https://doi.org/10.29309/TPMJ/2023.30.02.6734

The Professional Medical Journal
www.theprofesional.com
2023, Volume, 30 Issue, 02

ORIGINAL ARTICLE

Risk factors of diabetic retinopathy - a cross sectional study from Holy Family Hospital, Rawalpindi.

Salman Tariq[1], Mafaza Naseem[2], M. Rizwan Khan[3], M. Imran Janjua[4], Hurmat Fatima Azeem[5], Fuad Ahmad Khan Niazi[6]

Article Citation: Tariq S, Naseem M, Khan MR, Janjua MI, Azeem HF, Niazi FAK. Risk factors of diabetic retinopathy - a cross sectional study from Holy Family Hospital, Rawalpindi. Professional Med J 2023; 30(02):168-173. https://doi.org/10.29309/TPMJ/2023.30.02.6734

ABSTRACT… Objective: To assess the major risk factors of diabetic retinopathy in patients presenting to the eye OPD of the Holy Family Hospital, Rawalpindi. **Study Design:** Descriptive Cross-sectional study. **Setting:** Department of Ophthalmology, Holy Family Hospital, Rawalpindi. **Period:** March 2018 to September 2018. **Material & Methods:** 330 patients presenting at the diabetic clinic of Holy Family Hospital aged between 30-70 years with both type I and type II diabetes for ≥5 years (diagnosed by checking fasting blood sugar or HbA1C). History including age, gender, weight, height, duration of diabetes mellitus and control of diabetes mellitus was taken on a pre-designed proforma. Slit lamp examination was performed by the consultant ophthalmologist to check for Diabetic Retinopathy (NPDR and PDR). **Results:** Mean age of the patients was 50.4±9.8. Patients were distributed according to the age groups showing that 56(56%) of the patients were diabetics, 61(49.9%) with NPDR and 48(48%) with PDR in the 30-50 year group. While 51-70 year group included 44(44%) diabetics, 69(53.1%) with NPDR and 52(52%) with PDR. There was no significant association between history of hypertension and diabetic retinopathy (p=0.804) or BMI and diabetic retinopathy (p=0.451). There was significant association between diabetic retinopathy and duration of diabetes (p=0.035) as well as diabetic retinopathy and Hb1Ac levels (p=0.001). Gender variations were statistically significant (p=0.001), with females being more affected than males. **Conclusion:** Diabetic retinopathy is strongly associated with female gender, longer duration of diabetes and poor glycemic control.

Key words: Diabetes, Non- proliferative, Proliferative, Retinopathy.

INTRODUCTION

Diabetes is the leading cause of avoidable blindness in developing as well as developed countries.[1] with the prevalence of diabetes increasing in Asian countries like India and China.[2] The number of people with diabetes is on the rise due to longevity, population growth, urbanization and increasing rates of obesity and sedentary lifestyle. In 2000, the number of diabetics was estimated to be 171 million and is estimated to double by 2030 due to longer life spans and urbanization.[3]

Diabetes leads to many microvascular complications; retinopathy, nephropathy, neuropathy and coronary artery disease accounts for its macrovascular complications. Retinopathy is the most common micro vascular complication of diabetes, leading to blindness for over 10,000 people with diabetes per year in the United States alone.[4] Diabetic Retinopathy has two subtypes; non-proliferative (NPDR) and proliferative diabetic retinopathy (PDR). Macular edema which threatens visual acuity can occur at any stage of the disease.[2] In the initial 3-5 years, retinopathy is rare in type 1 diabetics, however, nearly all develop retinopathy during the next two decades. While of all the type 2 diabetics around 21% have retinopathy at the time of diagnosis while most of them develop retinopathy over time.[5]

Diabetes occurs at a much younger age in south Asian countries. Pakistan ranks 6th among the countries with the highest prevalence of diabetes.[6] According to Pakistan national blindness survey the prevalence of blindness in adults older than

1. MBBS, MCPS, FCPS, Senior Registrar Ophthalmology, DHQ Teaching Hospital, Rawalpindi.
2. MBBS, Resident Medicine, Combined Military Hospital, Rawalpindi.
3. MBBS, Fellowship in Pediatric Ophthalmology, Senior Registrar Ophthalmology, Holy Family Hospital, Rawalpindi.
4. MBBS, FCPS, Senior Registrar Ophthalmology, Shifa International Hospital, Islamabad.
5. MBBS, Rawalpindi Medical University, Rawalpindi.
6. MBBS, FCPS, FRCS, MCPS-HPE, Professor Ophthalmology, Holy Family Hospital, Rawalpindi.

Correspondence Address:
Mafaza Naseem
Rawalpindi Medical University, Rawalpindi.
mafaza.nasim@gmail.com

Article received on: 06/08/2021
Accepted for publication: 21/10/2022

30 years of age is 2.7%, out of these, 15.3% have diabetic retinopathy.[7] Another study conducted at the Baqai Institute of Diabetes and Endocrinology, Karachi from 1996 to 2001 showed the prevalence of diabetic retinopathy to be 16%.[8]

Long duration of diabetes, blood pressure control, dyslipidemia and poor glycemic control account for the risk factors of development and progression of diabetic retinopathy.[2] However, due to the paucity of data available for the assessment of risk factors and progression of DR, our study was conducted to assess the major risk factors of diabetic retinopathy in patients presenting to the eye OPD of the Holy Family Hospital, Rawalpindi.

MATERIAL & METHODS

This study was a descriptive cross-sectional study carried out at the Ophthalmology Department Holy Family Hospital, Rawalpindi from March 2018 to September 2018 which included 330 patients presenting at the diabetic clinic of Holy Family Hospital aged between 30-70 years with both type I and type II diabetes for ≥5 years. Patients with uncontrolled/ malignant hypertension, known allergy to eye drops, suffering from any other eye disease that causes impairment in fundus visualization, e.g. mature cataract, corneal opacity, retinal vein occlusion or vitreous hemorrhage and those who had already taken treatment for diabetic retinopathy e.g. pan retinal photocoagulation or grid laser were excluded from the study.

Diabetes mellitus was defined as fasting plasma glucose >7.0 mmol/L or 126mg/dL and HbA1C >6.5% according to American Diabetes Association. It was diagnosed by checking fasting blood sugar or HbA1C. Non proliferative diabetic retinopathy (NPDR) was diagnosed by the presence of at least one of the following on retinoscopy; micro aneurysm, hemorrhages or hard exudates while Proliferative diabetic retinopathy(PDR) was indicated by the presence of at least one of the following on retinoscopy; neovascularization, pre-retinal hemorrhages, vitreous hemorrhages or retinal detachment.

After taking ethical approval from the Institutional Research Forum, Rawalpindi Medical University, patients fulfilling the above mentioned inclusion/ exclusion criteria were enrolled in the study after taking informed consent. History including age, gender, weight, height, duration of diabetes mellitus and control of diabetes mellitus was taken on a pre-designed proforma. Slit lamp examination was performed by the consultant ophthalmologist. Patients were informed regarding the procedure in detail. Pupils were dilated with tropicamide 1% with one drop in each eye at 0, 15 and 30 minutes. The grading of diabetic retinopathy was determined by the consultant ophthalmologist.

Data was entered and analyzed in SPSSv23.0. For the categorical variables like gender, grades of diabetic retinopathy and HTN frequencies and percentages were calculated. For the quantitative variables like age, BMI and duration of diabetes mean and standard deviation was calculated. Effect modifiers like age, gender, duration of diabetes mellitus, control of diabetes mellitus, HTN and BMI was controlled by stratification. Post stratification chi square test was applied. P value ≤0.05 was considered significant.

RESULTS

Mean age of the patients was 50.4±9.8. Patients were distributed according to the age groups showing that 56(56%) of the patients were diabetics, 61(49.9%) with NPDR and 48(48%) with PDR in the 30-50 year group. While 51-70 year group included 44(44%) diabetics, 69(53.1%) with NPDR and 52(52%) with PDR. (p=0.351)

Distribution of the patients across gender showed that 48(48%) of the diabetics were males while 52(52%) were females. Of the 130 patients with NPDR, 57(43.8%) were males while 73(56.2%) were females. 24(24%) of the patients with PDR were males while rest 76(76%) were females. The distribution of diabetic retinopathy was statistically significant showing that females are more affected. (p=0.001)

Patients were divided according to positive or negative history of hypertension which showed that 41(41%) of the diabetics, 53(40.8%) of

patients with NPDR and 37(37%) of patients with PDR suffered from hypertension. There was no significant association between history of hypertension and diabetic retinopathy (p=0.804).

The BMI of the patients was calculated with mean of 26.2±5.01SD. Patients were divided into two groups with BMI<30 and ≥30. The first group (<30) included 72(72%) of the diabetics, 101(77.7%) of the patients with NPDR and 71(71%) of the patients with PDR. While the second group (BMI≥30) included 28(28%) of the diabetics, 29(22.3%) of the patients with NPDR and 29(29%) of the patients with PDR. There was no significant association between BMI and diabetic retinopathy (p=0.451)

According to the duration of diabetes patients were divided into 3 groups i.e 5-7 years, 8-10 years and >10 years. Of the 100 diabetics, 40(40%) had diabetes for 5-7 years, 36(36%) had diabetes for 8-10 years while 24(24%) had diabetes for >10 years. In patients with NPDR, 37(28.5%) had diabetes for 5-7 years, 51(39.2%) had diabetes for 8-10 years while 42(32.3%) had diabetes for >10 years. In patients with PDR, 29(29%) had diabetes for 5-7 years, 28(28%) of the patients had diabetes for 8-10 years while 43(43%) had diabetes for >10 years. There was significant association between diabetic retinopathy and duration of diabetes (p=0.035)

Control of diabetes was assessed by HbA1c levels. 33(33%) of the diabetics had Hb1Ac levels <6%, 32(32%) had HbA1c levels of 6-10% while 35(35%) had levels >10%. In patients with NPDR, 33(25.4%) of the patients had HbA1c levels of <6%, 74(56.9%) had 6-10% Hb1Ac level while 23(17.7%) had >10% levels. Patients with PDR had 29(29%) of the patients with HbA1c levels of <6%, 28(28%) had 6-10% Hb1Ac level while 43(43%) had >10% levels. There was significant association between diabetic retinopathy and Hb1Ac levels (p=0.001).

Groups	Diabetics with no DR (n=100)	Diabetics with NPDR (n=130)	Diabetics with PDR (n=100)	P-Value
Gender				
Male	48(48%)	57(43.8%)	24(24%)	0.001*
Female	52(52%)	73(56.2%)	76(76%)	
Age Groups				
30-50 years	56(56%)	61(49.9%)	48(48%)	0.351
51-70 years	44(44%)	69(53.1%)	52(52%)	
Hypertension				
Yes	41(41%)	53(40.8%)	37(37%)	0.804
No	59(59%)	77(59.2%)	63(63%)	
BMI				
<30	72(72%)	101(77.7%)	71(71%)	0.451
≥30	28(28%)	29(22.3%)	29(29%)	

Table-I

Duration of Diabetes				
5-7 years	40(40%)	37(28.5%)	29(29%)	0.035*
8-10 years	36(36%)	51(39.2%)	28(28%)	
>10 years	24(24%)	42(32.3%)	43(43%)	
Control of Diabetes(HbA1c)				
<6%	33(33%)	33(25.4%)	29(29%)	0.001*
6-10%	32(32%)	74(56.9%)	37(37%)	
>10%	35(35%)	23(17.7%)	34(34%)	

Table-II
*** p<0.05 was considered significant**

DISCUSSION

With the current prevalence rate of diabetes, the diabetic population in Pakistan is expected to reach 15% (14 million) by 2030. This will place Pakistan at 4th position in the list of countries with the high prevalence of Diabetes Mellitus. This will also lead to an increase in complications due to diabetes which poses a great challenge not only for the health care professionals but for the economy of Pakistan which already has limited health care resources.[9]

In our study from a total of 330 diabetics, 230(69.6%) patients had diabetic retinopathy. Diabetic Retinopathy was significantly higher in females (45.1%) as compared to males (24.5%). Our results are supported by another study which analyzed the data of Pakistan National Blindness and Visual Impairment Survey and another study by Momon etal.[17] which have reported higher prevalence of diabetic retinopathy in females. However, our results are in contrast with the study by Thomas et al. which has reported a high prevalence of DR, 54.7% and 59.1% in type 1 and type 2 male diabetics, respcetivley.[10] Another study conducted in the United States has established the male preponderance in DR as well.[11] This could be attributed to the greater proportion of females (60.9%) as compared to males (39%) in our study or due to the higher prevalence of DM in females(19.3%) as compared to males(16.6%) in Punjab, making them more prone to developing complications.[9]

Studies by Kajiwara et al[12], Romero-Aroca et al.[13] and Jin et al.[14] have established a strong correlation between the progression of DR and hypertension which is in contrast to our study which doesn't show any significant association between the two variables which can be attributed to the lack of awareness and access to basic health facilities in the population due to which many patients of hypertension can remain undiagnosed.

Studies have not shown any conclusive results between association of DR and BMI. Some studies have shown increased risk of BMI with DR while some studies have shown contradictory results; high BMI having protective effect on DR. Some studies have also shown no significant association between the two variables which is consistent with our study.

Longer duration of diabetes and poor glycemic control are strong predictors of DR which is not only supported by another study in Military Hospital, Rawalpindi[15] but also in Japan.[16] A study in Wales has shown that the longer the duration of diabetes, longer the chances to develop sight threatening Diabetic Retinopathy.[20]

The United Kingdom Prospective Diabetes Study (UKPDS) and the Diabetes Control and Complications Trial (DCCT) provided strong evidence that tight control of glycemia (HbA1c <7%) reduces the risk of development and progression of DR in both type 1 and type 2 diabetes.[18] As higher Hb1Ac levels are associated with higher levels of VEGF expression, which is a potent angiogenic factor and causes vascular permeability making the patients more prone to develop micro vascular complications.[19]

The limitation of this study was the small sample size which might have resulted in insignificant relation between BMI, hypertension and DR as opposed to previous studies. We recommend such studies with larger sample sizes and a multi center approach to identify major risk factors which will not only aid in early diagnosis but also a better approach for the management of the disease.

CONCLUSION

Diabetic Retinopathy has shown strong association with female gender, longer duration of diabetes and poor glycemic control. More studies should be conducted to identify these risk factors.

REFERENCES

1. Singh R, Ramasamy K, Abraham C, Gupta V, Gupta A. **Diabetic retinopathy: An update.** Indian journal of ophthalmology. 2008 May; 56(3):179.

2. Yau JW, Rogers SL, Kawasaki R, Lamoureux EL, Kowalski JW, Bek T, Chen SJ, Dekker JM, Fletcher A, Grauslund J, Haffner S. **Global prevalence and major risk factors of diabetic retinopathy.** Diabetes care. 2012 Mar 1; 35(3):556-64.

3. Wild S, Roglic G, Green A, Sicree R, King H. **Global prevalence of diabetes: Estimates for the year 2000 and projections for 2030.** Diabetes care. 2004 May 1; 27(5):1047-53.

4. Fowler MJ. **Microvascular and macrovascular complications of diabetes.** Clinical diabetes. 2008 Apr 1; 26(2):77-82.

5. Fong DS, Aiello L, Gardner TW, King GL, Blankenship G, Cavallerano JD, Ferris FL, Klein R. **Retinopathy in diabetes.** Diabetes care. 2004 Jan 1; 27(suppl 1):s84-7.

6. Qureshi MB, Khan AJ, Khan MD, Ahmad K. **Prevalence of diabetic retinopathy among individuals screened positive for diabetes in five community-based eye camps in northern Karachi, Pakistan.** Journal of Ayub Medical College Abbottabad. 2006; 18(3):40-3.

7. Basit A, Hydrie MZ, Hakeem R, Ahmedani MY, Masood Q. **Frequency of chronic complications of type 2 diabetes.** J Coll Physicians Surg Pak. 2004 Feb; 14(2):79-83.

8. Shaikh A, Shaikh F, Shaikh ZA, Ahmed J. **Prevalence of diabetic retinopathy and influence factors among newly diagnosed diabetics in rural and urban areas of Pakistan: Data analysis from the Pakistan National Blindness & Visual Impairment Survey 2003.** Pak J Med Sci. 2008 Oct 1; 24(6):774-9.

9. Hussain A, Ali I. **Diabetes mellitus in Pakistan: A major public health concern.** Archives of Pharmacy Practice. 2016 Jan 1; 7(1):30.

10. Thomas RL, Dunstan FD, Luzio SD, Chowdhury SR, North RV, Hale SL, Gibbins RL, Owens DR. **Prevalence of diabetic retinopathy within a national diabetic retinopathy screening service.** British Journal of Ophthalmology. 2015 Jan 1; 99(1):64-8.

11. Zhang X, Saaddine JB, Chou CF, Cotch MF, Cheng YJ, Geiss LS, Gregg EW, Albright AL, Klein BE, Klein R. **Prevalence of diabetic retinopathy in the United States, 2005-2008.** Jama. 2010 Aug 11; 304(6):649-56.

12. Kajiwara A, Miyagawa H, Saruwatari J, Kita A, Sakata M, Kawata Y, et al. **Gender differences in the incidence and progression of diabetic retinopathy among Japanese patients with type 2 diabetes mellitus: A clinic-based retrospective longitudinal study.** Diabetes Res Clin Pract. 2014; 103(3):e7–10.

13. Romero-Aroca P, Baget-Bernaldiz M, Fernandez-Ballart J, Plana-Gil N, Soler-Lluis N, Mendez-Marin I, et al. **Ten-year incidence of diabetic retinopathy and macular edema. Risk factors in a sample of people with type 1 diabetes.** Diabetes Res Clin Pract. 2011; 94(1):126–32.

14. Jin P, Peng J, Zou H, Wang W, Fu J, Shen B, Bai X, Xu X, Zhang X. **The 5-year onset and regression of diabetic retinopathy in Chinese type 2 diabetes patients.** PLoS One. 2014 Nov 17; 9(11):e113359.

15. Niazi MK, Akram A, Naz MA, Awan S. **Duration of diabetes as a significant factor for retinopathy.** Pakistan Journal of Ophthalmology. 2010 Dec 31; 26(4).

16. Kajiwara A, Miyagawa H, Saruwatari J, Kita A, Sakata M, Kawata Y, Oniki K, Yoshida A, Jinnouchi H, Nakagawa K. **Gender differences in the incidence and progression of diabetic retinopathy among Japanese patients with type 2 diabetes mellitus: A clinic-based retrospective longitudinal study.** Diabetes research and clinical practice. 2014 Mar 1; 103(3):e7-10.

17. Memon S, Ahsan S, Riaz Q, Basit A, Sheikh SA, Fawwad A, Shera AS. **Frequency, severity and risk indicators of retinopathy in patients with diabetes screened by fundus photographs: A study from primary health care.** Pakistan journal of medical sciences. 2014 Mar; 30(2):366.

18. Mohamed Q, Gillies MC, Wong TY. **Management of diabetic retinopathy: A systematic review.** JAMA. 2007; 298(8):902–16.

19. Zehetner C, Kirchmair R, Kralinger M, Kieselbach G. **Correlation of vascular endothelial growth factor plasma levels and glycemic control in patients with diabetic retinopathy.** Acta ophthalmologica. 2013 Sep; 91(6):e470-3.

20. Thomas RL, Dunstan F, Luzio SD, Chowdury SR, Hale SL, North RV, Gibbins RL, Owens DR. **Incidence of diabetic retinopathy in people with type 2 diabetes mellitus attending the Diabetic Retinopathy Screening Service for Wales: Retrospective analysis.** Bmj. 2012 Feb 22; 344:e874.

AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Salman Tariq	Study concept, Planning, Manuscript writing.	
2	Mafaza Naseem	Manuscript study.	
3	M. Rizwan Khan	Manuscript writing, Critical review.	
4	M. Imran Janjua	Conception of study, Planning.	
5	Hurmat Fatima Azeem	Critical review.	
6	Fuad Ahmad Khan Niazi	Critical review.	