



**PREVALENCE AND RISK FACTORS FOR DIABETIC
RETINOPATHY AMONG TYPE 2 DIABETES PATIENTS RECEIVING
CARE IN PRIMARY HEALTHCARE FACILITIES IN SOUTH INDIA:
AN OBSERVATIONAL STUDY.**

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Abstract

Introduction: "Diabetic retinopathy (DR)", which is a common complication of type 2 diabetes, has the potential to result in visual impairment and blindness. The current study sought to ascertain the prevalence of DR and related risk factors among type 2 diabetes patients in South India who use primary healthcare facilities.

Materials and Procedures: Five hundred subjects with type 2 diabetes who were utilising primary healthcare facilities in South India participated in a cross-sectional study. The patients got a thorough eye examination, and information on their demographic and clinical features was obtained by reviewing their medical records.

Results: The majority (62.4%) were female, with a mean age of 56.5 years (SD=9.7). Diabetes lasted 9.4 years (SD=6.4). Glycated haemoglobin (HbA1c) was 8.5% (SD=1.4), and fasting blood glucose was 156.3 mg/dL (SD=48.7). DR prevalence: 203 (40.6%) of 500 study participants had DR, while 297 (59.4%) did not. The logistic regression study found that longer-term diabetes, poor glycemic control (HbA1c > 7%), and greater systolic blood pressure all increase the risk of DR. However, age, gender, body mass index, smoking, and alcohol use did not increase DR risk.

Conclusion: This study found that South Indian primary care patients with type 2 diabetes have significant rates of DR. DR risk factors include long-term diabetes, poor glycemic management, and high systolic blood pressure. To avoid DR, early detection and care of diabetes and its risk factors are crucial.

Keywords: Prevalence, Risk Factors, Diabetic Retinopathy, South India, Diabetes Mellitus.

Introduction

This disorder represents a huge threat to the general public's health all over the world, as the number of people living with “*Diabetes Mellitus (DM)*” is expected to reach 463 million in 2019 (1). There has been a rapid increase in the number of persons diagnosed with diabetes in developing nations like India, where it is estimated that more than 77 million people are affected by the condition (2). The most common complication of diabetes, known as “*Diabetic Retinopathy (DR)*”, is the leading cause of blindness in people around the world who are of working age (3). DR is a degenerative disorder that causes damage to the microvasculature of the retina, and it is associated with the development of microaneurysms, haemorrhages, exudates, and neovascularization (4). Both the level of glycemic control and the duration of diabetes are factors that contribute to an increased risk of DR (5, 6). Through early detection and treatment of DR vision loss can be avoided or postponed.

On a global scale, DR plays a significant part in cases of vision impairment and blindness. It is estimated that thirty percent of people who have diabetes have DR and ten percent of those people have DR severe enough to threaten their vision (7). The incidence of DR varies according to the population that is being researched, the length, and the management of DM (8). There are estimates that DR affects between 12% and 33% of the Indian population, with a higher prevalence in urban areas (9, 10). Even though a significant number of people are affected by DR, screening for the condition is typically insufficient, and a significant number of patients with DR go undiagnosed and untreated (11).

There are many different risk factors that have been identified as being connected with the beginning and progression of DR (DR). Poor glycemic control, hypertension, dyslipidemia, smoking, and genetic characteristics have been identified as contributing factors to the severity and length of time that diabetes lasts (12, 13). Other factors that have been identified as contributing factors include dyslipidemia and smoking. If risk factors are identified and managed at an early stage (14,15), it may be possible to slow down or stop the advancement of DR. On the other hand, there is a lack of data regarding the prevalence of DR and the risk factors that are related with it in the primary healthcare facilities that are located in South India.

The purpose of this research was to investigate the prevalence of DR and the risk factors associated with it in type 2 diabetic patients who were treated at basic healthcare institutions in south India. The purpose of the study was to determine the clinical and demographic variables that are connected to the occurrence and severity of DR, as well as the efficacy of DR screening and care in these facilities. Additionally, the study aimed to identify the clinical and demographic characteristics that are related to the prevalence of DR.

Material and methods

Study Design and Location: The primary healthcare institutions in South India served as the study's cross-sectional observational setting. The research was carried out between January and December of 2022. Prior to the start of the trial, all participants provided written informed permission, which was authorised by the institutional review board.

Patients with type 2 diabetes who visited primary healthcare institutions in the designated South Indian districts during the study period comprised the study's participants. The study enrolled 500 patients in total using a convenience sample method.

Type 2 diabetes patients who were 18 years of age or older and regularly utilising primary healthcare facilities were included in the study.

Type 1 diabetes, gestational diabetes, diabetic ketoacidosis, and any other illness that would impair a retinal examination were prohibited from participating in the study.

Data collection: The study participants' answers to a standardised questionnaire were utilised to gather the data. The survey asked questions about demographic information, medical history, and lifestyle choices. The individuals' diabetes duration, blood glucose management, and any prior cases of DR were all questioned.

Retinal Examination: An ophthalmologist performed a thorough retinal examination on each study participant. 1% tropicamide eye drops were used to dilate the subjects' pupils. A biomicroscope with a slit-lamp and a 90-diopter lens was used for the investigation. The examination comprised a macula, retinal vessel, and optic disc evaluation. The "Early Treatment Diabetic Retinopathy Study (ETDRS)" grading system was used to rate the severity of DR (13, 14).

Data analysis was performed using the "Statistical Package for the Social Sciences (SPSS)" version 26 and the information gathered from the study participants. The study participants' demographic and clinical features were summarised using descriptive statistics. Logistic regression analysis was used to examine the risk variables for DR. For each risk factor, the "Odds Ratio (OR)" and 95% "Confidence Interval (CI)" were determined. A 0.05 p-value was regarded as statistically significant.

Calculation of Sample Size: To get the sample size, use the formula $n = Z^2PQ/d^2$, where Z is the standard normal variate at a 95% confidence level (1.96), P is the prevalence of DR (40%) and Q is 1-P (60%) and d is the margin of error (5%). These factors led to a sample size calculation of 385. With a 30% non-response rate taken into account, a total of 500 volunteers were sought for the study.

Quality Control: The questionnaire was pretested among 50 patients before the study's start in order to guarantee the accuracy of the results. The retinal examination was carried out by an ophthalmologist who had received training and certification in the ETDRS grading system. A second researcher double-checked the data entry for accuracy.

Results

The study comprised 500 participants with type 2 diabetes in total. The bulk of the participants (62.4%) were female, with a mean age of 56.5 years (SD=9.7). Diabetes was present for an average of 9.4 years (SD = 6.4). The mean glycated haemoglobin (HbA1c) level was 8.5% (SD=1.4), and the mean fasting blood glucose level was 156.3 mg/dL (SD=48.7). Table 1

DR Prevalence: 203 (40.6%) of the 500 study participants had DR while the remaining 297 (59.4%) had none. The DR type is depicted in Table 2

Risk Factors for DR: According to the findings of the logistic regression study, having diabetes for a longer period of time, having poor glycemic control (HbA1c > 7%), and having

higher systolic blood pressure all pose a substantial risk for developing DR. On the other hand, it was not found that characteristics such as age, gender, body mass index, smoking, or alcohol usage were substantial contributors to the likelihood of developing DR. Table 3

Table 1: Characteristics of subjects

Characteristics	Values
Age (years)	56.5 ± 9.7
Gender (female)	312 (62.4%)
Duration of diabetes (years)	9.4 ± 6.4
Fasting blood glucose (mg/dL)	156.3 ± 48.7
Glycated hemoglobin (HbA1c) (%)	8.5 ± 1.4

Table 2: Prevalence and severity of DR

DR	N (%)
Mild non-proliferative DR	102 (20.4%)
Moderate non-proliferative DR	62 (12.4%)
No DR	297 (59.4%)
Proliferative DR	10 (2.0%)
Severe non-proliferative DR	29 (5.8%)

Table 3: Logistic regression analysis of risk factors for DR

Risk Factor	OR	95% CI	P
Age	1.03	0.99-1.06	.192
Sex (female)	1.02	0.68-1.54	.926
Duration of diabetes	1.52	1.15-2.00	.003
BMI	0.99	0.95-1.04	.679
Smoking	0.94	0.59-1.50	.795
Alcohol consumption	1.03	0.64-1.66	.888
HbA1c > 7%	2.31	1.56-3.41	<.001
Systolic blood pressure	1.21	1.03-1.43	.021

Discussion

Patients with type 2 diabetes in South India who go to primary healthcare facilities have a large prevalence of DR, as shown by the findings of the current study. Primary healthcare institutions are located in India. This finding is consistent with previous investigations carried out in India (15, 16). According to the findings of the study, significant risk factors for DR include having diabetes for a longer period, having poor glycemic control, and having a higher systolic blood pressure. These findings are consistent with those found in earlier study that was carried out in India and in other countries (17–19).

The length of time someone has diabetes increases the cumulative exposure of the retinal arteries to hyperglycemia, which in turn raises the risk of DR (20). According to the findings

of the current research, an individual's risk of acquiring DR climbs by 52% each year as the length of time they have diabetes increases. Consequently, the early detection and management of diabetes are necessities if one wishes to halt the development of DR as well as its advancement.

Glycemic control is another important aspect that contributes to the risk of DR. Ineffective regulation of blood sugar levels leads to increased oxidative stress and inflammation, which in turn causes damage to the vasculature of the retina (21). According to the findings of the current research, the likelihood of DR developing in patients whose HbA1c levels were greater than 7% was 2.31 times higher than in patients whose HbA1c levels were 7%. As a consequence of this, it is vital to maintain stringent glycemic control in order to prevent the start and progression of DR.

The current study also demonstrated that having greater systolic blood pressure significantly increases your risk of developing DR. Increased arterial permeability and endothelial dysfunction brought on by hypertension harm the retinal vessels (22). According to the current study, the likelihood of developing DR increases by 21% for every 10 mmHg increase in systolic blood pressure. Therefore, it is crucial to maintain blood pressure under control to stop the onset and progression of DR.

When evaluating the results, it is important to take into account the limitations of the current study. First, because of the cross-sectional nature of the study, causal links between the risk factors and DR can't be established. In order to determine the temporal order and direction of the relationships, longitudinal studies are required. Second, because only patients using South Indian primary healthcare institutions were included in the study, the results may not be applicable to other groups. Third, a crucial component of management—the impact of medication on DR—was not examined in the study. The usefulness of different therapies, including as strict glycemic control and blood pressure control, in preventing the onset and progression of DR should be the subject of future research. Fourth, the study only graded retinopathy once, which may have overestimated the true prevalence of DR. Multiple grading systems should be used in future research to increase diagnosis precision.

Finally, additional potential risk factors for DR, such as cholesterol levels and smoking status, were not examined in this investigation. Future research should look into how these risk variables affect the onset and development of DR.

Conclusion

This study found that South Indian primary care patients with type 2 diabetes have significant rates of DR. DR risk factors include long-term diabetes, poor glycemic management, and high systolic blood pressure. To avoid DR, early detection and care of diabetes and its risk factors are crucial.

This study also impacts South Indian primary healthcare. DR is common among type 2 diabetics, thus primary care institutions should test and treat it. Integrating ophthalmology services into general care and teaching primary care clinicians to recognise and treat DR can achieve this.

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