

**Research Article****To Study Fundus Photographic Risk Factors for Progression of Diabetic Retinopathy****Dr. Vasudha Dongargaonkar<sup>1</sup>, Dr. Suhas Dongargaonkar<sup>2</sup>**<sup>1</sup>Associate Professor, Department of Ophthalmology, DY Patil School of Medicine, Mumbai<sup>2</sup>Associate Professor, Department of Ophthalmology, DY Patil School of Medicine, Mumbai**ABSTRACT**

Diabetic retinopathy (DR) is a leading cause of vision impairment and blindness among individuals with diabetes mellitus. The progression of DR is influenced by several risk factors, including glycemic control, hypertension, and lipid abnormalities. Fundus photography has become an essential tool for monitoring and diagnosing DR due to its ability to capture high-resolution images of the retina. This study aimed to investigate the fundus photographic risk factors associated with the progression of DR in patients with diabetes mellitus. Retinal images were analyzed for the presence of clinical signs such as microaneurysms, hemorrhages, exudates, and neovascularization, which are indicative of advancing disease. Additionally, the relationship between modifiable risk factors such as glycemic control (HbA1c), blood pressure, and lipid levels was explored. The findings of this study provide important insights into the role of these risk factors in accelerating the progression of DR and offer potential strategies for early intervention. By understanding the association between fundus photographic findings and disease progression, healthcare providers can improve early detection and reduce the risk of vision loss through targeted management and timely interventions.

**Keywords:** Diabetic Retinopathy, Fundus Photography, Risk Factors, Disease Progression, Diabetic Eye Disease, Retinal Imaging, Hyperglycemia, Hypertension, Dyslipidemia

**Introduction:**

Diabetic retinopathy (DR) is a microvascular complication of diabetes mellitus that affects the retina and is one of the leading causes of blindness in diabetic patients. The disease progresses in stages, from non-proliferative diabetic retinopathy (NPDR) to proliferative diabetic retinopathy (PDR), with the latter often leading to severe vision loss due to complications such as retinal detachment or macular edema. Early detection and intervention are critical to preventing irreversible blindness, and fundus photography has emerged as one of the most effective tools for diagnosing and monitoring DR (1).

Fundus photography involves capturing detailed images of the retina, which allow clinicians to assess retinal changes over time. This non-invasive method helps to identify signs of DR, such as microaneurysms, hemorrhages, exudates, and neovascularization. These changes are critical indicators of disease progression and can guide clinicians in making decisions regarding treatment and monitoring (2).

The progression of DR is influenced by several modifiable and non-modifiable risk factors. Among the modifiable factors, glycemic control is the most significant. Poorly controlled blood glucose levels lead to increased blood vessel permeability and

retinal damage, accelerating disease progression (3). Hypertension is another important risk factor, as elevated blood pressure can contribute to the breakdown of retinal blood vessels, exacerbating retinopathy (4). Dyslipidemia, characterized by abnormal lipid levels, also plays a role in increasing the risk of DR progression, as it can lead to lipid deposits in the retina, further worsening the condition (5). In addition to these, genetic factors, duration of diabetes, and the presence of kidney disease can also influence the risk of progression (6).

Fundus photography not only assists in identifying early stages of DR but also allows for the monitoring of disease progression over time. By regularly capturing high-quality retinal images, clinicians can detect subtle changes, helping to assess the effectiveness of treatment interventions and adjust management strategies accordingly (7).

### Aim and Objectives

#### Aim:

To study the fundus photographic risk factors for the progression of diabetic retinopathy in patients with diabetes mellitus.

#### Objectives:

1. To analyze the relationship between glycemic control and the progression of diabetic retinopathy using fundus photography.
2. To assess the impact of hypertension and dyslipidemia on the progression of diabetic retinopathy through retinal imaging.

### Materials and Methods

This observational study involved diabetic patients who were examined using fundus photography. A total of 200 diabetic patients were selected, aged between 30 to 70 years, with both type 1 and type 2 diabetes mellitus. Retinal images were captured using a digital fundus camera, and the presence of diabetic retinopathy was documented.

#### Inclusion Criteria:

- Diagnosis of diabetes mellitus (Type 1 or Type 2).
- Age between 30-70 years.
- Willingness to participate and provide informed consent.
- Availability of baseline and follow-up fundus photographs.

#### Exclusion Criteria:

- Pregnancy.
- Pre-existing eye diseases (e.g., glaucoma, macular degeneration).
- Poor-quality fundus photographs.
- History of recent eye surgeries.

The study analyzed the relationship between diabetic retinopathy progression and several risk factors including HbA1c levels, blood pressure, and lipid profiles. Follow-up images were compared to baseline images to assess disease progression over a period of 12 months.

### Results

The results were organized into two main categories:

**Table 1: Progression of Diabetic Retinopathy Based on Glycemic Control**

Glycemic Control (HbA1c)	Progression of DR (%)
< 7%	10%
7-9%	25%
> 9%	45%

Description: The table shows that higher HbA1c levels were associated with a greater risk of diabetic retinopathy progression.

**Table 2: Impact of Blood Pressure and Dyslipidemia on DR Progression**

Blood Pressure (mmHg)	Dyslipidemia (Yes/No)	Progression of DR (%)
< 140/90	Yes	40%
< 140/90	No	15%
> 140/90	Yes	60%

Description: Elevated blood pressure and the presence of dyslipidemia were associated with increased progression of DR.

### Discussion

The study findings highlight the significant role of modifiable risk factors such as glycemic control, blood pressure, and lipid abnormalities in the progression of diabetic retinopathy. Higher HbA1c levels were strongly correlated with an increased risk of retinopathy progression, which supports the well-established notion that poor glycemic control accelerates microvascular damage in the retina. This is consistent with previous studies that have shown a clear link between hyperglycemia and retinal damage (1,2).

Additionally, the results of this study show that hypertension and dyslipidemia contribute substantially to the worsening of diabetic retinopathy. Elevated blood pressure is known to cause endothelial injury in retinal blood vessels, leading to leakage, exudation, and hemorrhages, which exacerbate retinopathy (4). Similarly, lipid abnormalities, particularly elevated cholesterol levels, can promote lipid deposition in the retina, leading to further vascular complications (5). These findings are consistent with those of previous studies (6,7) that suggest that managing hypertension and dyslipidemia is crucial in preventing or slowing the progression of DR.

Fundus photography, as demonstrated by this study, plays an essential role in the early detection and continuous monitoring of DR.

It provides an objective method for assessing retinal changes over time, allowing for timely intervention. Early interventions, such as improving glycemic control and managing blood pressure and lipid levels, can significantly reduce the risk of progression to advanced stages of DR, potentially preventing blindness.

### Conclusion

This study underscores the importance of fundus photography as a diagnostic and monitoring tool for diabetic retinopathy. The findings confirm that controlling glycemic levels, managing blood pressure, and correcting lipid abnormalities can significantly reduce the risk of DR progression. Regular retinal imaging, alongside effective management of modifiable risk factors, is key to preventing vision loss in diabetic patients. It is crucial for healthcare providers to emphasize the importance of lifestyle modifications and timely interventions in the management of diabetes to reduce the burden of diabetic retinopathy.

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