

The Contribution of Optometrists to the Early Identification of Diabetic Retinopathy

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Abstract—Objective: To assess the level of knowledge among optometrists regarding Diabetic Retinopathy (DR) and its early clinical signs.

Methods: A prospective observational study was conducted involving 120 diabetic patients undergoing routine eye examinations. Visual acuity (VA) assessment was performed using a Snellen chart, followed by anterior segment evaluation using a slit lamp biomicroscope. Dilated fundus examination was carried out using direct ophthalmoscopy (DO) and fundus photography where available. Early signs of diabetic retinopathy such as microaneurysms, dot-blot hemorrhages, and hard exudates were recorded. Data were collected and analyzed using statistical methods including frequency distribution and chi-square analysis.

Results: The study found that a significant proportion of patients showed early retinal changes suggestive of diabetic retinopathy. Microaneurysms were the most commonly observed early sign, followed by dot-blot hemorrhages and hard exudates. Optometrists were able to identify these early findings during routine examinations and appropriately refer suspected cases to ophthalmologists. Statistical analysis indicated an association between the duration of diabetes and the presence of early retinal changes.

Conclusion: Optometrists play a crucial role in the early detection of diabetic retinopathy through routine eye examinations and screening practices. Strengthening optometric training and integrating optometrists into diabetic retinopathy screening programs can significantly improve early diagnosis and reduce the risk of vision loss caused by diabetic eye disease.

Index Terms—Diabetic Retinopathy, Visual acuity, Microaneurysms, Dot blot hemorrhages, Direct Ophthalmoscopy.

I. INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder characterized by elevated blood glucose levels and is a growing global health concern. One of the most

serious ocular complications of diabetes is Diabetic Retinopathy (DR), which occurs due to damage to the small blood vessels of the retina caused by prolonged hyperglycemia. It is one of the leading causes of preventable blindness among the working-age population worldwide.[5] According to the World Health Organization (WHO), the prevalence of diabetes and its complications is increasing rapidly, making early detection and management essential to prevent vision loss.[4]

Diabetic retinopathy (DR) often develops without noticeable symptoms in its early stages. Patients may maintain normal vision until the disease progresses to advanced stages, when irreversible retinal damage and significant visual impairment can occur.[2],[3] Therefore, regular eye examinations and early detection of retinal changes are crucial for timely treatment and prevention of blindness.

Optometrists play an important role in primary eye care and are often the first professionals to examine patients seeking vision care. Through routine eye examinations, optometrists can identify early signs of diabetic retinopathy (DR) such as microaneurysms, retinal hemorrhages, and hard exudates.[3] With appropriate training and diagnostic tools, optometrists can contribute significantly to the early screening, patient education, and referral of diabetic patients to (DR ophthalmologists.[6],[7]The findings of this study may help strengthen optometric involvement in diabetic retinopathy (DR) screening programs and improve preventive eye care services.

II. REVIEW OF LITERATURE

Several studies have emphasized the importance of early detection and screening of Diabetic Retinopathy (DR), which is one of the most common microvascular complications of diabetes mellitus (DM) and a leading cause of visual impairment

worldwide. Early identification and proper management of diabetic retinopathy are essential to prevent irreversible vision loss.

A landmark study by Ronald Klein and colleagues in the Wisconsin Epidemiologic Study of Diabetic Retinopathy (1984) demonstrated that the prevalence and severity of diabetic retinopathy (DR) increase with the duration of diabetes. The study highlighted that patients with long-standing diabetes are at a significantly higher risk of developing retinal complications.[1]

The Early Treatment Diabetic Retinopathy (DR) Study conducted by the Early Treatment Diabetic Retinopathy (DR) Study Research Group in 1985 provided important guidelines for the management and treatment of diabetic retinopathy (DR). The study concluded that early detection and timely treatment, such as laser photocoagulation, can significantly reduce the risk of severe vision loss.[2]

Later, Charles P. Wilkinson and colleagues (2003) proposed the International Clinical Diabetic Retinopathy (DR) Disease Severity Scale, which standardized the classification and grading of diabetic retinopathy.[3] This classification system has been widely adopted in clinical practice and research for accurate diagnosis and monitoring of the disease.

Screening programs have also shown significant benefits in reducing blindness due to diabetic retinopathy (DR). A study by Philip H. Scanlon (2017) on the English National Screening Programmed for Diabetic Retinopathy demonstrated that regular retinal screening using digital fundus photography improved early detection rates and reduced the incidence of vision-threatening diabetic retinopathy (DR).[6]

Furthermore, research by Jennifer W. Y. Yau and colleagues (2012) reported that the global prevalence of diabetic retinopathy among diabetic patients is approximately 35%, highlighting the growing burden of this condition.[5]

These studies collectively emphasize that early screening and detection are essential for preventing visual disability. Optometrists, being primary eye-care providers, can play a significant role in identifying early retinal changes and referring patients for timely treatment, thereby contributing to the prevention of blindness caused by diabetic retinopathy.

III. AIM AND OBJECTIVES

A. Aim: To evaluate the role of optometrists in the early detection and screening of Diabetic Retinopathy during routine eye examinations and to assess their contribution to early diagnosis and timely referral.

B. Objectives:

- To assess the level of knowledge among optometrists regarding Diabetic Retinopathy and its early clinical signs.
- To identify the common early retinal changes of diabetic retinopathy detected during routine optometric examinations.
- To evaluate the clinical screening practices used by optometrists for diabetic patients.
- To assess the referral patterns of optometrists for patients suspected of having diabetic retinopathy.
- To analyze the effectiveness of optometrist-led screening in promoting early detection and prevention of vision loss caused by diabetic retinopathy.

IV. RESEARCH METHODOLOGY

A. Study Design:

The present study was conducted as a descriptive Prospective observational study to evaluate the role of optometrists in the early detection of Diabetic Retinopathy among diabetic patients undergoing routine eye examinations.

B. Study Setting:

The study was carried out at Nalbari Eye Hospital, Nalbari.

C. Study Population:

The study population consisted of diabetic patients attending routine eye examinations and optometrists involved in screening for diabetic eye disease. The optometrists performed visual assessment and retinal examination to identify early signs of diabetic retinopathy.

D. Study Duration:

The study was conducted over a period of one year, from September 2024 to September 2025, followed by five months of data analysis and interpretation.

E. Sample Size:

A total of 120 diabetic patients undergoing eye examination were included in the study.

F. Inclusion Criteria:

Registered optometrists involved in clinical eye examinations. Diabetic patients attending routine eye check-ups. Participants who were willing to participate in the study.

G. Exclusion Criteria:

Optometrists not involved in clinical practice. Patients with incomplete examination records. Participants who did not provide consent for participation.

H. Materials Used:

The following instruments and materials were used during the study: Snellen or LogMAR visual acuity chart for measuring visual acuity. Slit lamp biomicroscope for anterior segment examination. Direct and/or indirect ophthalmoscope (DO/ IDO) for retinal examination. Fundus camera (where available) for retinal imaging.

I. Study Procedure:

The following steps were followed during the examination:

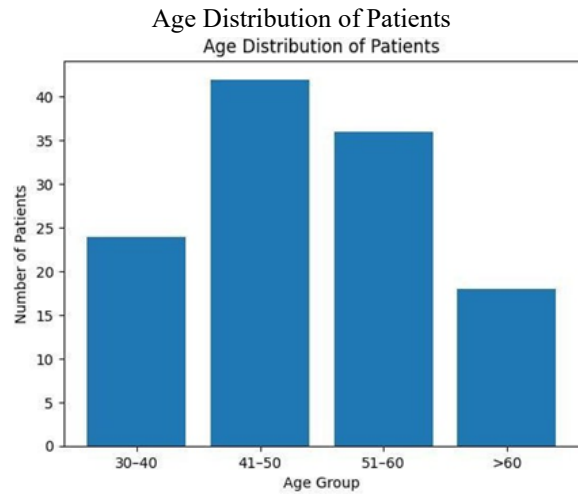
- **Case History:** Detailed patient history was recorded, including age, gender, duration of diabetes, and previous ocular history.
- **Visual Acuity Assessment:** Visual acuity was measured using a Snellen or LogMAR chart.
- **Anterior Segment Examination:** Examination of the anterior segment of the eye was performed using a slit lamp biomicroscope.
- **Dilated Fundus Examination:** Pupillary dilation was performed when necessary, and the retina was examined using direct ophthalmoscopy or fundus photography.
- **Identification of Retinal Changes:** Early signs of diabetic retinopathy such as microaneurysms, dot-blot hemorrhages, and hard exudates were identified and recorded.
- **Documentation and Grading:** Findings were documented and graded according to standard diabetic retinopathy classification systems.
- **Referral:** Patients suspected of having diabetic retinopathy were referred to an ophthalmologist for further evaluation and management.

J. Data Collection and Analysis:

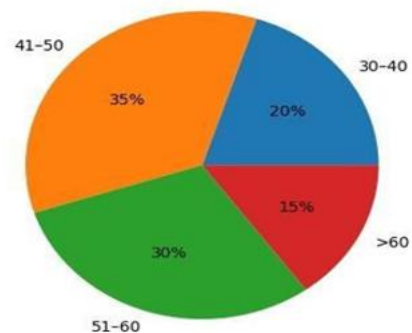
All collected data were compiled and entered in Microsoft excel and analyzed using SPSS version 25.0. Descriptive statistics such as frequency and percentage were used to summarize the findings. Statistical tests such as chi-square analysis were applied to determine the association between duration of diabetes and the presence of early retinal changes. The results were presented using tables, graphs, and charts for better interpretation of the data.

V. RESULT AND DATA ANALYSIS

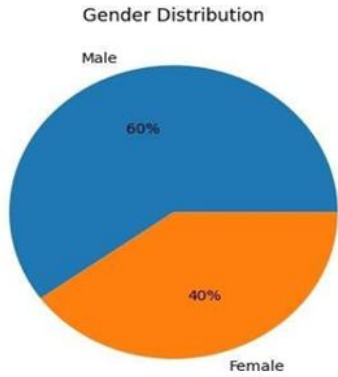
A total of 120 diabetic patients who underwent routine eye examinations were included in this study to evaluate the role of optometrists in the early detection of Diabetic Retinopathy



Age Distribution of Patients

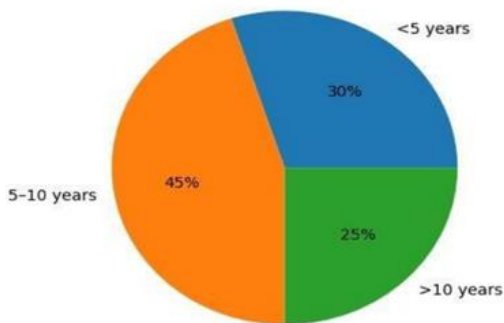
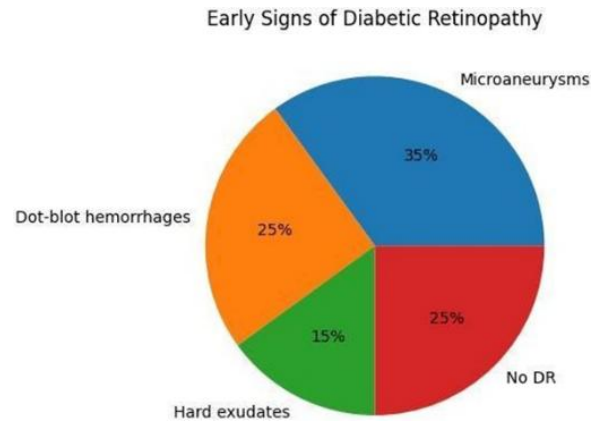
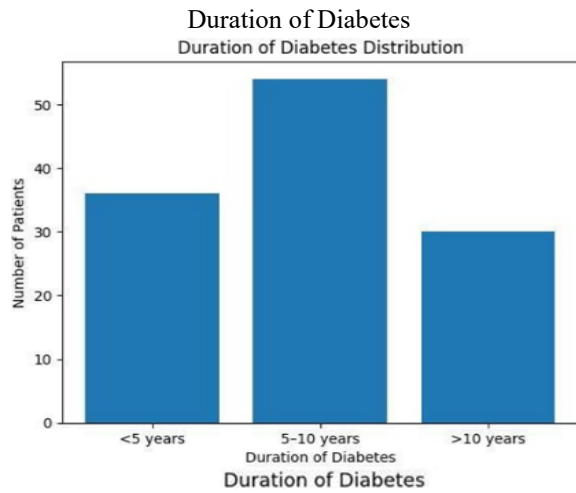
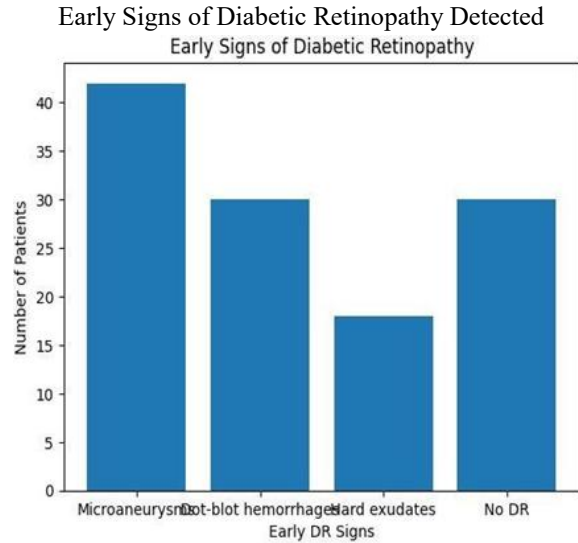


The majority of patients (35%) were in the 41–50 years age group, followed by 30% in the 51– 60 years group.



Gender Distribution

Among the participants, 60% were male and 40% were female, indicating a higher proportion of male patients undergoing eye examination



Most patients (45%) had diabetes for 5–10 years, while 30% had diabetes for less than 5 years.

Microaneurysms were the most frequently detected early sign of diabetic retinopathy, observed in 35% of patients.

A. Summary of Findings

The majority of patients were aged 41–50 years. Microaneurysms were the most common early retinal finding. Longer duration of diabetes was associated with a higher risk of developing diabetic retinopathy. Optometrists played an important role in identifying early retinal changes and referring patients for specialized care. These findings highlight the importance of routine eye examinations and the significant contribution of optometrists in the early detection and prevention of vision loss caused by diabetic retinopathy.

B. Statistical Analysis:

Table 1: Descriptive statistics of study participants (n=120)

Variable	Mean ± SD/ frequency	Percentage
Age (years)	52.4 ± 8.6	-
Male	72	60%
Female	48	40%
Diabetes <5 years	36	30%
Diabetes 5-10 years	54	45%
Diabetes >10 years	30	25%

Table 2: Early signs of Diabetic Retinopathy detected

Early retinal findings	Frequency (n)	Percentage
Microaneurysms	42	35%
Dot-blot Hemorrhages	30	25%
Hard exudates	18	15%
No retinopathy	30	25%

Table 3: Association between duration of Diabetes and Diabetic Retinopathy

Duration of diabetes	Dr present	Dr absent	Total
<5 years	10	26	36
5-10 years	36	18	54
>10 years	24	6	30

Chi-square (χ^2) = 14.62

p- value = 0.001 (statistically significant)

Interpretation:

There was a statistically significant association between longer duration of diabetes and presence of Diabetic Retinopathy ($p < 0.05$). Patients with diabetes duration greater than 5 years showed a higher prevalence of early retinal changes. This indicates duration of Diabetes is a significant risk factor for Diabetic Retinopathy

VI. DISCUSSION

The present study evaluated the role of optometrists in the early detection of Diabetic Retinopathy among diabetic patients undergoing routine eye examinations. Early detection of diabetic retinopathy is essential because the disease often progresses without noticeable symptoms until the advanced stages, which may lead to significant visual impairment or blindness.[2]

In this study, the majority of patients were in the 41–50 years age group, indicating that middle aged individuals are more commonly affected by diabetes and its ocular complications. This finding is consistent with previous epidemiological studies that have reported a higher prevalence of diabetic retinopathy among middle-aged and older adults.[5]

The results of the study showed that microaneurysms were the most common early sign of diabetic retinopathy, followed by dot-blot hemorrhages and hard exudates. Microaneurysms are widely recognized as one of the earliest clinical manifestations of diabetic retinopathy and are often detected during fundus examination. These findings are consistent with earlier research such as the Wisconsin Epidemiologic Study of Diabetic Retinopathy, which reported similar retinal changes in the early stages of the disease.[3]

The study also demonstrated a relationship between the duration of diabetes and the presence of retinal changes. Patients with a longer duration of diabetes showed a higher likelihood of developing early signs of diabetic retinopathy. This observation supports the findings of the Early Treatment Diabetic Retinopathy Study, which emphasized that the risk of developing diabetic retinopathy increases significantly with the duration of diabetes.

Another important observation of this study was the significant role of optometrists in detecting early retinal abnormalities. Through routine eye examinations using tools such as slit lamp bio microscopy and ophthalmoscopy, optometrists were able to identify early signs of diabetic retinopathy and refer patients to ophthalmologists for further evaluation and management. This highlights the importance of integrating optometrists into screening programs for diabetic retinopathy.[4],[6],[7]

Overall, the findings of this study emphasize that optometrists can play a vital role in early screening, identification, and referral of diabetic retinopathy cases, thereby helping to reduce the risk of vision loss and improving the overall management of diabetic eye disease.

VII. CONCLUSION

The present study highlights the important role of optometrists in the early detection of Diabetic Retinopathy, which is one of the leading causes of

preventable blindness among diabetic patients. The findings indicate that routine eye examinations conducted by optometrists can effectively identify early retinal changes such as microaneurysms, dot-blot hemorrhages, and hard exudates.

The study also shows that the duration of diabetes is an important risk factor for the development of diabetic retinopathy, with patients having a longer duration of diabetes showing a higher prevalence of retinal changes. Early detection through regular screening allows timely referral to ophthalmologists for appropriate treatment and management.

Overall, the study demonstrates that optometrists play a crucial role in screening, early identification, patient education, and referral of diabetic patients at risk of diabetic retinopathy. Strengthening optometric training and integrating optometrists into diabetic retinopathy screening programs can significantly contribute to the prevention of vision loss and improvement of eye care services.

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