

# Study of prevalence and risk factors of diabetic retinopathy in type 2 diabetic patients

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## Abstract

**Background:** Type 2 diabetes mellitus (DM) is a group of disorders characterized by hyperglycemia and associated micro vascular (retinal, renal, possibly neuropathic), macro vascular (coronary, peripheral vascular), and neuropathic (autonomic, peripheral) complications. Diabetic retinopathy is a leading cause of visual impairment among diabetic patients. **Aim and Objectives:** To Study of prevalence and risk factors associated with diabetic retinopathy in type 2 diabetic patients. **Material and Methods:** It's a hospital based, cross-sectional, descriptive study among patients of type 2 diabetes mellitus (DM) of both genders irrespective of duration of diabetes, more than 30 years of age attending ophthalmology OPD of tertiary health care centre. The sample size for the study considered was 250. **Results:** Mean age of the patients was  $49.04 \pm 6.9$  years. Females were slightly predominant (n=137, 54.8%) as compared to males with M:F ratio of 1:1.21. Diabetic retinopathy was diagnosed in about 1/4th patients (n=61, 24.4%) while, males were found to have higher frequency of retinopathy (n=35/113, 30.97%) as compared to females (n=26/137, 18.97%). **Summary and Conclusions:** Diabetic retinopathy was found to be significantly associated with male gender, duration of diabetes, older age, high cholesterol, high LDL, albuminuria and insulin therapy. Persistently raised HbA1c level mostly associated with diabetic retinopathy.

**Key Words:** Diabetes mellitus, Glycosylated Haemoglobin.

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## INTRODUCTION

Diabetes is a metabolic disorder, with environmental and hereditary factors playing an important role in its pathogenesis.<sup>1</sup> The epidemic of diabetes mellitus (DM), in particular type 2 DM, is assuming significant proportions in developing countries, such as India.<sup>2</sup> The International Diabetes Federation (IDF) has projected that the number of people with diabetes in India would rise from 65.1

million in 2013 to 109 million in 2035. It is clear that, as the number of diabetics will increase tremendously in near future, the complications will also increase proportionately.<sup>3</sup> Diabetic retinopathy (DR) is one of the most serious ocular complications of diabetes. The disease progresses from mild non-proliferative diabetic retinopathy to proliferative stage, which can ultimately lead to blindness if no measures are taken in time. DR is an important cause of blindness in the productive population all over the world. Presence and progression of diabetic retinopathy depends on certain factors. These risk factors can be either non-modifiable risk factors like age, gender, ethnicity, nephropathy, hypothyroidism, duration of diabetes, pregnancy, family history etc., or modifiable like glycaemic control, hypertension, hyperlipidaemia, smoking, obesity, anaemia, alcohol consumption, hypomagnesaemia, body mass index (BMI) etc.<sup>4</sup> Diabetic retinopathy is a leading cause of visual impairment among diabetic patients. There are many reports from various countries about incidence and

prevalence of diabetic retinopathy and the risk factors associated with this condition. A study on large number of diabetics having retinopathy (n=7577) from Asia found duration of disease, elevated blood glucose levels and high blood pressure as independent risk factors.<sup>5</sup> The HbA1c (glycosylated haemoglobin) test is currently one of the best ways to check the control of diabetes. Intensive glycemetic control for long duration (HbA1c levels normal or near normal) reduces the risk of retinopathy significantly. Intensive therapy is most effective when initiated early in the course of the diabetes, demonstrating a beneficial effect over the course and progression of retinopathy.<sup>6,7</sup>

**Operational Definitions:** Diabetic retinopathy: A diagnosis of diabetic retinopathy will be established if the subject has a minimum of one micro aneurysm in any field, or showing hemorrhages (dot and blot, or flame shaped), or maculopathy (with or without clinically significant edema). High glycosylated hemoglobin (HbA1c): Value of glycosylated hemoglobin more than 7% will be taken as high.

### MATERIAL AND METHODS

It's a hospital based, cross-sectional, descriptive study among patients of type 2 diabetes mellitus (DM) of both genders irrespective of duration of diabetes, more than 30 years of age attending ophthalmology OPD of tertiary health care centre were included this study. Study was conducted from January 2016 to December 2016 for a period of one year. Patients of type 1 DM, Known cases of retinopathy which may be due to causes other than DM and value of HbA1c less than 7% were excluded. The sample size for the study considered was 250. Purposive Sampling technique was used for this study. The study was approved by the institutional ethical committee. The patients were explained in detail the purpose of the study by the interviewer. No patient showed any reluctance in participation. After taking written and verbal consent from the patients, a structured proforma containing demographic features, duration of DM, oral or insulin therapy was filled. Blood samples were collected for analysis of HbA1c, serum total cholesterol and LDL cholesterol. HbA1c was measured by Boronate affinity chromatography (Clover A1c). Total and LDL cholesterol were measured by automated chemistry analyzer. A detailed fundus examination was performed by slit lamp bio microscopy.

**Data analysis:** Data was analyzed using Statistical Package for the Social Sciences version 20.0 (SPSS 20.0). A p-value < 0.05 was taken as statistically significant. The results were evaluated using frequencies, proportions and group means. The frequencies and percentages were

calculated for all the qualitative data including gender, age group, and diabetic retinopathy.

### RESULTS AND OBSERVATIONS

Mean age of the patients was 49.04 ± 6.9 years. Females were slightly predominant (n=137, 54.8%) as compared to males (M: F ratio 1:1.21). Diabetic retinopathy was diagnosed in about 1/4th patients (n=61, 24.4%) i.e. prevalence of diabetic retinopathy among type 2 diabetic patients from our study found to be 24.4%.

**Table 1:** Comparison of HbA1c in diabetic patients having retinopathy

|       | Retinopathy | N   | Mean  | SD   | SEM  |
|-------|-------------|-----|-------|------|------|
| HbA1c | Yes         | 61  | 8.16% | 1.11 | 0.13 |
|       | No          | 189 | 8.89% | 1.44 | 0.10 |

Mean HbA1c was 8.53 ± 0.08 percent. A majority of patients was literate (n=159, 63.9%) as compared to illiterate (n=91, 36.1%), similarly 151 patients (60.3%) had good socioeconomic status as compared to poor patients (n=99, 39.7%). It was found that patients (n=85, 33.9%) were counselled by the treating doctor about compliance to medication and complications of diabetes mellitus if poorly controlled, as compared to 165 (66.1%) patients who were just prescribed treatment without counselling. Family cooperation was noted in 183 (73.2%) patients. History of Hakeem medication was found in 96 (38.4%) patients. As shown in Table-01, there was no statistical difference of mean HbA1c among the patients who had diabetic retinopathy or not (p = 0.08).

**Table 2:** Association of duration of diabetes with development of retinopathy

| Variable       | N   | Mean duration in years | SD  | SEM  |
|----------------|-----|------------------------|-----|------|
| Retinopathy    | 61  | 15.8                   | 7.8 | 0.91 |
| No Retinopathy | 189 | 4.7                    | 3.1 | 0.20 |

Mean duration of diabetes mellitus who had developed retinopathy was 15.8 ± 0.903 years as compared to 4.7 ± 0.197 years who had not developed retinopathy yet. Independent Samples t Test was applied and a statistically significant difference (0.0001) was calculated as shown in Table-2. Although there was slight female preponderance among type 2 diabetics however, males were found to have higher frequency of retinopathy (n=35/113, 30.97%) as compared to females (n=26/137, 18.97%). Similarly, high serum total cholesterol, high serum LDL-cholesterol, presence of albuminuria and insulin therapy were found to have significant associations with the development of diabetic retinopathy as shown in Table-03. Chi square was applied which revealed significant difference (p = 0.021) between the two genders.

**Table 3:** Association of various risk factors with diabetic retinopathy

| Risk Factors             | Diabetic Retinopathy |            | P-value       |
|--------------------------|----------------------|------------|---------------|
|                          | Frequency            | Percentage |               |
| <b>Gender</b>            |                      |            |               |
| Male                     | 35/113               | 30.97%     | 0.021         |
| Female                   | 26/137               | 18.97%     |               |
| <b>Age</b>               |                      |            |               |
| </= 49 years             | 12/136               | 8.82%      | <b>0.0001</b> |
| >49 years                | 49/114               | 42.98%     |               |
| <b>Total cholesterol</b> |                      |            |               |
| Normal                   | 16/99                | 16.16%     | 0.011         |
| High                     | 45/151               | 29.80%     |               |
| <b>LDL Cholesterol</b>   |                      |            |               |
| Normal                   | 27/165               | 16.36%     | <b>0.0001</b> |
| High                     | 34/85                | 40.00%     |               |
| <b>Albuminuria</b>       |                      |            |               |
| Absent                   | 12/161               | 7.45%      | <b>0.0001</b> |
| Present                  | 49/89                | 55.05%     |               |
| <b>Therapy</b>           |                      |            |               |
| Insulin                  | 41/62                | 66.12%     | <b>0.001</b>  |
| Oral hypoglycemics       | 20/188               | 10.63%     |               |

## DISCUSSION

Diabetes mellitus is a global problem and diabetic retinopathy is a common complication of this systemic disorder. In the present study, prevalence of diabetic retinopathy among type 2 diabetic patients was found to be 24.4% while, its overall global prevalence is 34.6% (range = 17.99% – 51.2%).<sup>8</sup> Diabetes mellitus, being a lifestyle disease, is on the rise in urban areas; we reported that the prevalence of DM in the population older than 40 years, in urban India, was around 28%.<sup>9</sup> However, in a study carried out in South India where the population was hybrid, both rural and urban, the prevalence of DM was around 11%.<sup>10</sup> In our study, there is no significant association of retinopathy with single high HbA1c level among patients of type 2 diabetes. It is common observation that most of the patients of type 2 diabetes have high HbA1c levels at the time of diagnosis of the disease but they have no retinopathy at that time. Persistent elevation in serum glucose (HbA1c) increases the risk for the long-term vascular complications of diabetes such as retinopathy.<sup>11</sup> Many of the other studies have also identified the duration of diabetes as the major risk factor of the development of diabetic retinopathy.<sup>12</sup> High serum total cholesterol, high serum LDL-cholesterol, presence of albuminuria and insulin therapy in our present study were found to have significant associations with the development of diabetic retinopathy. Comparable study results like insulin treatment, duration of diabetes, age at examination, HbA1c, systolic blood pressure, cholesterol, triglyceride and microalbumin were found to be significantly related to the development and

the progression of diabetic retinopathy among type 2 diabetics from Kuwait by AlKharji *et al.*<sup>13</sup>

## CONCLUSIONS

Diabetic retinopathy was found in 24.4% of type 2 diabetics which was significantly associated with male gender, duration of diabetes, older age, high cholesterol, high LDL, albuminuria and insulin therapy. Persistently raised HbA1c level mostly associated with diabetic retinopathy. A targeted approach to treatment, which includes combined control of glycemia, hypertension and dyslipidemia, may prove most beneficial in both patient and health service terms, and can dramatically delay or prevent the micro- and macrovascular complications of diabetes, including diabetic retinopathy (DR). The World Health Organization (WHO) lists Diabetic Retinopathy as a priority disease in their “VISION 2020” program initiative for the global elimination of avoidable blindness.

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