Immunol Genet J, Vol. 5, No. 2, June 2022, pp.89-94 DOI:https://doi.org/10.18502/igj.v5i2.15100

Original Article

Prevalence of Diabetic Retinopathy in Diabetic Patients Referred to Mashhad Parsian Diabetes Center, Iran

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Received:18 April 2022; Accepted: 4 June 2022

Abstract

Background: Diabetes is a common disease that leads to chronic complications such as neuropathy, nephropathy, vascular diseases, and retinopathy. Diabetic retinopathy is an eye condition that can cause vision loss and blindness in diabetic patients. The aim of this study is to describe the prevalence of diabetic retinopathy in diabetic patients.

Method: In this descriptive-cross-sectional study, 550 patients with diabetes referring to the diabetes centers in Mashhad Parsian Diabetes Center, Iran were enrolled. All patients were assessed for the presence of diabetic retinopathy by direct or indirect ophthalmoscopy. A standardized protocol was used to grade diabetic retinopathy. Two groups of diabetic patients with and without retinopathy were compared in terms of body mass index (BMI), gender, disease duration and type of diabetes, history of blood pressure, history of blood lipids, hemoglobin AIC and albumin.

Results: The prevalence of diabetic retinopathy among 550 diabetic patients was 23.4% (129 patients). Age, duration of diabetic disease, history of high blood pressure, history of high blood lipids, type 2 diabetes and urine albumin were significantly different between the diabetic patients with and without retinopathy, while no significant difference was observed between the two groups in terms of gender, BMI, smoking, and hemoglobin A1C level.

Conclusion: Due to the high prevalence of DR in diabetic patients, it is recommended that retinal examination should always be considered in the evaluation of diabetic patients.

Keywords: Diabetes; Diabetic Retinopathy; Prevalence; Hemoglobin A1C Level

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How to cite this article
Roshanzamir N, Erfanian Salim M. Prevalence of diabetic retinopathy in diabetic patients referred to Mashhad Parsian Diabetes Center, Iran. Immunology and Genetics Journal, 2022; 5(2): 89-94. DOI: https://doi.org/10.18502/igj.v5i2.15100

Introduction

Diabetes is one of the most common non-communicable and chronic diseases in developed western countries and developing countries (1). Diabetes Mellitus (DM) is a metabolic disease determined by increased blood glucose levels due to the body's inability to produce insulin resistance to insulin action or both (2, 3). The World Health Organization estimates that the total number of diabetic patients will double from 171 million in

2000 to 366 million by 2030 (4). Diabetic retinopathy (DR) is one of the most important complications of diabetes mellitus, which is a very specific complication of type 1 and type 2 diabetes (5, 6). According to the Global Burden of Disease Study, in adults aged 50 years and older, DR is the fifth leading cause of blindness and moderate to severe visual impairment (7). The probability of blindness in patients with diabetes is 25 times higher than in people without diabetes (8). Diabetic retinopathy is determined by various degrees of microaneurysm, hard exudates, hemorrhage, venous changes and the formation of new vessels involved in the peripheral retina, macula or both (9, 10). Diabetic retinopathy is divided into two types, proliferative and non-proliferative. Non-proliferative retinopathy is a progressive microangiopathy characterized by damage and blockage of small vessels and can lead to vision loss if the macula is involved (11). Proliferative retinopathy is a serious complication of diabetes and is characterized by the formation of new blood vessels on the disc or anywhere in the retina (12). Worldwide, approximately 95 million (35.4%) diabetic patients have DR, with one-third having vision-threatening DR and 7.6% macular edema (13). Several factors affect the progression of diabetic retinopathy; including the type of diabetes and its duration, the patient's age, gender, blood sugar control status, high blood pressure, smoking, and high blood fat (14). Early diagnosis and prompt treatment can prevent diabetes-related visual impairment (15). The risk of DR sight can be reduced through good blood control, controlling hypertension, effective early screening and having regular follow-ups in a diabetic eye clinic (16).

Considering that the late diagnosis of retinopathy in most diabetic patients, especially type 2, causes complications and incurs a heavy burden of expenses, it is possible to help early treatment of these patients by investigating the prevalence of the disease and its timely diagnosis. This study was conducted to investigate the prevalence of diabetic retinopathy in diabetic patients referred to diabetes centers in Mashhad Parsian Diabetes Center, Iran.

Method and Materials

In this descriptive-cross-sectional study, 550 patients with diabetes referring to the Parsian Diabetes Center in Mashhad, Iran in 2021 were enrolled. The diagnosis of diabetes was according to the criteria of the American Diabetes Association with fasting plasma sugar more than 126 mg/dL or 2-h plasma glucose ≥200 mg/dL during an oral glucose tolerance test (17). The inclusion criteria were Type I and II diabetic patients over 18 years old and having a complete history including eye examinations. Patients with an incomplete questionnaire, pregnant women, and patients with cataracts, glaucoma, or any other eye disease were excluded from the study. A questionnaire including demographic and clinical information was designed to record patients' data. Eye examination was done by an ophthalmologist after pupil dilation and direct and indirect ophthalmoscopy. If necessary, a +90 lens and 3 mirrors were used to check the macula. A standardized protocol was used to grade diabetic retinopathy. Two groups of diabetic patients with and without retinopathy were compared in terms of body mass index (BMI), gender, disease duration, type of diabetes, history of blood pressure, history of blood lipids, hemoglobin AIC and albumin. The study was approved by the Medical Ethical Committee of the Islamic Azad University of Mashhad. The written informed consent was obtained from each patient.

Statistical analysis

Statistical analysis was performed by SPSS software version 22 (IBM, Chicago, USA). The quantitative and qualitative variables were indicated as mean±SD and number (percentage), respectively. Kolmogorov–Smirnov and Shapiro–Wilk tests were used to test for the distribution. Differences were compared by using the T-test or Mann–Whitney U test as appropriate. For the test of significance, chi-square/Fisher's exact test was calculated to compare the frequencies among groups. *P*-value less than 0.05 was considered statistically significant.

Results

The prevalence of diabetic retinopathy among 550 diabetic patients was 23.4% (129 patients). The ages of patients with and without retinopathy were 59.4± 10.11 and 51.7±13.3, respectively, according to the results, there was a significant difference in the age of the patients between the two groups of diabetic patients with and without retinopathy (*P*=0.00001). The duration of diabetic disease in patients with retinopathy was statistically higher than in patients without retinopathy (*P*=0.00001). The sex of patients with and without retinopathy did not differ (*P*=0.375). Hypertension and hyperlipidemia were significantly different between the two groups of patients (both *P*=0.00001). A significant difference was observed in the type of diabetes between the two groups with and without retinopathy (*P*=0.008). Hemoglobin AIC was not different between the two groups (*P*=0.88). **Table 1** shows the demographic and clinical characteristics of diabetic patients with and without retinopathy.

Figure 1 shows the prevalence of different types of retinopathies in diabetic retinopathy patients. Among 129 patients with retinopathy, 42.6%, 33.3% and 14% of patients were in the mild, mod-

Table 1. Demographic and clinical characteristics in diabetic patients with and without retinopathy

Variables	With Retinopathy	Without Retinopathy	*P-value*
Age	59.4 ± 10.113	51.7 ± 13.29	0.00001
Duration of diabetic disease (year)	15.87 ± 5.89	10.51 ± 4.72	0.00001
Sex (Male: Female)	39:90 (30.2 %: 69.8%)	145: 276 (34.4%: 65.6%)	0.375
BMI	29.74 ±16.025	28.274 ± 5.31	0.311
Hypertension	66 (51.2%)	107 (25.4%)	0.00001
Smoking	66 (15.7%)	28 (21.7%)	0.11
Hyperlipidemia	40 (31%)	58 (13.8%)	0.00001
Diabetic type			
Type I	4 (3.1%)	45 (10.7%)	0.008
Type II	125 (96.9%)	376 (89.3%)	
Hemoglobin A1C			
Less than 7	164 (39%)	40 (20.8%)	0.088
More than 7	256 (61%)	90 (69.2%)	
Albumin (Mg/24 H)			
Less than 30	318 (57.7%)	68 (52.3%)	
30 – 300	102 (24.3%)	59 (45.4%)	0.0001
More than 300	0 (0 %)	3 (2.3%)	

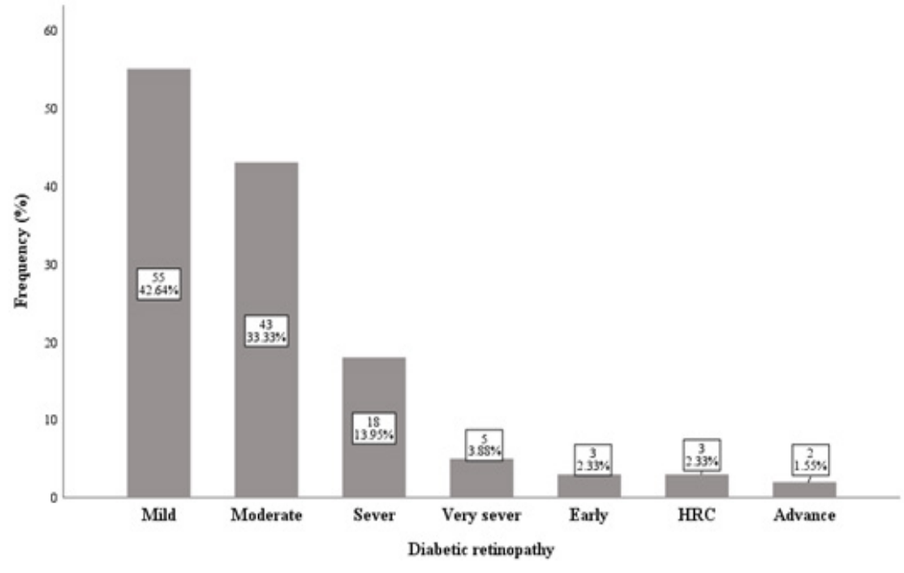

Figure 1. The prevalence of different types of retinopathies in patients with diabetic

erate and severe stages, respectively.

Discussion

Diabetes is a common disease that leads to chronic complications such as neuropathy, nephropathy vascular diseases and retinopathy (5, 18). The most severe eye complication of diabetes is diabetic retinopathy. Medical advances during the last 40 years have significantly reduced the risk of blindness caused by it. However, since diabetes is very common, retinopathy remains an important health problem (15). This study was conducted to evaluate the prevalence of retinopathy among diabetic patients using direct and indirect ophthalmoscopy in Mashhad, Iran. The current study has shown that the prevalence of DR among 550 diabetic patients was 23.4%, comparable with previous studies such as Heydari et. al (23.6%) (19), and Javadi et. al (36%) (20). In the population-based study by Wang et al and Alemu Mersha et al, the prevalence of DR was 43.1% and 34.1%, respectively (2, 21), which was more than our study. It seems the DR prevalence is lower in some ethnicities in Asia than it is in Caucasians (22). This dissimilarity can be related to differences in cultural or ethnic cultural behaviors or methodology.

In our study, a statistically significant correlation was observed between retinopathy and duration of diabetes (P=0.00001). Similar to our finding, in the study by Heydari et al. there was a relationship between the duration of diabetes and diabetic retinopathy (19). In addition, the findings of Alemu Mersha et al.'s study showed that an extra year of diabetes duration increases the chance of developing DR, which was in agreement with our study (2). The findings of our study are consistent with studies worldwide that have reported that a longer duration of diabetes is significantly associated with the development of DR (23-25). This association can be explained by the fact that retinal arteriolar dilation occurs with increasing duration of diabetes, which is a subclinical marker of endothelial dysfunction leading to DR (2). In our study, the age of patients with retinopathy was statistically higher than that of patients without retinopathy (P=0.00001). Similar to our study, in the study of Javadi et al., there was a notable relationship between the presence of DR and age (20). In a study in Oman, age had no significant relationship with the prevalence of retinopathy (26), but in other studies, its positive role in the occurrence of this complication has been emphasized (27). Considering the involvement of several factors in the occurrence of retinopathy, probably the age factor does not act as an independent factor for the occurrence of eye and retinal complications caused by diabetes. In the present study, there was no significant correlation between the prevalence of diabetic retinopathy and sex (P=0.375). Similar to our findings, in Teo et al.'s study, subgroup multivariate meta-regression analysis showed that gender had no significant effect on the prevalence of DR (18). In the study by Javadi et al, male had notably higher prevalence of diabetic retinopathy in both univariate and multivariate analysis, which is inconsistent with our finding (20). In a study by Wang et al. in Singapore, a higher prevalence of DR was observed in females. However, this difference did not exist after adjusting for metabolic and socioeconomic risk factors (28). More studies are needed to investigate the causes of this contradiction in the prevalence of DR in sex differences in different populations.

Hypertension in the group of diabetic patients with retinopathy was higher than that of patients without retinopathy (P=0.00001). This is similar to studies conducted in Kenya (29), Tanzania (30), and Ethiopia (5), but inconsistent with a study conducted by Rasoulinejad in Iran (31). This discrepancy may be due to confounding effects, variations in self-care practices, and variations in the prevalence of hypertension among studies. The results of the study by Eslami et al. showed that there is a strong relationship between the amount of microalbuminuria and retinopathy (8), which is consistent with the results of the present study. In another study conducted by Papazafiropoulous et al. in 2011 in Greece, the prevalence of retinopathy in diabetic patients with microalbuminuria did not have a statistically significant difference compared to diabetic patients without microalbuminuria (32).

In our study, hemoglobin A1C level was not a significant difference between the two groups. Similar to our studies, in some domestic and foreign studies, no relationship between hemoglobin A1C and the progression of retinopathy has been reported. This result is probably due to the existence of several people with retinopathy who, after suffering from this condition, tried to control their blood sugar more precisely. In many studies, hyperglycemia has been reported as a risk factor for the occurrence of DR and it has been noted that high levels of glucose in retinal artery endothelial cells lead to impaired glucose uptake and increased oxidative stress, which leads to diabetic complications such as DR (2).

One of the limitations of the present study is the single center and small sample size. The second limitation is that clinical examination was used to diagnose and grade DR. While the clinical examination is inexpensive and widely available, it is not very sensitive compared to stereoscopic fundus photography and can limit direct comparisons with other recent similar studies. More multi-center studies with a larger sample size are needed to investigate the prevalence of diabetic retinopathy and identify risk factors.

Conclusion

In our study, the overall prevalence of retinopathy among diabetic patients was 23.4%. Age, Duration of diabetic disease, history of high blood pressure, history of high blood lipids, type 2 diabetes and urine albumin were significantly different between the diabetic patients with and without retinopathy, while no significant difference was observed between the two groups in terms of gender, BMI, smoking history, and hemoglobin A1C level. Due to the high prevalence of DR in diabetic patients, it is recommended that retinal examination should always be considered in the evaluation of diabetic patients. It is better to start a coordinated early screening for DR in the hospital.

Conflict of interests

The authors declare that they have no Conflict of interests.

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