number of 451 type 2 diabetic patients were included in the study. Their pupils were dilated using 1% tropicamide. Photograph of each retina was taken using non-mydriatic retinal camera (Canon model CR6-

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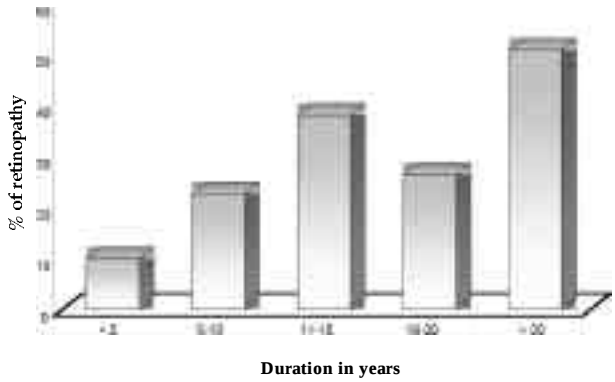

Fig 1: Duration of diabetes in relation to retinopathy

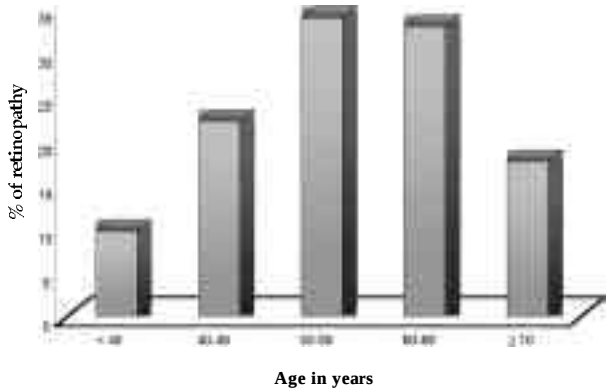

Fig 2: Age in relation to retinopathy

45NM). One shot was taken for each eye. The films were processed and the pictures (18 x 15 cm) were examined by two trained diabetologists.

Retinopathy was graded according to EURODIAB IDDM complication study[8].

Grade A = no retinopathy

Grade B = mild non-proliferative retinopathy

Grade C = moderate to severe non-proliferative retinopathy

Grade D = Proliferative or photocoagulated

Grade E = not classified due to media opacities

In this study, it was not possible to assess retinal thickening and elevation as a consequence of not taking stereo retinal photographs. Therefore, maculopathy *per se* was not gradable. Mild retinopathy cases were followed up in our clinic, while moderate to severe retinopathy and proliferative or photocoagulated cases were referred to an ophthalmology service.

The files of the patients were reviewed for recognized data such as age, gender, duration of diabetes, BP measurement, lipid profile, microalbumin and HbA1c (glycosylated hemoglobin) values. Lipid profile was measured by standard laboratory methods. HbA1c levels were determined by immunological assay for the *in vitro* quantitative determination of HbA1c in whole blood on an automated clinical chemistry analyzer (Roche Diagnostics Corporation, Indianapolis USA). Microalbumin was determined by Beckman array system using early morning collected urine sample (Beckman Caulter IMMAGE).

Statistical Analysis: All data were computerized using SPSS version 9.0. Means and standard deviations were used for simple data analysis. ANOVA test, t-test and chi- square test were used for analysis of quantitative and qualitative data as a test for significance. P-values of 0.05 and 0.001 levels were used for all significant tests.

RESULTS

This study included 451 type 2 diabetic patients. 42.8% (193) were male and 57.2% (258) were female. Prevalence of retinopathy in general was 23.5%. Prevalence of mild retinopathy was 11.3% while prevalence of moderate-severe retinopathy was 11.08%. There were five cases of proliferative or photocoagulated retinopathy (1.12%). Fundi in twenty-eight patients were not visualized because of corneal or lenticular opacities (6.2%).

There were 354 Kuwaiti patients (78.49%), 31 non-Kuwaiti Arabs (6.8%) and 66 non-Kuwaiti Asians (14.6%). Prevalence of retinopathy was 22.2% in Kuwaitis, 22.58% in non-Kuwaiti Arabs and 28.78% in non-Kuwaiti Asians.

Prevalence of any retinopathy differed in patients treated with insulin (43.1%) and in patients treated with oral hypoglycemic agents or diet only (15.8%). This difference was found to be significant using the chi-square test ($p < 0.000$).

Prevalence of retinopathy increased with longer duration of diabetes, ranging from 10% at < 5 years to 51% at > 20 years (Fig. 1). This difference was found to be statistically significant when tested by t-test ($p < 0.000$, Table 1). ANOVA test indicated a strong influence of duration on the severity of retinopathy ($p < 0.000$, Table 2).

Table 1: Medical risk factors in relation to the presence or absence of retinopathy (t-test)

	No retinopathy (n = 317) Mean value	Any retinopathy (n = 134) Mean value	p-value of t-test
Age (years)	50.5	55.2	0.000*
Duration (years)	8.23	12.32	0.000*
Systolic BP(mmHg)	131.8	135.2	0.028*
Diastolic BP(mmHg)	83.6	84.01	0.67
HbA1c (%)	7.95	9.06	0.000*
Cholesterol (mmol/L)	5.39	5.84	0.000*
Triglyceride (mmol/L)	1.94	2.23	0.019*
Microalbumin (mg/L)	69.65	122.57	0.011*

* significant ($p < 0.05$)

Table 2: ANOVA analysis of risk factors for different grades of retinopathy

	No retinopathy (n = 317) Mean value	Mild (n = 51) Mean value	Moderate -severe (n = 55) Mean value	ANOVA test p value
Age (years)	50.5	56.51	54.13	0.001*
Duration (years)	8.22	11.33	13.23	0.000*
Systolic BP (mmHg)	131.88	137.35	133.36	0.03*
Diastolic BP(mmHg)	83.61	84.61	83.45	0.712
HbA1c (%)	7.95	9.09	9.04	0.001*
Cholesterol (mmol/l)	5.39	5.70	5.97	0.001*
Triglyceride (mmol/l)	1.94	2.27	2.18	0.059
Microalbumin (mg/l)	69.65	101.1	142.48	0.020*

* significant ($p < 0.05$)

An increasing frequency of retinopathy was found with increasing age at examination, from 9.7% at age group < 40 years to 33% at age group 60-69 years (Fig. 2). This difference was found to be highly significant for the presence of any retinopathy ($p < 0.001$, Table 1). Age at examination was found to be a significant factor indicating the severity of retinopathy ($p < 0.001$, Table 2).

Higher levels of glycosylated hemoglobin HbA1c was found to be related to higher frequency of retinopathy, from 10.6% at levels < 7% to 33.7% at levels > 10% (Fig. 3). This difference was found to be highly significant ($p < 0.000$, Table 1). Moreover, HbA1c was found to be a significant indicator of the severity of retinopathy ($p < 0.001$, Table 2).

The results showed that systolic blood pressure was a significant factor for the presence of any retinopathy ($p < 0.028$, Table 1), and in determining the severity of retinopathy ($p < 0.03$, Table 2). On the other hand the diastolic blood pressure showed no significant relationship to the presence of any retinopathy ($p = 0.67$, Table 1), or to the severity of retinopathy ($p = 0.712$, Table 2).

Level of cholesterol was found to be significantly related to the presence of any retinopathy ($p < 0.000$, Table 1), and the association to severity was also significant ($p < 0.001$, Table 2). Triglyceride levels were significantly related to the presence of any retinopathy ($p < 0.019$, Table 1), but levels were marginally significant in relation to the severity of retinopathy ($p < 0.059$, Table 2).

Microalbumin levels were higher in patients with any retinopathy ($p < 0.011$, Table 1). Moreover, severity of retinopathy increased with increased levels of micoalbumin ($p < 0.02$, Table 2).

DISCUSSION

The prevalence of any retinopathy in type 2 diabetes in this study was similar to some previous studies. It was reported as 26.2% in North Italy[9], 25.3% in Liverpool[10] and 26.8% in Southern India[11].

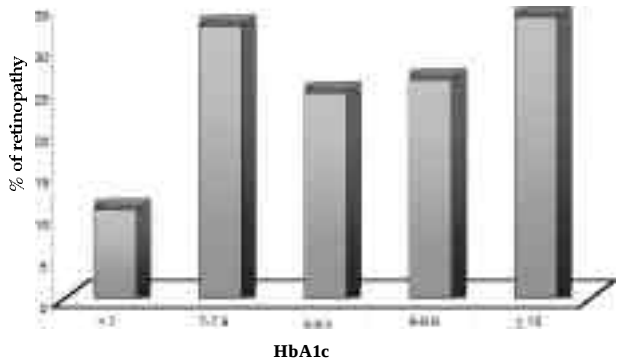

Fig 3: HbA1c in relation to retinopathy

Prevalence of non-proliferative retinopathy was 27.3% in a Chinese population with type 2 diabetes[12]. The prevalence of any retinopathy in this study was lower than some reported studies. It was 42% in the Omani diabetic population[13] and 48% in a study reported from the USA[14].

These differences in prevalence rates reported may be due to many factors. Some studies considered each type of diabetes separately[10,15], which gave rise to different prevalence rates. Moreover, the distribution of patients according to therapy (either oral hypoglycemics or insulin) differs among populations considerably. This depends on many factors and affects the prevalence of retinopathy. Finally, the prevalence of retinopathy may vary depending on the method of detection and the presence of experienced specialist who interprets the findings. In our study, only one-field pictures were studied by trained diabetologists and this can cause some underestimation of mild changes. The main purpose of these examinations was the detection of sight threatening lesions that needed referral to retina specialist.

Our findings suggest that prevalence of retinopathy was higher in non-Kuwaiti Asians (28.78%) than in non-Kuwaiti Arabs (22.58%) and in Kuwaitis (22.2%). However, the small number of the non-Kuwaiti patients did not allow for any generalization of this statement. More comprehensive studies would be needed to verify this point.

Our findings were in agreement with the well-established statement that the prevalence and severity of retinopathy are strongly associated with the duration of diabetes[9, 10, 12-14].

A significant association between presence and progression of retinopathy and HbA1c was confirmed in accordance with other studies[13-16].

In our study, only systolic blood pressure was associated with higher risk of developing and progression of retinopathy. This is in accordance with some studies[6, 9, 13, 17]. However, diastolic blood pressure had no significant association to retinopathy development or progression[14].

Serum cholesterol and triglyceride levels had positive association with retinopathy in our study. This is in agreement with some previous studies[13], but not in agreement with Segato, 1991, who did not find any significant relationship between prevalence of retinopathy and cholesterol or triglyceride levels[9].

Our study supports previous findings by other workers that higher levels of microalbumin are associated with higher prevalence of retinopathy[12, 18].

Insulin treatment was found to be an important factor in the occurrence and progression of retinopathy as reported in several studies[9, 10, 15].

CONCLUSION

As recommended by American Diabetes Association guidelines 2004 all type 2 diabetic patients should have comprehensive fundus examination shortly after diagnosis. Subsequent examinations should be repeated annually. However, examination would be required more frequently if retinopathy is progressing[3].

Caring for diabetic patients should include screening for risk factors associated with retinopathy and controlling them to delay or prevent the development and / or the progression of retinopathy. More comprehensive studies are needed to confirm the true prevalence of retinopathy among Kuwaiti diabetic patients.

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