

Frequency of Factors Responsible for Diabetic Retinopathy Among Patients of Type II Diabetes Mellitus

NISAR AHMED KHAN¹, ASMA SHAMS², NARAIN DAS³, RIAZ AHMED MEMON⁴, NADEEM MEMON⁵, ABDUL HAQ SHAIKH⁶

¹Associate Professor of Ophthalmology, Indus medical College Hospital TM Khan

²Senior registrar of Ophthalmology, SMBBMC Lyari Karachi

³Assistant Professor of Ophthalmology, SMBBMC Lyari Karachi

⁴Consultant Ophthalmologist, POB eye Hospital Karachi

⁵Assistant Professor of medicine, MMC Mirpurkhas

⁶Department of medicine, LUMHS Jamshoro

Corresponding author: Nisar Ahmed Khan. Email: nisargh2001@yahoo.com

ABSTRACT

Objective: To determine the frequency of factors responsible for diabetic retinopathy (DR) among patients with type II diabetes mellitus (DM).

Materials and methods: This cross-sectional study was conducted at the department of Ophthalmology at Indus Medical College Tando Muhammad Khan from January 2021 to June 2021. Patients having type II diabetes mellitus, aged > 40 years, presenting with diabetic retinopathy of either gender were included. After dilating the eye with a 1% tropicamide eye drop, skilled and experienced ophthalmologists diagnosed diabetic retinopathy by using the 90 diopter Volk lens and a slit lamp biomicroscope. A 5 mL blood sample was obtained and sent to the diagnostic laboratory to assess the random blood sugar (RBS) and HBA1c. All the data was collected by using the study proforma and SPSS version 26 was used for the data analysis.

Results: A total of 66 patients with diabetic retinopathy were evacuated regarding risk factors. Most of the patients (68.2%) were old. Males were in the majority 75.8%, and females were 24.2%. Out of all, 56.1% patients were poor socioeconomically, while 65.2% were smokers. Half of the patients had microalbuminuria and 68.2% of the cases had HBA1c > 7, while 22.7% of the cases were hypertensive. Most of the cases (66.7%) had a duration of diabetes of more than 10 years.

Conclusion: We concluded in this study that age greater than 60 years, low socioeconomic status, smoking, diabetes duration greater than 10 years, HBA1c greater than 7, and microalbuminuria were found to be significant prognostic factors for diabetic retinopathy. As per several study limitations, further large-scale case control studies on particular risk factors are recommended.

Keywords: Prognostic factors, prevalence, diabetic retinopathy, type II DM

INTRODUCTION

Diabetes mellitus, the world's most prevalent endocrine illness, is characterized by persistent hyperglycemia, which leads to a variety of microvascular and neuropathic disorders.^{1,2} Diabetes has been designated as a 21st-century epidemic by the United Nations. Global data shows that its prevalence is increasing at a rate of about 2.5 percent every year.³ Chronic hyperglycemia promotes advanced glycation end products by increasing the glucose interaction with arterial wall elements. Such substances crosslink the collagen, increasing arterial stiffness, which, in combination with high cholesterol and low-density lipoprotein (LDL) concentrations, promotes atherogenesis.⁴ As a result, elevated blood glucose levels cause endothelial dysfunction, which manifests as macrovascular or microvascular abnormalities.^{4,5} Microvascular disease has a significant impact on the lives of T2DM patients, and diabetic retinopathy is one of the most serious ocular complications of diabetes.⁵ In Pakistan, type II diabetes and diabetic retinopathy affect 10% and 27% of the population, respectively.^{2,6} Long-term diabetes can induce a variety of retinal abnormalities, including aberrant retinal neovascularization, which can cause significant vision loss and even blindness.² It has emerged as a primary cause of visual impairment in adults, leading to permanent blindness.¹ It starts as a neuro-retinopathy, then progresses to vascular alterations when the blood-retinal barrier breaks down and retinal capillaries are obliterated. Unmanaged glucose concentrations, aging, prolonged diabetes duration, smoking, high blood pressure, and hypercholesterolemia are all risk factors that enhance diabetic retinopathy problems.^{1,7} Several studies, on the other hand, have shown no link between smoking and diabetic retinopathy.⁸ Even in China, several studies have found that smoking is a contributing cause against diabetic retinopathy.⁹ On the other hand, it has been shown that microalbuminuria has been linked to the development of retinopathy in diabetes patients and the presence of proliferative conditions in those with a younger beginning of the disease. People with microalbuminuria were more likely to get retinopathy than people who didn't have microalbuminuria.⁵ In a study, it was observed that diabetes duration, systolic blood pressure, and uncontrolled hyperglycemia appear to be the most critical

attributes in the occurrence of any degree of retinopathy in individuals with type 2 diabetes mellitus.⁹ In the Chinese population, particularly as characterized by WC, is linked to the risk of diabetic Retinopathy.¹⁰ Although according to a meta-analysis, neither being overweight nor obese is linked to a higher risk of diabetic retinopathy, and it is recommended that such findings should be confirmed by further research.¹¹

MATERIAL AND METHODS

This cross-sectional study was conducted at the department of Ophthalmology at Indus Medical College Tando Muhammad Khan from January 2021 to June 2021. All the patients having type II diabetes mellitus, aged >40 years presented with diabetic retinopathy of either gender were included. Participants having type I diabetes, signs of retinopathy or visual loss not attributable to hyperglycemia and those who did not agree to participate in the study were excluded. Complete medical history and clinical examination was done. BMI was computed by dividing weight and height squared (kg/m²). After dilating the eye with a 1% tropicamide eye drop, skilled and experienced ophthalmologist diagnosed diabetic retinopathy by using the 90 diopter Volk lens and a slit lamp biomicroscope. A 5 ml blood sample was obtained and sent to the diagnostic laboratory to assess the random blood sugar (RBS) and HBA1c. All the data regarding age, gender, socioeconomic status, educational status, duration of diabetes, history of smoking, BMI, hypertension, microalbuminuria, RBS, and HBA1c was collected by using the study proforma and SPSS version 26 was used for the data analysis.

RESULTS

A total of 66 patients of diabetic retinopathy were evaluated regarding risk factors. Most of the patients (68.2%) were older than 50 years, while 31.8% were younger than 50 years old. Males were in majority 75.8%, and females were 24.2%. Of all patients, 68.2% were urban area residents, and 31.8% were from rural areas, while 56.1% of patients were poor socioeconomically. 65.2% of patients were smokers and the remaining 34.8% were non-smokers. In this study, most of the cases (48.5%) were

overweight and 30.3% were obese, while 21.2% had normal BMI. Half of the patients had microalbuminuria. Out of all the study subjects, 68.2% had HbA1c > 7, while 22.7% of the cases were hypertensive. Most of the cases (66.7%) had a duration of diabetes of more than 10 years, while 33.3% of the cases had a duration of diabetes of 5 to 20 years. Table.1

Table 1: Estimated prognostic factors of the diabetic retinopathy n=66

Risk factors	Statistics		
	N.	%	
Age groups	<60 years	21	31.8
	>60 years	45	68.2
Gender	Males	38	57.6
	Females	28	42.4
Residence	Rural	21	31.8
	Urban	45	68.2
Socioeconomic status	Poor	37	56.1
	Middle	21	31.8
	Upper	8	12.1
Educational status	Illiterate	26	39.4
	Educated	40	60.6
Smoking	Yes	43	65.2
	No	23	34.8
Body weight as per BMI	Normal	14	21.2
	Overweight	32	48.5
	Obese	20	30.3
Microalbuminuria	Yes	33	50.0
	No	33	50.0
HbA1c	<7	21	31.8
	>7	45	68.2
Hypertension	Yes	15	22.7
	No	51	77.3
Diabetes duration	>10 years	44	66.7
	< 10 years	22	33.3

DISCUSSION

Diabetic retinopathy commonly recognized as a significant potential cause of vision-threatening retinopathy in adults.^{10,12} Nevertheless, in contrast to a better awareness of the consequences linked with DR, risk factors for DR are still poorly understood.¹⁰ Current study has been done to assess the prognostic factors of the diabetic retinopathy among patients of type II diabetes mellitus and in this study most of the patients 68.2% were aged more than 50 years, while 31.8% were below the 50 years old. Males were in majority 57.6% and females were 42.4%. Consistently Yin L et al¹³ reported that that in the diabetic retinopathy group average age of the patients was 61.15±9.18 years and males were in majority 248 (61%) compared to females 161 (39%), while inconsistently Lima VC et al¹⁴ reported that the females were in majority and more than 60 years old patients were 48.12 % in diabetic antipathy group. On other hand Hussain S et al² reported that the participants' average age was 49.04 0.69 years, with a little female preponderance. The gender predominance controversy may be due to sample size and sample selection of the studies, and in this smoker, patients were majority and, in our community, smokers mostly are males.

In this study most of the cases 48.5% were overweight and 30.3% were obese, while 21.2% had normal BMI. These findings almost similar to the study of Silverberg EL et al¹⁵ as 13.9% cases had normal Weight, 30.6% were overweight and 55.6% were obese. On other hand it was observed that the prevalence of DR rose over time in the normal weight, overweight, and obese categories, while obesity, instead of overweight, was shown to be related with a higher prevalence of diabetic retinopathy.¹⁶ In this study 65.2% patients were smokers and half of the patients had microalbuminuria. In the study of Cai X et al¹⁷ observed that in the comparison to nonsmokers, smokers with type I diabetes had a considerably higher risk of diabetic retinopathy, but smokers with type II diabetes had a much lower risk. Although male gender, older age, hyperglycemia (consistently increased HbA1c), high blood pressure, and smoking were all linked to the onset and development of retinopathy in type 2 diabetes patients, according

to Stratton et al.¹⁸ In the study of Hao Z et al⁸ demonstrated that the BMI more than 28 kg/m² with heavy smoking was an extremely important risk for diabetic retinopathy among individuals those were newly diagnosed as the patients of diabetes mellitus. Smoking is thought to impact the symptoms of diabetic retinopathy due to its effect on lowering retinal blood flow, however the link has yet to be proven.¹⁷ Early research established a link between cigarette smoking and diabetic retinopathy.¹⁷ Inconsistently Magliah SF et al¹⁹ reported that the outcomes of their study revealed that there had been no significant link between DR and established risk factors such as gender, diabetes types, smoking and obesity. In this study most of the cases 66.7% had duration of diabetes more than 10 years and 68.2% cases had uncontrolled diabetes (HbA1c >7). Consistently Magliah SF et al¹⁹ reported that the diabetes duration, haemoglobin A1c concentration, uncontrolled diabetes, dyslipidemia, high blood pressure, age, nephropathy and insulin therapy were all found to be major predictors of DR in patients of diabetes. In this study out of all 68.2% patients were urban areas resident and 56.1% patients were poor socioeconomically. Individuals' overall health and health-seeking behaviours may be influenced by their socioeconomic position. Identifying the prevalence of the disease in various socioeconomic strata may reveal to key connections between socioeconomic status and diabetic retinopathy.²⁰ While higher-quality diets are connected with more income, persons with lower socioeconomic status choose to consume energy-dense, nutrient-poor meals.²⁰ Although nutrition plays a crucial role in the development of diabetes, its impact in diabetic retinopathy is unclear. The Mediterranean diet, which includes a lot of fruits, vegetables, and seafood, was shown to be preventive against by the development of diabetic retinopathy in a comprehensive review, however the evidence was weak.^{20,21} Individuals on a reduced dietary fiber diet exhibited worse glycemic control and a greater frequency of DR in urban population-based research in south India.^{20,22} According to the findings of this study and other published studies, the prognostic indicators of diabetic neuropathy is a broad health issue that is still controversial, with most studies reporting different results and evidences. There are several limitations to this study, as well as a limited sample size. Furthermore, large scale studies are recommended on particular prognostic factors.

CONCLUSION

In the study conclusion, age greater than 60 years, poor socioeconomic status, smoking, diabetes duration of more than 10 years, uncontrolled diabetes, and microalbuminuria were observed to be the significant prognostic factors of diabetic retinopathy. As per several study limitations, further large-scale case control studies on particular risk factors are recommended. which will aid in the development of management strategies to prevent diabetes complications such as diabetic retinopathy.

REFERENCES

- Singh A, Tripathi A, Kharya P, Agarwal R. Awareness of diabetic retinopathy among diabetes mellitus patients visiting a hospital of North India. *Journal of Family Medicine and Primary Care*. 2022 Apr;11(4):1292.
- Hussain S, Qamar MR, Iqbal MA, Ahmad A, Ullah E. Risk factors of retinopathy in type 2 diabetes mellitus at a tertiary care hospital, Bahawalpur Pakistan. *Pakistan journal of medical sciences*. 2013 Apr;29(2):536.
- Kotwas A, Karakiewicz B, Zabielska P, Wieder-Huszla S, Jurczak A. Epidemiological factors for type 2 diabetes mellitus: evidence from the Global Burden of Disease. *Archives of Public Health*. 2021 Dec;79(1):1-7.
- Cooper ME, Bonnet F, Oldfield M, Jandeleit-Dahm K. Mechanisms of diabetic vasculopathy: an overview. *American journal of hypertension*. 2001 May 1;14(5):475-86.
- Zubair A, Mateen FE, Hafeez S, Ali H, Waheed K, Ahmad A. Diabetic Retinopathy Among Type II Diabetics; with and without Microalbuminuria. *Annals of Punjab Medical College (APMC)*. 2019 Sep 28;13(3):236-40.

- 6 Mazhar PS, Awan MZ, Manzar N. Prevalence of type-II diabetes and diabetic retinopathy. *J Coll Phys Surg Pak.* 2010;20(8):528–532.
- 7 Tan GS, Gan A, Sabanayagam C, Tham YC, Neelam K, Mitchell P, et al Ethnic differences in the prevalence and risk factors of diabetic retinopathy: The Singapore epidemiology of eye diseases study *Ophthalmology* 2018 125 529–36
- 8 Hao Z, Huang X, Qin Y, Li H, Tian F, Xu R, Chang B, Shao H. Analysis of factors related to diabetic retinopathy in patients with newly diagnosed type 2 diabetes: a cross-sectional study. *BMJ open.* 2020 Feb 1;10(2):e032095.
- 9 Manaviat MR, Rashidi M, Afkhami-Ardekani M. Four years incidence of diabetic retinopathy and effective factors on its progression in type II diabetes. *European journal of ophthalmology.* 2008 Jul;18(4):572-7.
- 10 Zhou JB, Yuan J, Tang XY, Zhao W, Luo FQ, Bai L, Li B, Cong J, Qi L, Yang JK. Is central obesity associated with diabetic retinopathy in Chinese individuals? An exploratory study. *Journal of International Medical Research.* 2019 Nov;47(11):5601-12.
- 11 Zhou Y, Zhang Y, Shi K, Wang C. Body mass index and risk of diabetic retinopathy: a meta-analysis and systematic review. *Medicine.* 2017 Jun;96(22).
- 12 Zhu XR, Zhang YP, Bai L, et al. Prediction of risk of diabetic retinopathy for all-cause mortality, stroke and heart failure: evidence from epidemiological observational studies. *Medicine (Baltimore)* 2017; 96: e5894.
- 13 Yin L, Zhang D, Ren Q, Su X, Sun Z. Prevalence and risk factors of diabetic retinopathy in diabetic patients: A community based cross-sectional study. *Medicine.* 2020 Feb;99(9).
- 14 Lima VC, Cavalieri GC, Lima MC, Nazario NO, Lima GC. Risk factors for diabetic retinopathy: a case-control study. *International journal of retina and vitreous.* 2016 Dec;2(1):1-7.
- 15 Silverberg EL, Sterling TW, Williams TH, Castro G, Rodriguez de la Vega P, Barengo NC. The association between social determinants of health and self-reported diabetic retinopathy: an exploratory analysis. *International Journal of Environmental Research and Public Health.* 2021 Jan;18(2):792.
- 16 Yang GR, Li D, Xie Z. Association of obesity with diabetic retinopathy in US adults with diabetes in a national survey. *Endocrine Connections.* 2021 Jul 1;10(7):725-30.
- 17 Cai X, Chen Y, Yang W, Gao X, Han X, Ji L. The association of smoking and risk of diabetic retinopathy in patients with type 1 and type 2 diabetes: a meta-analysis. *Endocrine.* 2018;62(2):299-306.
- 18 Stratton IM, Kohner EM, Aldington SJ. UKPDS 50: Risk factors for incidence and progression of retinopathy in type 2 diabetes over 6 years from diagnosis. *Diabetologia.* 2001;44(2):156–163
- 19 Magliah SF, Bardisi W, Al Attah M, Khorsheed MM. The prevalence and risk factors of diabetic retinopathy in selected primary care centers during the 3-year screening intervals. *Journal of family medicine and primary care.* 2018 Sep;7(5):975.
- 20 Behera UC, Brar AS. Socioeconomic status and diabetic retinopathy in India. *Indian journal of ophthalmology.* 2021 Nov;69(11):2939.
- 21 Dow C, Mancini F, Rajaobelina K, Boutron-Ruault M-C, Balkau B, Bonnet F, et al. Diet and risk of diabetic retinopathy: A systematic review. *Eur J Epidemiol* 2018;33:141-56.
- 22 Ganesan S, Raman R, Kulothungan V, Sharma T. Influence of dietary-fibre intake on diabetes and diabetic retinopathy: Sankara Nethralaya-Diabetic Retinopathy Epidemiology and Molecular Genetic Study (report 26). *Clin Exp Ophthalmol* 2012;40:288-94.