

HYPERTENSION AS A PREDICTOR OF DIABETIC RETINOPATHY AT A TERTIARY  
CARE HOSPITAL

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## ABSTRACT

**Background:** In the year 2000, there were around 171 million people with diabetes globally, and by 2030, it is estimated that this number would increase to 366 million. These microvascular complications are linked to the duration of diabetes mellitus, poor glycemic control and systolic hypertension. **Objective:** To determine the frequency diabetic retinopathy (DR) in diabetic patients with hypertension. **Subjects and Methods;** A total of 365 diabetic patients having hypertension were included in our study using non – probability consecutive sampling technique. These patients were screened for diabetic retinopathy. All the information was recorded in the proforma and data was analyzed by using SPSS version 22. **Results;** of these 365 study cases, 226 (61.9%) were male patients while 139 (38.1%) were female patients. Mean age of our study cases was  $50.92 \pm 5.77$  years (with minimum age of our study cases was 40 years while maximum age was 60 years). Of these 365 study cases, 127 (34.8%) belonged to rural areas and 238 (65.2%) belonged to urban areas. Monthly family income up to Rs. 25000 was noted in 188 (51.5%) and 177 (48.5%) had monthly family income rupees more than 25000. History of smoking was present in 89 (24.4%) of our study cases. Mean body mass index was  $26.32 \pm 2.45$  kg/m<sup>2</sup> and obesity was present in 112 (30.7%) of our study cases. Mean disease duration was  $12.35 \pm 7.52$  years and 239 (65.5%) had duration of illness more than 5 years. Of these 365 study cases, 238 (65.2%) were illiterate and 127 (34.8%) were literate. Controlled diabetes was noted in 75 (20.5%) and 75 (20.5%) were taking proper treatment. Diabetic retinopathy was 151 (41.4%) of our study cases. **Conclusion;** Very high frequency of diabetic retinopathy was noted in patients with diabetes and hypertension in our study. Diabetic retinopathy was significantly associated with residential status, increasing age, monthly family income, smoking, treatment status, disease duration and obesity. Diabetic retinopathy was not associated with control of diabetes and hypertension. All clinicians treating such patients must educate their patients regarding regular eye check up to decrease disease morbidity.

**KEYWORDS:** Diabetic retinopathy, hypertension, frequency.

## INTRODUCTION

Diabetes is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of different organs, especially eyes; kidneys, nerves, heart, and blood vessels.<sup>[1]</sup> There are three main types of diabetes mellitus (DM): Type I, Type II and gestational diabetes.<sup>[2]</sup> The multisystem complications of diabetes such as retinopathy, nephropathy, neuropathy and cardiovascular diseases are considered important, impinging on public health.<sup>[3]</sup> Diabetic nephropathy (DN) and diabetic retinopathy (DR) are arguably the two most dreaded complications of diabetes. Together they contribute to serious morbidity and mortality. As they progress to end-stage renal disease (ESRD) and blindness, they impose enormous medical, economic, and social costs on both the patient and the health care system. Because

nephropathy and retinopathy are frequently linked in patients.<sup>[4]</sup> Diabetic retinopathy, which is a common complication in diabetes, is characterized by retinal vascular leakage, inflammation and abnormal neovascularization.<sup>[5,6]</sup> DR is recognized as a leading cause of blindness and visual impairment in working-age adults in developed and developing countries. The World Health Organization (WHO) lists DR as a priority disease in their “VISION 2020” program initiative for the global elimination of avoidable blindness. Potential risk factors of DR include age, duration of diabetes, glycemic level, blood pressure, pregnancy and nephropathy.<sup>[7-9]</sup> However, risk reduction for DR with glucose and BP control in diabetic patients is limited. Diabetic retinopathy is a common complication of diabetes and a leading cause of visual impairment and blindness. Research has established the importance of blood glucose control to prevent development and progression of the ocular complications of diabetes.

Simultaneous blood pressure control has been advocated for the same purpose, but findings reported from individual studies have supported varying conclusions regarding the ocular benefit of interventions on blood pressure.<sup>[10,11]</sup> A large number of studies have evaluated the effect of elevated blood pressure on the development and progression of diabetic retinopathy and conversely, the effect of blood pressure reduction on preventing such progression. Among the more, notable was the UKPDS, which evaluated blood pressure reduction using either an angiotensin-converting enzyme inhibitor or a beta-adrenergic blocker, in conjunction with other drugs as needed to reduce blood pressure, by comparison with controls, who received no antihypertensive medication, in type 2 diabetics. Most of these patients were hypertensive (systolic blood pressure more than 150 mm Hg) at the outset of the study. Reduction of blood pressure by either drug prevented retinopathy progression. Other studies, some with diabetic patients who were normotensive at the outset, showed little or no effect of blood pressure reduction. The Action to Control Cardiovascular Risk in Diabetes (ACCORD)-Eye Study, for example, showed that blood pressure reduction in type 2 diabetic patients had no effect on the development or progression of diabetic retinopathy.<sup>[12]</sup> A study from Jordan conducted by Al Amer et al,<sup>[13]</sup> reported 38.7% diabetic retinopathy in diabetic patients having hypertension. Diabetic retinopathy leads to significant morbidity and affects functional status of the main work force of the society. Previous studies have reported that control of diabetes and blood pressure can lead to improvement in visual outcomes.

## MATERIALS AND METHODS

A total of 365 patients with Type 2 diabetes mellitus and hypertension aged up to 60 years of either sex were enrolled in our descriptive cross-sectional study. Patients underwent any form of retinal surgery / laser therapy, on ACE-inhibitors or ARBs, Kidney disease (Nephrotic syndrome, Nephritic Syndrome) not related with diabetes, patient having cataract were excluded from our study. A total of 365 type 2 diabetic hypertensive patients presenting in Diabetes OPD fulfilling the inclusion criteria were selected from Diabetes outdoor clinic of Nishtar Hospital Multan. Once registered, all patients had undergone retinal imaging using Non Mydriatic Fundus Camera (NIDEK® Model # AFC-330). All retinal images were interpreted and reported by consultant ophthalmologist from department of ophthalmology Nishtar Hospital Multan. Collected Data was entered into SPSS version 22 and was analyzed through its statistical package. Descriptive statistics was used to analyze the data. Mean  $\pm$ S.D. was calculated for age of the patients, height, weight and BMI. Frequencies and percentages were calculated for qualitative variables like gender, DR, obesity, history of smoking, regular eye checkup, level of education, residential status and monthly family income.

## RESULTS

Our study comprised of a total of 365 patients meeting inclusion criteria of our study. Of these 365 study cases, 226 (61.9%) were male patients while 139 (38.1%) were female patients. Mean age of our study cases was  $50.92 \pm 5.77$  years (with minimum age of our study cases was 40 years while maximum age was 60 years). Mean age of the male patients was noted to be  $51.49 \pm 5.20$  years while that female patients was  $50.00 \pm 6.38$  years ( $p=0.016$ ). Our study results have indicated that majority of our study cases i.e. 190 (52.1%) were aged more than 50 years. Of these 365 study cases, 127 (34.8%) belonged to rural areas and 238 (65.2%) belonged to urban areas. Monthly family income up to Rs. 25000 was noted in 188 (51.5%) and 177 (48.5%) had monthly family income rupees more than 25000. History of smoking was present in 89 (24.4%) of our study cases. Mean body mass index of our study cases was  $26.32 \pm 2.45 \text{ kg/m}^2$  and obesity was present in 112 (30.7%) of our study cases. Mean disease duration was  $12.35 \pm 7.52$  years and 239 (65.5%) had duration of illness more than 5 years.

Of these 365 study cases, 238 (65.2%) were illiterate and 127 (34.8%) were literate. Controlled diabetes was noted in 75 (20.5%) and 75 (20.5%) were taking proper treatment while none of them had undergone regular eye checkup. Diabetic retinopathy was 151 (41.4%) of our study cases.

## DISCUSSION

In the year 2000, there were around 171 million people with diabetes globally, and by 2030, it is estimated that this number would increase to 366 million. As the number of persons with diabetes increases, the development of microvascular complications like retinopathy, nephropathy and neuropathy also rises. These microvascular complications are linked to the duration of diabetes mellitus, poor glycemic control and systolic hypertension. The magnitude of damage caused by these microvascular complications of diabetes stresses the need for sensitive markers of screening for retinopathy and nephropathy.<sup>[14-16]</sup> Our study comprised of a total of 365 patients meeting inclusion criteria of our study. Of these 365 study cases, 226 (61.9%) were male patients while 139 (38.1%) were female patients. A study conducted in India by Thakkar et al<sup>[17]</sup> reported 57% male patients' predominance, these findings are similar to that of our study results. Salem et al<sup>[18]</sup> reported male gender predominance over female patients i.e. 54.14% male patients, these findings are similar to that of our study results. Rani et al.<sup>[14]</sup> reported 52.2% male patients which is same as that of our study results. Mean age of our study cases was  $50.92 \pm 5.77$  years (with minimum age of our study cases was 40 years while maximum age was 60 years). Mean age of the male patients was noted to be  $51.49 \pm 5.20$  years while that female patients was  $50.00 \pm 6.38$  years ( $p=0.016$ ). Our study results have indicated that majority of our study cases i.e. 190

(52.1%) were aged more than 50 years. Rani et al,<sup>[14]</sup> reported  $58.6 \pm 9.6$  mean age, these findings are close to that of our study results. Nisar et al.<sup>[19]</sup> reported  $52.18 \pm 8.99$  years which is similar to that of our study results. Jamil et al.<sup>[20]</sup> reported  $50.95 \pm 10.12$  years mean age, these findings are also in compliance with that of ours. Thakkar et al.<sup>[17]</sup>  $61.91 \pm 9.16$  which is quite higher than our study results, the reason for this disparity is that we only included patients ranging from 40-60 years of age. Similar results have been reported by Jamil et al.<sup>[20]</sup> Of these 365 study cases, 127 (34.8%) belonged to rural areas and 238 (65.2%) belonged to urban areas. Monthly family income up to Rs. 25000 was noted in 188 (51.5%) and 177 (48.5%) had monthly family income rupees more than 25000. History of smoking was present in 89 (24.4%) of our study cases. Mean body mass index of our study cases was  $26.32 \pm 2.45$  kg/m<sup>2</sup> and obesity was present in 112 (30.7%) of our study cases. Of these 365 study cases, 238 (65.2%) were illiterate and 127 (34.8%) were literate. Mean disease duration was  $12.35 \pm 7.52$  years and 239 (65.5%) had duration of illness more than 5 years. Crimi et al<sup>[21]</sup> reported  $14.7 \pm 7.1$  years mean duration of diabetes in diabetic retinopathy, these results are close to that of our study results. Rani et al<sup>[85]</sup> 6.6 years mean disease duration among targeted population. These findings are quite lower than that of our study results. Controlled diabetes was noted in 75 (20.5%) and 75 (20.5%) were taking proper treatment while none of them had undergone regular eye checkup. Similar results have by reported by Rani et al.<sup>[14]</sup> and Thakkar et al.<sup>[17]</sup> Diabetic retinopathy was 151 (41.4%) of our study cases. A study from Jordan conducted by Al-Amer et al.<sup>[13]</sup> reported 38.7% diabetic retinopathy in diabetic patients having hypertension which is close to our study results. A study conducted by Rehman et al.<sup>[22]</sup> reported 58% diabetic retinopathy among hypertensive patients which is close to our study results.

## CONCLUSION

Very high frequency of diabetic retinopathy was noted in patients with diabetes and hypertension in our study. Diabetic retinopathy was significantly associated with residential status, increasing age, monthly family income, smoking, treatment status, disease duration and obesity. Diabetic retinopathy was not associated with control of diabetes and hypertension. All clinicians treating such patients must educate their patients regarding regular eye check up to decrease disease morbidity.

## REFERENCES

- American Diabetes Association. "Diagnosis and classification of diabetes mellitus." *Diabetes Care*, 2014; 37(1): S81-S90.
- Ludwig J, Sanbonmatsu L, Gentian L, Adam E, Duncan GJ, Katz LF. Neighborhoods, obesity, and diabetes--a randomized social experiment. *N Eng J Med.*, 2011 Oct 20; 365(16): 1509-19.
- Boussageon R, Bejan-Angoulvant T, Saadatian-Elahi M, Lafont S, Bergeonneau C, Kassai B. Effect of intensive glucose lowering treatment on all-cause mortality, cardiovascular death, and microvascular events in type 2 diabetes: meta-analysis of randomized controlled trials. *BMJ.*, 2011 Jul 26; 343: d4169.
- Crawford TN, Alfaro DV 3rd, Kerri son JB, Jalon EP. Diabetic retinopathy and angiogenesis. *Cur Diabetes Rev.*, 2009 Feb; 5(1): 8-13.
- Antoinette DA, Klein R, Gardner TW. Diabetic retinopathy. *N Engl J Med.*, 2012; 366(13): 1227-39.
- Zhang K, Zhang L, Weiner RN. Ophthalmic drug discovery: novel targets and mechanisms for retinal diseases and glaucoma. *Nat Rev Drug Disco.*, 2012; 11(7): 541-59.
- Cain X, Han X, Zhang S, Lou Y, Chen Y, Jib L. Age at diagnosis and C-peptide level are associated with diabetic retinopathy in Chinese. *PLoS One.*, 2014; 9(3): e91174. doi: 10.1371/journal.pone.0091174.
- Yang JY, Kim NK, Lee YJ, Noh JH, Kim DJ, Koi KS, et al. Prevalence and factors associated with diabetic retinopathy in a Korean adult population: the 2008-2009 Korea National Health and Nutrition Examination Survey. *Diabetes Res Clin Pract.*, 2013; 102(3): 218-24. doi: 10.1016/j.diabres.2013.10.016.
- Yang L, Wu Q, Li Y, Fan X, Halo Y, Sun H, et al. Association of the receptor for advanced glycation end products gene polymorphisms and circulating RAGE levels with diabetic retinopathy in the Chinese population. *J Diabetes Res.*, 2013; 2013: 264579. doi: 10.1155/2013/264579.
- Do DV<sup>1</sup>, Wang X, Medulla SS, Maroni M, Leilani G, Hawkins BS, et al. Blood pressure control for diabetic retinopathy. *Cochrane Database Syst Rev.*, 2015 Jan 31; 1: CD006127. doi: 10.1002/14651858.CD006127.pub2.
- Crosby-Naomi R<sup>1</sup>, Chatziralli I<sup>2</sup>, Sergentanis T<sup>3</sup>, Dew T<sup>2</sup>, Forbes A<sup>4</sup>, Sivaprasad S<sup>1</sup>. Cross talk between lipid metabolism and inflammatory markers in patients with diabetic retinopathy. *J Diabetes Res.*, 2015; 2015: 191382. Doi: 10.1155/2015/191382.
- Chew EY, Davis MD, Danies RP, Novato JF, Perdue LH, Graven C, et al. The effects of medical management on the progression of diabetic retinopathy in persons with type 2 diabetes: the action to control cardiovascular risk in diabetes (ACCORD) eye study. *Ophthalmology*, 2014 Dec; 121(12): 244351.
- Al-Amer RM, Khaddar Y, Males S, Abu-Yagi N, Al-Dour M, Alone K. Prevalence and risk factors of diabetic retinopathy among Jordanian patients with type 2 diabetes. *Digital J Ophthalmol*, 2008; 14(2): DOI. <http://www.djo.harvard.edu/print.php?url=/physicians/oa/1204&print=1>.
- Rani PK, Raman R, Gupta A, Pal SS, Kulothungan V, Sharma T. Albuminuria and Diabetic Retinopathy in Type 2 Diabetes Mellitus Ankara Nethralaya Diabetic Retinopathy Epidemiology And Molecular Genetic Study (SN-DREAMS, report 12). *Diabetol*

- Metab Syndr, 2011 May 25; 3(1): 9. doi: 10.1186/1758-5996-3-9.
15. Unnikrishnan RI, Ream M, Pradeep R, Deepak M, Shanthirani CS, Deepa R, Mohan V. Prevalence and risk factors of diabetic nephropathy in an urban South Indian population: the Chennai Urban Rural Epidemiology Study (CURES 45). *Diabetes Care*, 2007; 30: 2019-24.
  16. Chang CH, Chuang LM<sup>1</sup>. Microalbuminuria and diabetic retinopathy in type 2 diabetic patients: From risk association to risk prediction. *J Diabetes Investing*, 2013; 4(1): 42-4.
  17. Thakkar B, Arora K, Vekariya R, Lulania M, Agnihotri AS. Prevalence of microalbuminuria in newly diagnosed patients with type II diabetes. *NIJRM*, 2011; 2(4): 22-5.
  18. Salem MK, Asher SA, Husain SJ. Frequency of diabetic retinopathy and microalbuminuria in newly diagnosed patients and their association with each other. *Pak J Med Health Sci.*, 2010; 4(4): 479-83.
  19. Nisar S, Marten F, Masood F. Frequency of retinopathy in type II diabetic patients with or without microalbuminuria. *Pak J Med Health Sci.*, 2010; 4(4): 479-83.
  20. Jamil K, Iqbal Y, Zia S, Khan QA. Frequency of Retinopathy in Newly Diagnosed patients of Type-2 Diabetes Mellitus. *Pak J Ophthalmol*, 2014; 30(1): 38-41.
  21. Crime S<sup>1</sup>, Cipolin D, Infantine E, Infantine L, Lunette M. Micro albuminuria and severity of diabetic retinopathy in type 1 diabetic patients: association and relationship with some risk factors. *Diabetes Metab.*, 1995 Dec; 21(6): 440-5.
  22. Rahman S, Nawaz R, Khan GJ, Amir AH. Frequency of diabetic retinopathy in hypertensive diabetic patients in a tertiary care hospital of Peshawar, Pakistan. *J Aye Med Cull Abbottabad*, 2011 Apr Jun; 23(2): 133-5.