



## Relationship of HBA1C Levels and Severity of Diabetic Retinopathy in Patients of Type 2 Diabetes Mellitus

<sup>1</sup>Dr. Afshan Kounser\*, <sup>2</sup>Dr. Poonam Sharma, <sup>3</sup>Dr. Nadia Manzoor, <sup>4</sup>Dr. Ifrah Shafat Kitab  
Postgraduate, Department of Ophthalmology, Govt. Medical College, Srinagar

**\*Corresponding Author:**

**Dr. Afshan Kounser**

Postgraduate, Department of Ophthalmology, Govt. Medical College, Srinagar

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### Abstract

**Background:** Type 2 diabetes constitutes one of the significant causes of global health problem and has been mostly associated with unhealthy lifestyle changes that have occurred over the past few decades in both developed and developing countries. Hyperglycaemia of long duration and increased severity is a critical factor in the etiology of diabetic retinopathy. Our study aims to find the correlation between the severity of diabetic retinopathy and HbA1c levels in patients of type 2 diabetes.

**Methods:** Our study was an observational study carried out in a tertiary care centre. 280 patients who were known cases of type 2 diabetes were included in the study. Age, sex, duration of diabetes, fasting blood sugar levels, HbA1c value, and funduscopy findings were recorded. Diabetic Retinopathy was graded as per ETDRS categories.

**Results:** Out of 280 patients 30.71% of the patients belonged to the age group 40-50 years, followed by 30-40 years age group (i.e., 22.14%) then 17.50% belonged to age group 50-60 years, 16.42% in 20-30 years. Males constituted 55.35% and females 44.65%. Mild NPDR was found in 18.2% patients, Moderate NPDR in 20.35%, Severe NPDR in 38.2%, Early PDR in 15% and High Risk PDR in 9.2%. Grade III HbA1C levels were found in 38.6%, Grade II in 32.8% and 28.5% had Grade I levels of HbA1C.

**Conclusion:** Diabetic retinopathy severity increases with increased values of HbA1c level in body and duration of hyperglycaemia

**Keywords:** Diabetic retinopathy; HbA1C, Type 2 Diabetes

### Introduction

Diabetic retinopathy (DR) is a chronic progressive sight-threatening disease of the retinal microvasculature and is associated with prolonged period of hyperglycemia and other conditions linked to diabetes mellitus such as hypertension [1], hyperlipidemia, dysregulated hormone levels and growth factors. These initiate a cascade of biochemical and physiological changes which lead to neurovascular damage in the retina through oxidative damage, inflammation and apoptosis [2]. Higher blood sugar levels in diabetes is considered the most important etiology for DR [3]. DR has been found to

be one of the leading causes of blindness in the working age group of 20 – 65 year [4].

### Methods:

An observational study after obtaining the ethical clearance from ethical committee was carried out in the Post graduate department of Ophthalmology Government Medical College, Srinagar from August 2020 to April 2021. 280 diabetic patients referred for fundus evaluation were included in the study after obtaining their consent to be included in the study. Age, gender, duration of disease, blood sugar fasting,

HbA1c levels, and fundus examination findings were recorded.

**Inclusion Criteria**

Patients of type 2 diabetes mellitus who were referred from general medicine and endocrinology department for funduscopic examination and having complain of visual loss.

**Exclusion Criteria**

1. Patients with any anterior segment pathology including cataract.
2. Gestational diabetes patients.
3. Type 1 diabetes mellitus patient.
4. Acute and chronic renal failure.
5. Hypertensive patients

A detailed medical history particularly duration of diabetes, use of oral hypoglycaemic agents or use of insulin was taken. Local and systemic examination was done along with ocular examination. Visual acuity done by Snellen’s chart was recorded. Best corrected visual acuity was also recorded. Anterior segment evaluation was done using slit lamp biomicroscopy, fundus examination was done using indirect ophthalmoscopy and 90D lens. Grading of retinopathy was done as per Early Treatment Diabetic Retinopathy Study (ETDRS). All patients underwent blood sugar fasting and HbA1c levels test.

**Non-Proliferative Diabetic Retinopathy (NPDR)5**

1. No DR
2. Very mild NPDR- Microaneurysms only.
3. Mild NPDR- Any or all of: microaneurysms, retinal haemorrhages, exudates, cotton wool spots, up to the level of moderate NPDR. No intraretinal microvascular anomalies (IRMA) or significant venous beading.

**Results**

**Table 1(AGE DISTRIBUTION)**

AGE	NUMBER OF PATIENTS	PERCENTAGE
20-30	46	16.42
30-40	62	22.14
40-50	86	30.71

4. Moderate NPDR

1. Severe retinal haemorrhages (more than ETDRS standard photograph 2A: about 20 medium–large per quadrant) in 1–3 quadrants or mild IRMA.
2. Significant venous beading can be present in no more than 1 quadrant.
3. Cotton wool spots commonly present.

5. Severe NPDR

**The 4–2–1 rule; one or more of**

1. Severe haemorrhages in all 4 quadrants.
2. Significant venous beading in 2 or more quadrants.
3. Moderate IRMA in 1 or more quadrants

6. Very Severe NPDR

Two or more of the criteria for severe NPDR

**Proliferative Diabetic Retinopathy**

**1.Mild** – Moderate PDR :New vessels on the disc (NVD) or new vessels elsewhere (NVE), but extent insufficient to meet the high-risk.

**2. High Risk PDR**

1. New vessels on the disc (NVD) greater than ETDRS standard photograph 10A (about 1/3 disc area).
2. Any NVD with vitreous haemorrhage.
3. NVE greater than 1/2 disc area with vitreous haemorrhage

**HBA1C LEVELS**

HbA1c levels were classified in 3 grades as follows;

Grade I 5 – 8

Grade II 8 – 12

Grade III 12 – 15

50-60	49	17.50
>60	37	13.21
TOTAL	280	99.98

Patients were divided into five age groups as seen in table 1. Majority (30.71%) of the patients belonged to the age group 40-50 years, followed by the age group 30-40 years (i.e., 22.14%), then 17.50% belonged to age group 50-60 years , 16.42% in 20-30 years

**Table 2 (GENDER DISTRIBUTION)**

GENDER	NUMBER OF PATIENTS	PERCENTAGE
Males	155	55.35
Females	125	44.65
TOTAL	280	100

Table 2 depicts that majority of the patients constituted males ( 55.35% ) and females consisted 44.65%.

**Table 3 (PREVALENCE OF DIABETIC RETINOPATHY)**

PREVALENCE OF DR	NUMBER OF PATIENTS	PERCENTAGE
Mild NPDR	51	18.2
Moderate NPDR	57	20.3
Severe NPDR	107	38.2
Early PDR	42	15.0
High Risk PDR	26	9.2
TOTAL	280	99.9

Table 3 shows that Mild NPDR was found in 18.2% patients, Moderate NPDR in 20.35%, Severe NPDR in 38.2%, Early PDR in 15% and High Risk PDR in 9.2%. Majority of the patients had Severe NPDR i.e., 38.2%.

**Table 4 (DURATION AND SEVERITY)**

Duration (in years)	Mild NPDR	Moderate NPDR	Severe NPDR	Early PDR	High Risk PDR	Total (percent)
<10	9	10	22	8	6	55(19.6)
10-20	13	17	32	11	7	80(28.5)
>20	29	27	53	23	13	145(51.8)
TOTAL	51(18.2)	54(20.3)	107(38.2)	42(15)	26(9.2)	280

In table 4, it is evident that with increase in the duration of diabetes, percentage of patients with DR increases.

**Table 5 (Relationship Between HbA1c levels and Severity of Diabetic Retinopathy)**

HbA1c grading	Mild NPDR	Moderate NPDR	Severe NPDR	Early PDR	High Risk PDR	Total(percent)
Grade I	18	14	22	18	8	80(28.5)
Grade II	13	17	30	22	10	92(32.8)
Grade III	20	23	55	2	8	108(38.6)
Total	51(18.2)	54(20.3)	107(38.2)	42(15)	26(9.2)	280

Table 5 shows that the percentage of individuals with DR increases with the increase in the levels of HbA1C. Grade III HbA1C levels were found in 38.6% , Grade II in 32.8% and 28.5% had Grade I levels of HbA1C

## Discussion

These days the prevalence of diabetic population in the whole world has increased due to the unhealthy lifestyle among the people especially in these COVID times when one is forced to live a sedentary life.

In our study we found that the percentage of patients with DR was greater i.e., 30.71% in the age group of 40 to 50 years i.e., middle aged population. This finding was consistent with a study done by Nanda PK et al.<sup>6</sup>

Majority of the patients were males i.e., 55.35%. This was in accordance with a study conducted by Lokesh S et al.<sup>7</sup>

In our study we found that Mild NPDR was found in 18.2% patients, Moderate NPDR in 20.35%, Severe NPDR in 38.2%, Early PDR in 15% and High Risk PDR in 9.2%. Majority of the patients had Severe NPDR i.e., 38.2%. This was in accordance with the study conducted by Sewak et al.<sup>8</sup>

In our study we found that with increase in the duration of diabetes, percentage of patients with DR increases i.e., patients with duration of diabetes of less than 10 years consisted of 19.6% and those with > 50 years consisted of 51.8%. This was in accordance with a study conducted by Nanda PK et al.<sup>6</sup>

We found that the percentage of individuals with DR increases with the increase in the levels of HbA1C i.e., the patients with grade1 HbA1C levels with DR consisted of 28.5% and those with grade3 HbA1C

levels with DR consisted 38.6% patients. This finding was in accordance with various studies.<sup>9-12</sup>

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