

Risk factors of diabetic retinopathy in patients with type 2 diabetes mellitus

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ABSTRACT

Aim: To investigate the association of systolic, diastolic hypertension, older age, longer duration of diabetic state, poorly controlled blood sugar (HbA1c) with diabetic retinopathy in patients of type 2 DM. **Methodology:** This is a case control study in which 1000 patients coming to Ophthalmology Department of Post Graduate Institute of Medical Sciences, Rohtak (a tertiary care hospital in India) were included. To avoid the influence of nephropathy, the patients with proteinuria were excluded from the study. Age for sample size ranges between 40–80 years. These 1000 patients were divided into two groups – group A with patients having diabetic retinopathy and group B with patients not having diabetic retinopathy. Systolic and diastolic blood pressure, fasting blood sugar, random blood sugar, HbA1c were investigated. **Results:** In our study, we found that patients with DR were having higher systolic BP than patients without DR (138 ± 14 vs. 126 ± 15 , $P < 0.001$). However no statistically significant variation was found in diastolic BP of both the groups. The mean age of patients with DR was significantly higher ($P < 0.001$) in comparison to patients without DR (58 ± 8 vs. 54 ± 7 years). A significant difference was observed in the mean duration of diabetes (12 ± 5 vs. 8 ± 5 years, $P < 0.001$) between patients with DR and diabetics without retinopathy. The % of HbA1c measured in DR patients was significantly higher than non-DR patients evidencing the fact that long term poor control of blood sugar levels had adverse effect on retina (8.16 ± 0.52 vs. 7.04 ± 0.32). **Conclusions:** Our study evidence that DR is significantly associated with older age, longer duration of diabetic state, poorly controlled blood sugar (HbA1c) and systolic hypertension.

Introduction

Diabetes mellitus (DM) is a major public health problem. 422 million people all around the world are suffering from DM and 69.2 million people among them live in India [1]. Due to increasing prevalence, lots of research is being conducted to decrease the morbidity and mortality due to DM. Thus, life expectancy of patients suffering from DM is gradually increasing which increases the chances of complications. Thus, DM is known to have been associated with a long list of complications and dysfunction of various organs especially eyes, kidneys, nerves, heart and blood vessels [2]. Among all those complications, diabetic retinopathy (DR) is the leading cause of

blindness among working age population [3]. In a study conducted by All India Ophthalmological Society of India in 2014, the prevalence of DR was found as 21.7% [4], with reported prevalence of diabetic retinopathy in India ranging from 7.03% to 25%. [5-10] Blindness due to DR has a significant impact on patients' quality of life, and can compromise their ability to manage their disease successfully, which can in turn have a negative impact on the incidence of other diabetic complications and overall life expectancy [11]. DR is also a key indicator of other systemic microvascular complications like diabetic neuropathy and diabetic nephropathy. Thus, it is crucial to study the risk factors for the development of diabetic retinopathy so that

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KEYWORDS

- diabetes mellitus
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- systolic & diastolic blood pressure
- HbA1C

necessary control measures can be taken in DM patients with these risk factors to prevent the development of DR at early stages. This in turn would result in early detection and decreased risk of other complications of DM.

Methodology

This is a case control study at a single tertiary care center of India - Post Graduate Institute of Medical Sciences, Rohtak, Haryana. Ethical clearance was obtained prior to the start of study. Total 1000 patients coming to Ophthalmology Department of Post Graduate Institute of Medical Sciences, Rohtak (a tertiary care hospital in India) were included. To avoid the influence of nephropathy, the patients with proteinuria were excluded from the study. Patients were informed about the study procedure, privacy, confidentiality and voluntary participation in the study following which a written informed consent was obtained (TABLE 1).

■ Procedure

These 1000 patients were examined by fundoscopy and the fundoscopic finding was verified with slit-lamp biomicroscopy with 90D lens. Thus, based on the results of fundoscopic examination, all the patients were divided into two groups –

1. Group A with patients having diabetic retinopathy
2. Group B with patients not having diabetic retinopathy.

Systolic and diastolic blood pressure of all the patients were measured twice in the sitting position with a mercury sphygmomanometer. Fasting blood sugar, random blood sugar, Hba1c were investigated in both the groups.

■ Analysis

The data collected was entered into a Microsoft Excel spread sheet and statistical analysis was performed using Statistical Package for Social Sciences (SPSS) Version 23.0. Inter group comparison of continuous and categorical

variables was performed using student’s t-test. Correlation of risk factors to DR was evaluated by odd ratio. For all test, significance level was kept at p<0.05.

Results

■ Systolic BP

Mean systolic BP of patients with diabetic retinopathy was 138 ± 14 mm of Hg while that of patients without diabetic retinopathy was significantly lower i.e. 126 ± 15 mm of Hg. This evidenced the fact that systolic BP is higher in patients of diabetic retinopathy.

■ Diastolic BP

Mean diastolic BP of patients with diabetic retinopathy was 88 ± 16 mm of Hg while that of patients without diabetic retinopathy was significantly lower i.e. 87 ± 11 mm of Hg. Thus, diastolic BP also followed the systolic BP of being higher in patients with diabetic retinopathy.

■ Fasting blood sugar

Mean blood sugar of patients with diabetic retinopathy was 188 ± 59 gm/dL while that of patients without diabetic retinopathy was lower i.e. 174 ± 62 gm/dL.

■ HbA1C levels

Mean HbA1C levels of patients with diabetic retinopathy was 8.16 ± .52 while that of patients without diabetic retinopathy was lower i.e. 7.04 ± .32 mm. This evidenced that patients with poor control on blood sugar over a long period of time has higher chances of developing diabetes related complications (TABLE 2).

Discussion

TM Arbab et al. in his study found significant correlation when diabetic retinopathy was correlated with systolic hypertension (P<0.02) and diastolic hypertension (P<0.007) as these are major factors but no significant correlation was found when diabetic retinopathy was correlated with age of the patient, duration of diabetes

Group	Gender		Age (in years)		Duration of diabetes (in years)	
	Male	Female	Mean	Standard Deviation	Mean	Standard Deviation
A	240	260	58	8	12	5
B	245	255	54	7	8	5

Table 2. Observed mean blood pressure, fasting blood sugar and glycated haemoglobin values in diabetic retinopathy and non diabetic retinopathy subjects

Group	Systolic BP		Diastolic BP		Fasting Blood Sugar		HbA1c	
	(in mm of Hg)		(in mm of Hg)		(in gm/dL)		(in % of Hb)	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
A	138	14	88	16	188	59	8.16	0.52
B	126	15	87	11	174	62	7.04	0.32

mellitus, fasting blood sugar and HbA1C because of small sample size [12]. Ishihara et al. also studied association of various risk factors with diabetic retinopathy and found significant correlation of systolic hypertension ($P < 0.01$), age of the patient ($P < 0.05$), duration of diabetes mellitus ($P < 0.001$), HbA1C ($P < 0.001$) but not diastolic pressure [13]. Van Leiden et al. did similar study on diabetic retinopathy correlating with age of patient ($P < 0.03$), HbA1C ($P < 0.03$) and fasting blood sugar ($P < 0.08$), systolic hypertension ($P < 0.02$) but correlation of diabetic retinopathy with diastolic hypertension was not significant [14]. In our study, we found that patients with DR were having higher systolic BP than patients without DR (138 ± 14 vs. 126 ± 15 , $P < 0.001$). However no statistically significant variation was found in diastolic BP of both the groups. The mean age of patients with DR was significantly higher ($P < 0.001$) in comparison to patients without DR (58 ± 8 vs. 54 ± 7 years). A significant difference was observed in the mean duration of diabetes (12 ± 5 vs. 8 ± 5 years, $P < 0.001$) between patients with DR and diabetics without retinopathy. The % of HbA1C measured in DR patients was significantly higher than non-DR patients evidencing the fact that long term poor control of blood sugar levels had

adverse effect on retina (8.16 ± 0.52 vs. 7.04 ± 0.32).

Conclusions

Our research results clearly evidence the fact that DR is significantly associated with older age, longer duration of diabetic state, poorly controlled blood sugar (HbA1c), systolic hypertension. Early screening and control of these risk factors can significantly help in reduction of prevalence and mortality caused by DR. Early and timely investments in prevention, awareness and care of patients having these risk factors can dramatically improve the quality of life of patients with long-standing diabetes and may prevent disability from blindness caused by DR.

Authors Contribution

Mohit Goyal - Conducted the examination and wrote the article.

Poonam Kamboj – Did the final editing.

Jai Behgal – Reviewed the literature and provided the needed articles.

Shailesh Rathi – Reviewed the literature and provided the needed articles.

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