

Commentary: Predictors of development and progression of diabetic retinopathy: A precis

Diabetes mellitus (DM) has become a global health and economic problem. India has been deemed as the world capital of diabetes. Diabetic retinopathy (DR) has been emerging as a significant noncommunicable disease, causing blindness and ocular morbidity. As per the recent National Blindness and Visual Impairment Survey, India, DR is one of the major causes of blindness in the population of ≥ 50 years of age.^[1] The risk factors of DR have mainly been attributed to poor glycemic control and longer duration of DM. However, development of DR despite good glycemic control implies that there are other risk factors in play for the development and progression of DR.^[2] A better understanding of such risk factors is of great importance to prevent its occurrence. Apart from high blood sugar, other modifiable risk factors are high blood pressure (BP), obesity, uncontrolled serum lipid levels, and anemia. Age, sex, and duration of DM are the nonmodifiable risk factors.^[3]

Younger age at diagnosis of DM is an independent risk factor for development of DR and sight-threatening DR (STDR). These patients have a longer exposure to hyperglycemia, which leads to a higher prevalence of and more severe microvascular complications, such as diabetic retinopathy (DR) and mortality.^[4] In a recent study, Parameswarappa *et al.* concluded that early-onset DM has a higher risk for development of STDR.^[5] It has been found that older age is associated with low incidence of DR, which may be explained by the fact that blood sugar management is better in older population than those with type 1 DM. However, STDR was found to be more prevalent in the older population.^[6] This may be explained by the associated comorbidities such as hypertension and hyperlipidemia in the older population.

High BP has been associated with a significantly higher incidence of DR and STDR.^[2,3,6] In eyes with DR, the microvascular damage caused by hyperglycemia makes the retina vulnerable to hyperperfusion damage and shearing injury caused by high BP. Therefore, controlling BP will help in avoiding exaggerated injury to the blood vessels from hypertension and subsequently preventing the development

and progression of DR.^[2] Increase in both the systolic as well as diastolic BP has been implicated in the progression of DR.^[2,4,6]

Association between the incidence or progression of DR and various serum lipid parameters are not found to be consistent.^[2-4,7] Evidence links serum levels of total cholesterol, low-density lipoprotein cholesterol (LDL), and triglycerides (TG) to the presence of retinal hard exudates as hard exudates often form due to leakage of lipids from the abnormal retinal capillaries.^[2] High total cholesterol level has been found to be associated with high risk for development of clinically significant macular edema.^[7] Elevated total cholesterol, LDL, and TG levels have been variedly implicated by different authors in the development of DR and its progression into STDR.^[3,4,6] Interestingly, high-density lipoprotein cholesterol (HDL), which has been traditionally known as "good cholesterol," has been found to be associated with high incidence of DR and diabetic macular edema (DME) but not with the severity of DR.^[3,4] However, other studies have established a beneficial effect of HDL on development of DME and proliferative DR.^[7]

Anemia hampers the body's ability to deliver oxygen to the retinal tissues and exaggerates the retinal microvascular hypoxia already present due to DR. There is an increased risk of DR progressing into STDR in presence of anemia and other diseases such as chronic obstructive pulmonary disease and hematological malignancies, which interfere with adequate oxygenation.^[8] The associations of alcohol intake and development of DR is inconsistent. A meta-analysis showed that alcohol intake was not associated with an increased risk of developing DR.^[9] The role of smoking as a potential risk factor for DR has been well-established in patients with type 1 DM, but its role is disputed in patients with type 2 DM. However, this finding does not undermine the importance of smoking cessation as smoking is an important risk factor for cardiovascular morbidity and mortality in patients with diabetes.^[10]

Improvement in healthcare facilities has led to an increase in the average lifespan. The general public in Indian should be sensitized about the modifiable risk factors for development of DR and STDR. A robust screening mechanism has to be implemented with interdisciplinary coordination between endocrinologists and ophthalmologists to detect DR in early stages and provide proper treatment.

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References

1. Available from: <https://npcbvi.gov.in/writeReadData/mainlinkFile/File341.pdf>. [Last accessed on 2021 Aug 24].
2. Cardoso CRL, Leite NC, Dib E, Salles GF. Predictors of development and progression of retinopathy in patients with type 2 diabetes: Importance of blood pressure parameters. *Sci Rep* 2017;7:4867.
3. Shrotr AP, Diagavane S. Clinical evaluation of correlation between diabetic retinopathy with modifiable, non-modifiable and other independent risk factors in tertiary set-up in central rural India. *J Clin Diagn Res* 2015;9:NC10-14.
4. Wang Y, Lin Z, Zhai G, Ding X, Wen L, Li D, *et al*. Prevalence of and risk factors for diabetic retinopathy and diabetic macular edema in patients with early and late onset diabetes mellitus. *Ophthalmic Res* 2020. doi: 10.1159/000508335.
5. Parameswarappa DC, Rajalakshmi R, Mohamed A, Kavya S, Munirathnam H, Manayath G, *et al*. Severity of diabetic retinopathy and its relationship with age at onset of diabetes mellitus in India: A multicentric study. *Indian J Ophthalmol* 2021;69:3255-61.
6. Liu Y, Yang J, Tao L, Lv H, Jiang X, Zhang M, *et al*. Risk factors of diabetic retinopathy and sight-threatening diabetic retinopathy: A cross-sectional study of 13 473 patients with type 2 diabetes mellitus in mainland China. *BMJ Open* 2017;7:e016280.
7. Klein BE, Myers CE, Howard KP, Klein R. Serum lipids and proliferative diabetic retinopathy and macular edema in persons with long-term type 1 diabetes mellitus: The Wisconsin Epidemiologic Study of Diabetic Retinopathy. *JAMA Ophthalmol* 2015;133:503-10.
8. Li Y, Yu Y, VanderBeek BL. Anaemia and the risk of progression from non-proliferative diabetic retinopathy to vision threatening diabetic retinopathy. *Eye (Lond)* 2020;34:934-41.
9. Zhu W, Meng YF, Wu Y, Xu M, Lu J. Association of alcohol intake with risk of diabetic retinopathy: A meta-analysis of observational studies. *Sci Rep* 2017;7:4.
10. 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;62:299-306.

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