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The Prevalence of Diabetic Retinopathy and associated Risk Factors in Type 2 Diabetes Mellitus in Al-Naeem area (Kuwait)

Author:
Dr. Farhan KH Al-Shammari
Dr. Osama Al-Meraghi
Dr. Alfred Nasif
Dr. Saad Al-Otaibi

Correspondence:
Dr. Farhan KH Al-Shammadi
Al Jahra Heaith Area, Al-neeam Clinic,
Kuwait State
Email: fkks69@hotmail.com

ABSTRACT

Background
Studying the prevalence of diabetic retinopathy and associated risk factors in type II diabetes mellitus in an Al-naeem area (Kuwait) case control study comparing type II diabetic with retinopathy and without retinopathy after group matching for age and sex to control confounders.

Results
HbA1c (p=0.0001), microalbuminuria (p=0.0001), neuropathy (p=0.002), insulin treatment (p=0.0001), body mass index >30(p=0.0001) and diabetes duration (p=0.0001); are significant risk factors in this study. On the other hand; age at diagnosis, total cholesterol, low density lipoprotein, triglycerides, and duration of hypertension are significant in univariate analysis where as hypertension, smoking and family history of diabetic retinopathy are insignificant

Methods
698 DM type II patients, 349 have retinopathy and 349 without retinopathy, 352 females and 346 males were identified and group matched for age and sex in a Al-naeem clinic in Jahra area (Kuwait).

Conclusion
This study shows that type II diabetes with poor control of blood sugar, longer diabetes duration, nephropathy, on insulin treatment and body mass index >30 are more prone to develop retinopathy.

BACKGROUND

Retinopathy can be found in as many as three-quarters of individuals who have had diabetes mellitus for more than 15 years[1]. Diabetic retinopathy is a leading cause of visual impairment among diabetic (DM) people. Numerous studies have investigated prevalence and risk factors for diabetic retinopathy (DR) but few case control studies in DM. This case control was conducted over 20 months (May 2003 till December 2004). In this study we report the prevalence and risk factors of retinopathy among type II DM patients in Al-naeem area. Type II DM patients comprise the greater proportion of diabetics in Al-naeem area and identification of visual status is relevant to their care and service provision. Al-naeem clinic is serving a population of 79952 according to the civil identification authority and it is an example of other clinics in the Jahra governorate in Kuwait. 3522 patients with type II DM were discovered, of which 349 had retinopathy.

The diabetes center in this area started service in September 2001. DM patients who have DR and patients who do not have DR (control) were identified by non-mydratic ophthalmoscopic camera, ophthalmoscopic fundus examination through dilated pupils and conformation referral to ophthalmologists and all participants consented to participate in the study. The diagnosis of type 2 diabetes was based on clinical characteristics that included *1*) diagnosis of diabetes after 30 years of age; and *2*) treatment by diet or oral hypoglycaemic agents or insulin treatment. A diagnosis of diabetic retinopathy was made only where a participant had a minimum of one microaneurysm in any field, as well as exhibiting hemorrhages (dot, blot, or flame shaped), and maculopathy (with or without clinically significant oedema). All participants (patient & control) underwent a medical history, blood pressure (BP), height, weight measurement (by which body mass index (BMI) was calculated), and total cholesterol (CH), high density lipoprotein (HDL), low density lipoprotein (LDL), triglycerides (TG), microalbumin (MIC) in urine, glycosylated haemoglobin (HBA1C) and for conformation, the investigation done twice except for nine patients who refused to have height, weight measurements and tests for microalbuminuria. Competing arterial blood pressure was measured with a mercury sphygmomanometer in the sitting position after a 10-min rest. Serum glucose, triglycerides, and total cholesterol Levels were measured using an autoanalyzer with enzymatic technique. HbA1C was measured by affinity chromatography (Isolab, Akron, OH) (normal range 4–8%). Patients collected timed overnight urine samples for the determination of albumin excretion rate (AER) by radio immunoassay (Diagnostic Products, Los Angeles, CA). Microalbuminuria was defined as AER 20–200 µg/min. Serum LDL levels were measured by one step sandwich enzyme-linked immunosorbent assay using monoclonal antibodies (Immuno, Vienna). Patients who had paraesthesia in lower limbs and had treatment for it (anticonvulsant) are considered as neuropathic. The multivariate logistic analysis was performed; the dependent variable was no DR (0) .DR (1). The independent variables (covariates) were

CH, HDL, LDL, MIC, HBA1C, BMI>30,TG, smoking, age at diagnosis (AG), hypertension (HPN), duration of hypertension (DH), insulin treatment (INT).

RESULTS

The prevalence of retinopathy in type 2 diabetes was 12/100. For DR patient, the means of age at diagnosis (41.1±9.2), age (54.28±8.7), duration of diabetes (13.2±5.8), duration of hypertension (4.6±6.6), family history of diabetes mellitus (0.55±0.5), cholesterol (5.65±1.2)), hba1c (11.5±9.8), ldl (3.6±1.1), microalbuminuria (15.1±30.2), hypertension (.44±0.5), neuropathy (0.2±0.4), insulin treatment (0.61±0.49), triglycerides (2.3±1.4) Body mass index >30 (0.45±0.5) and smoking (0.21±0.41); whereas for patients without DR the mean of age at diagnosis (47.1±9.2), age (54.09±8.5), sex (0.5±0.5), duration of diabetes (7±5.23), duration of hypertension (3.05±5), family history of diabetes mellitus (0.49±0.50), cholesterol (5.32±1.05), hba1c (8.4±2.8), ldl (3.4±0.9), microalbuminuria (6.55±12.6), hypertension (.0.38±0.49), neuropathy (0.06±0.23), insulin treatment (0.18±(0.39), triglycerides (2.19±1.3) body mass index >30 (0.55±0.5) and smoking (0.24±0.43); are shown in table 1. The univariate analysis, the p-value , also presented in table 1 is as follows: age at diagnosis (0.0001), age (1), sex (1), confounders controlled by age and sex group matching, duration of diabetes (0.0001), duration of hypertension (0.0001), hba1c (0.0001), ldl (0.002), microalbuminuria (0.001), cholesterol (0.0001), neuropathy (0.0001), insulin treatment (0.0001), triglyceride (0.035), body mass index >30 (0.01) family history of diabetic retinopathy (insignificant), hypertension (insignificant), and smoking (insignificant). The multivariate logistic analysis shown in table 2 where; HbA1c (0.0001), microalbuminuria (0.0001), neuropathy (0.002), insulin treatment (0.0001), body mass index >30(0.0001) and diabetes duration (0.0001); are the only significant risk factors in this study.

DISCUSSION

The prevalence in this study was of no difference to other populations[2-4]

After controlling age and sex during the comparison between diabetics who had DR and who had not, we found that poor blood sugar control (high HbA1C), obesity (BMI>30), nephropathy (MIC), neuropathy, INT and longer duration of diabetes mellitus are the risk factors for DR and it seems convincing that diabetics who had these risk factors are more borne to develop DR.

This study also showed other risk factors like age at diagnosis, total cholesterol, triglycerides, LDL, duration of hypertension which are relevant in univariate analysis, whereas a family history of diabetic retinopathy, hypertension and smoking are irrelevant. Poor blood sugar control indicated by high HbA1C has been found as a risk factor by other studies[5-12]. Nephropathy was also found as a risk factor[2, 8, 11, 13-17] as was duration of diabetes supported by these studies [2-4, 6, 8, 13, 16-22] Insulin treatment was found by studies like[6, 12, 13, 21-23] . Compared to studies[11, 23, 24] who found lower body mass index is more associated with DR and to our study which found body mass index >30 as a risk factor that may be explained by the difference

between the population and the study design, where BMI analysed as dichotomous variable and controlling age and sex might lead to this discrepancy in results, on the contrary was not found as a risk factor[22, 25]. Concerning neuropathy, to our knowledge there is a study [26]that has investigated it and it interpreted that diabetics who had neuropathy are more likely to develop DR and should be sent to an ophthalmologist since 87% of the patients with retinopathy had signs of peripheral neuropathy.

Although the study conducted in one center was considered to have limitations, being the centre having the highest score given by the Kuwait diabetes committee which is responsible for the application of Kuwait guidelines for diabetes, still we can not determine AG, DH, LDL, CH, TG, family history of DR, HPN, and smoking as risk factors.

AG was shown by [6, 27] both studies comparing different ethnic group which is not the case in this study. As far as we know there is no study trying to find an association between DH and family history of DR and this association cannot be indicated by this study.

We can not prove that CH, LDL, TG are associated with DR and this is shown also by[9, 20, 22, 28].On the other hand other studies prove CH as a risk factor and this is explained by the difference in the sample selected where type I diabetics were included[18] whereas [23] a study the population of Cree Indians of James Bay which may be different from our population.

LDL was shown as a relevant risk factor for patients who have proliferative DR[29] and this can be explained as the sample population was different from the sample of our population in which they divide their sample into three groups, DM without DR, nonproliferative DR and proliferative DR.

Although HPN found as a risk factor by [20, 30] which compares diabetics with non diabetics and hypertensive diabetics with normotensive diabetics respectively.[3] also found HPN relevant. Other studies found the opposite[13] which is a screening study. All such studies did not control the age and the sex by group matching.

Cigarette smoking is not a risk factor for retinopathy [22, 25, 31]and this support our finding where as study [3] found marginal effect of smoking relevant. However, the failure of ours to find an association between smoking and diabetic retinopathy does not imply that persons with diabetes who do not smoke should start smoking as cigarette smoking is a risk factor for other complications and associated conditions of diabetes, particularly cardiovascular disease.

CONCLUSION

In this case control study we investigated the prevalence of retinopathy in type II diabetic in Al-naeem clinic which is comparatively consistent with other population prevalence

and the risk factors of retinopathy. It has been shown that poor control of blood sugar, longer diabetes duration, microalbuminuria, insulin treatment and body mass index >30 increase the risk for development of retinopathy. The significant associations with poor control and duration of diabetes provide further strong evidence for the benefits of optimal glycaemic control and body weight reduction. There is a debate about DR risk factors; further study is needed to define them

Dr Ali Aldaher the head of primary care department in Aljahra area

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TABLE 1

UNIVARIATE ANALYSIS
COMPARISON BETWEEN PATIENTS WITH RETINOPATHY AND PATIENTS WITHOUT RETINOPATHY

VARIABLES	RETINOPATHY		P-VALUE *
	NO	YES	
	MEAN (SD)	MEAN (SD)	
AGE	54.09(8.5)	54.28(8.7)	1.000 #
SEX	0.5(0.5)	0.5(0.5)	1.000 #
AGE AT DIAGNOSIS	47.1(9.2)	41.1(9.2)	0.0001
DURATION OF DIABETES	7(5.23)	13.2(5.8)	0.0001
DURATION OF HYPERTION	3.05(5)	4.6(6.6)	0.001
FAMILY HISTORY OF DR	0.49(0.50)	0.55(0.5)	NS
CHOLESTROL	5.32(1.05)	5.65(1.2)	0.0001
HbA1C	8.4(2.8)	11.5(9.8)	0.0001
LDL	3.4(0.9)	3.6(1.1)	0.002
MICROALBUMINURIA	6.55(12.6)	15.1(30.2)	0.0001
HYPERTENSION	0.38(0.49)	.44(0.5)	NS
NEUROPATHY	0.06(0.23)	0.2(0.4)	0.0001
TREATMENT (INSULIN)	0.18(0.39)	0.61(0.49)	0.0001
TRIGLYCERIDES	2.19(1.3)	2.3(1.4)	0.035
BODY MASS INDEX >30	0.55(0.5)	0.45(0.5)	0.01
SMOKING	0.24(.43)	0.21(0.41)	NS

*** UNIVARIATE ANALYSIS, NS; NOT SIGNIFICANT**
 # CONFOUNDERS CONTROLLED BY GROUP MATCHING
SD, STADARD DEVIATION

TABLE 2

multivariate logistic regression

	p-value	adjusted odds ratio	95.0% C.I.	
			Lower	Upper
AGE AT DIAGNOSIS	NS	.986	.963	1.010
DURATION OF DIABETES	.000	1.134	1.088	1.182
DURATION OF HYPERTENTION	NS	1.004	.967	1.042
CHOLESTEROL	NS	.953	.675	1.346
GLYCOSYLATED HAEMOGLOBIN	.000	183.467	27.857	1208.296
LOW DENISITY LIPOPROTEIN	NS	1.155	.796	1.677
MICROALBUMINURIA	.000	2.092	1.522	2.877
NEUROPATHY	.002	.346	.179	.666
TREATMENT (INSULIN)	.000	.261	.168	.403
TRIGLYSERIDES	NS	1.189	.364	3.879
BODY MASS INDEX >30	.000	2.720	1.776	4.167

** 95% confidence interval for adjusted odds ratio ;NS.not significant