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Original article

Prevalence and risk factors associated with diabetic retinopathy among diabetic patients in Baba Gurgur Diabetic Center

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Abstract:

- ***Background*:** Diabetic retinopathy (DR) is a leading cause of preventable blindness worldwide. Early detection and timely management are essential to reduce the risk of vision loss among diabetic patients. This study aims to determine the prevalence of diabetic retinopathy and identify associated risk factors among diabetic patients.
- ***Methods:*** A descriptive cross-sectional study was conducted at Baba Gurgur Diabetic Center, K1 Hospital, in Kirkuk city, from November 2019 to May 2020. A total of 750 diabetic patients were enrolled to assess the prevalence and risk factors of DR.
- ***Result:*** The mean age was 55 years (range: 23–80); 54.9% were male and 45.1% female. DR was detected in 115 patients (15.3%), while 635 (84.7%) had no signs of DR. No significant gender difference was noted. DR prevalence increased with age, especially in those aged 50 and above. The mean HbA1c was significantly higher in the DR group (10.3%) compared to the non-DR group (8.5%). Hypertension was more common in DR patients (60.9%) than in non-DR patients (42.5%). Smoking was also more prevalent among the DR group (30.4%) compared to the non-DR group (22%). Type I diabetes was significantly associated with DR (22.6% in DR group vs. 16.2% in non-DR group). No significant association was found between DR and education level.
- ***Conclusions:*** A notable prevalence of DR was found among Iraqi diabetic patients. Poor glycemic control, hypertension, smoking, and type I diabetes were significantly associated with DR. These findings support the need for early screening and improved management of risk factors to prevent DR-related vision loss.
- **Keywords:** Diabetic retinopathy, risk factors, Kirkuk.

INTRODUCTION

Diabetic retinopathy (DR) remains a leading cause of vision loss among working-age adults globally, posing a significant public health concern (1). In 2015, diabetic retinopathy was responsible for vision impairment in approximately 2.6 million individuals worldwide (2). An earlier global assessment in 2010 estimated that among the 285 million people living with diabetes, more than 30% were affected by DR. Alarmingly, about one-third of these individuals had vision-threatening diabetic retinopathy (VTDR), which includes proliferative diabetic retinopathy (PDR), severe non-proliferative diabetic retinopathy, and diabetic macular edema (DME) (3).

Despite the substantial disease burden, contemporary global estimates of the prevalence of DR—especially in its vision-threatening forms—remain limited. Previous studies have reported considerable variability in the prevalence of DR among patients with both diagnosed and undiagnosed diabetes. For instance, a study conducted in India found a DR prevalence of 17.6%, whereas another study in the United States reported a significantly higher prevalence of 33.2% (4, 5). Such variations may stem from differences in population characteristics, study methodologies, and classification systems used to define DR severity, which complicates direct comparisons across studies.

Although major risk factors for DR—such as poor glycemic control and hypertension—have been extensively examined in epidemiological research and clinical trials, findings regarding the pattern, strength, and consistency of these associations are often inconsistent. This is particularly true for the more severe stages of DR, including PDR and DME, where individual studies frequently lack sufficient power to establish clear relationships. Consequently, the precise impact of modifiable risk factors on vision-threatening DR remains inadequately defined. Nonetheless, factors such as the duration of diabetes, elevated blood glucose levels, and high blood pressure are consistently implicated in the progression of retinal damage and visual decline (1).

In recent years, increasing attention has been given to regional and ethnic disparities in the prevalence and risk factors of DR. Building on this context, the present study aims to contribute region-specific data by examining the frequency and associated risk factors of diabetic retinopathy among patients attending Baba Gurgur Diabetic Center. Specifically, the objectives of this study are to identify the incidence of diabetic retinopathy among patients at Baba Gurgur Diabetic Center, recognize the risk factors associated with the development of DR, and clarify the relationship between HbA1c level control and the occurrence of DR.

PATIENT and METHOD

The research was conducted at the Baba Gurgur Diabetic Center, affiliated with K1 Hospital in Kirkuk City, Iraq, which serves patients from all areas of the Kirkuk region. Established in 2018, the center currently receives approximately 20 to 30 diabetic outpatients each day. A cross-sectional descriptive study was carried out at this center between November 2019 and May 2020.

A total of 750 adult diabetic patients, including both type I and type II diabetes (416 males and 334 females), voluntarily participated in the study. Prior to data collection, permission was obtained from the hospital and laboratory administrative authorities. Ethical approval for the study was granted by the Research Ethics Committee of the Iraqi Ministry of Health (Health Directorate of Kirkuk).

Several exclusion criteria were applied to select the study participants. Patients who were severely ill and unable to participate, those with corneal opacities or mature cataracts in both eyes preventing fundus examination, individuals with iris adhesions or any other

conditions that hindered pupil dilation, and patients suffering from severe bilateral visual impairment were all excluded from the study.

Data collection was conducted through direct interviews and clinical examinations. After explaining the objectives and content of the study, verbal informed consent was obtained from each participant. Data collection was organized into four main sections. In the first part, socio-demographic and behavioral characteristics such as age, sex, smoking status, type and duration of diabetes, and educational level were recorded. Educational attainment was classified according to the Iraqi Cultural Office 2010 classification into three categories: primary (illiterate and primary school), secondary (intermediate and secondary school), and tertiary (university and higher education).

In the second part, blood samples were collected through venipuncture at the center's laboratory to measure HbA1c levels using the AFIAS-6 (Automated Fluorescent Immunoassay System). The results were reported as percentage concentrations aligned with the Diabetes Control and Complications Trial (DCCT) standards.

The third part involved blood pressure measurements. Blood pressure was recorded from the right arm in a sitting position using a sphygmomanometer. A second measurement was taken after a five-minute interval, and the average of the two readings was used as the final blood pressure value.

In the fourth part, ocular examinations were conducted. Patients were referred to the ophthalmology department where best-corrected visual acuity was assessed using a Snellen chart. Pupils were dilated with 1% tropicamide, followed by a slit-lamp biomicroscopic examination with a 90D Volk lens to evaluate for signs of diabetic retinopathy. Diagnosis and grading were based on the Early Treatment Diabetic Retinopathy Study (ETDRS) standards, which define diabetic retinopathy as the presence of one or more retinal microaneurysms or blot hemorrhages, with or without more severe

lesions such as hard or soft exudates, intraretinal microvascular abnormalities, venous beading, retinal neovascularization, preretinal hemorrhage, or vitreous hemorrhage.

Participants were then divided into two groups: Group A included patients who exhibited any level of diabetic retinopathy, while Group B comprised those without signs of retinopathy.

Data coding and entry were performed using Microsoft Excel, and statistical analysis was carried out with SPSS version 20.0. Descriptive statistics including frequencies, means, percentages, and standard deviations were calculated. Comparative analysis between groups was performed using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

RESULTS

This study included 750 diabetic patients, with an average age of 55 years and a range of 16 to 80 years. 412 (54.9%) were male, and 338(45.1%) were female. 115 (15.3%) was found with signs of Diabetic Retinopathy, 635 84.7% with no signs of Diabetic Retinopathy there was no significant relationship between male and female ratio as we show in the (Table 1).

Table (1): Gender relation to Diabetic Retinopathy

Gender	Group A DR		Group B non-DR		Total	P-value
	No.	%	No.	%		
Male	59	51.3%	353	55.6%	412	0.395
Female	56	48.7%	282	44.4%	338	0.395
Total	115	15.3%	635	84.7%	750	

In our study, DR increases significantly with age as we show in the (Table 2), below 30 years age group we didn't record DR and gradually increase the percentage of the DR with age most of the patient was in the age group 50 and more.

Table (2): Age group relation to Diabetic Retinopathy

Age group	Frequency of Diabetic	Frequency of DR at age group	%
< 20	5	0	0 %
21-30	12	0	0 %
31-40	48	2	4.1%
41-50	168	16	9.5%
50-60	304	44	14.5%
> 60	213	53	24.9%
Total	750		

There was a significantly high level of mean HbAc1 (10.3) among the DR group in comparison to (8.5) in the non-DR group (Figure 1).

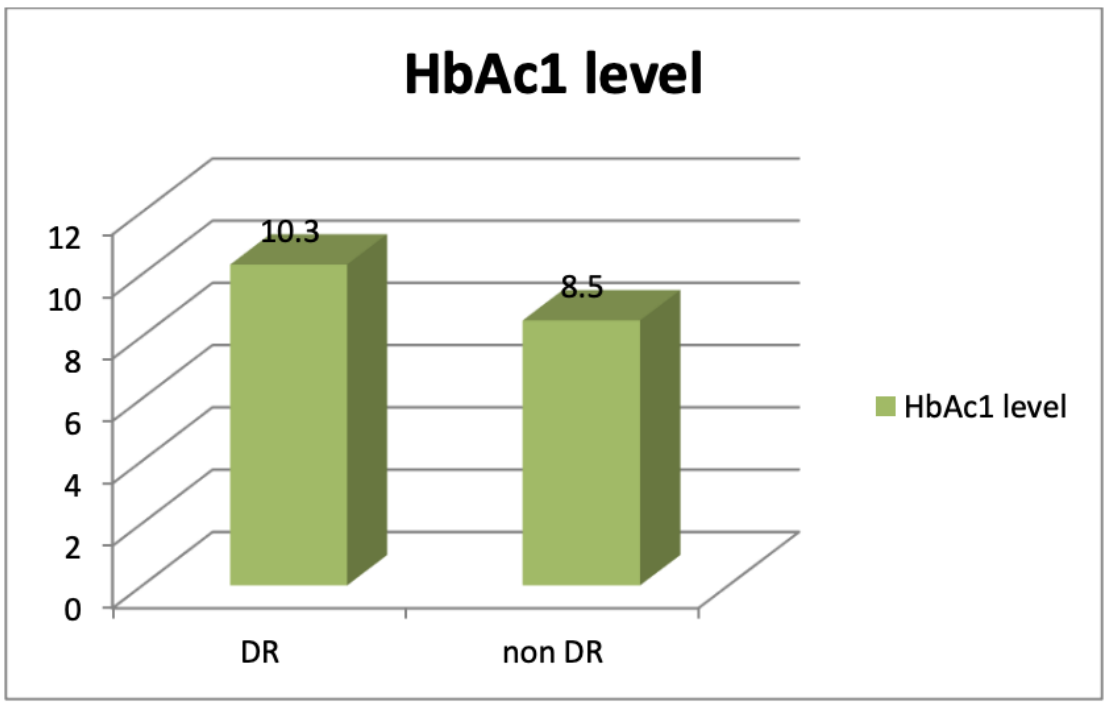

Figure (1): level of HbA1c in Diabetic Retinopathy and non-Diabetic Retinopathy patients.

Also, hypertension in our study group play a role in developing DR,(42.5%) 270 patient was hypertensive in non-DR Group while significantly higher percent in DR group (60.9%) 70 patients, and regarding smoking also there was a strong relationship to the DR as we found 30.4% of DR group were smoking in comparing to 22% in the non-DR group as shown in (Table 3).

Table (3): Risk factors among diabetic patients with Diabetic Retinopathy

Risk factor	Group A DR (115)		Group B non-DR (635)		Total	P-value
	No.	%	No.	%		
Hypertensive	70	60.9%	270	42.5%	340	0.005
Smoker	35	30.4%	140	22%	338	0.050

We found a significantly clear relation between the duration of diabetes and DR. The mean duration of diabetes in the DR group was 14 years while in the non-DR group was 6.8 years as shown in (Figure 2).

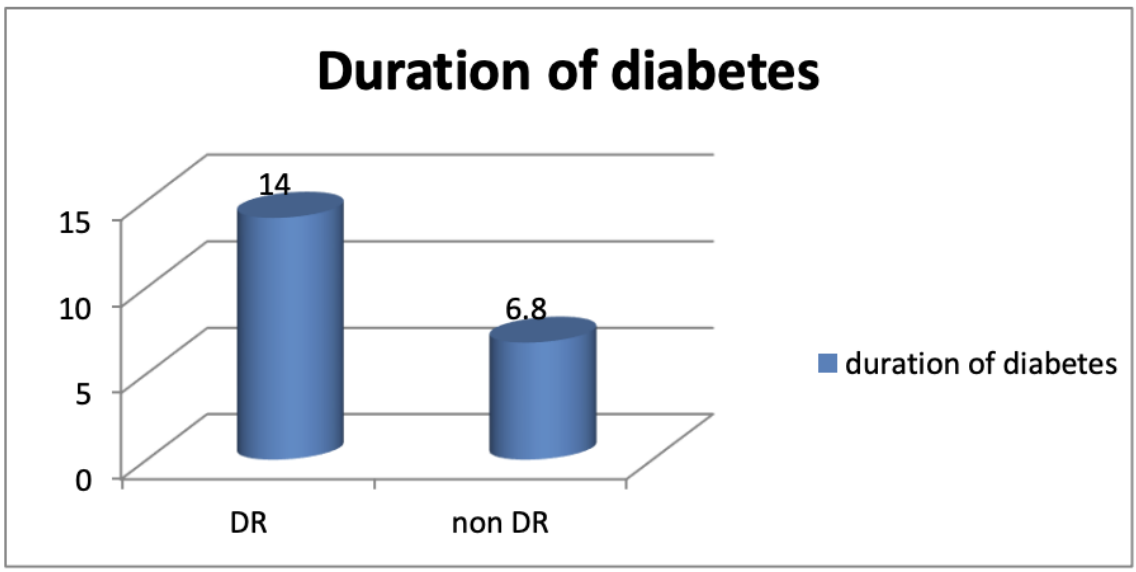

Figure (2): Relation between the duration of diabetes with Diabetic Retinopathy

Regarding the type of diabetes, we noticed significant relation with type I diabetic as shown in (Table 4). 22.6% (26) patients in group A have Type I diabetic in comparing to 16.2% (103) patients in Group B.

Table (4): The percentage of Diabetic Retinopathy according to the type of Diabetes

Diabetes type	Group A DR (115)		Group B non-DR (635)		Total	P-value
	No.	%	No.	%		
Type I	26	22.6%	103	16.2%	129	0.050
Type II	89	77.4%	532	83.8%	621	0.095
Total	115		635		750	

In our study, we didn't found any relation of DR with the education level of diabetic patients as we mention in (Table 5).

Table (5): Correlation of educational level to Diabetic Retinopathy

Educational level	Group A DR (115)		Group B non-DR (635)		Total	P-value
	No.	%	No.	%		
Primary	58	50.4%	310	48.9%	368	0.750
Secondary	38	33.1%	224	35.2%	262	0.644
Tertiary	19	16.5%	101	15.9%	120	0.868
Total	115		635		750	

DISCUSSION

This study provides important insight into the prevalence of diabetic retinopathy (DR) and its associated risk factors in the Kirkuk region of Iraq, where limited data on DR has previously been published. The findings revealed a DR prevalence of 15.3% among diabetic patients attending Baba Gurgur Diabetic Center. In detail, the prevalence was

14.3% in patients with type II diabetes and 20.1% in those with type I diabetes. These figures are comparable to or even lower than the rates reported in other countries, including Saudi Arabia (9), India (21.7%) (8), and Iran (37.0%, with 19.7% among type II diabetics) (7).

Globally, DR prevalence varies considerably, often due to differences in methodology, environment, diagnostic criteria, and sample population. A large meta-analysis conducted by Joanne et al., which included 35 studies from various countries between 1980 and 2008, estimated a global DR prevalence of 34.6%. A study in the United Kingdom involving 22,896 diabetic patients found a DR prevalence of 32.4%, with 56% in type I and 27.9% in type II diabetics (10, 11, 12).

The lower prevalence in our study may be attributed to several factors. Firstly, there is a lack of routine screening programs and patient education regarding DR, particularly in rural areas. This challenge is not unique to Iraq and has been reported in other Middle Eastern countries. Secondly, the study lacked access to advanced diagnostic tools such as fundus cameras and optical coherence tomography (OCT), potentially leading to underdiagnosis. Thirdly, the sample size was relatively small and randomly selected, which might not represent the entire diabetic population of the region.

Our analysis found no significant association between gender and the presence of DR, consistent with some studies that reported no gender differences (14), though others found males to be more at risk (13). Age, however, showed a strong correlation with DR prevalence. No DR was recorded among patients under the age of 30, while prevalence increased steadily with age, particularly among those aged 50 and older. This trend is in agreement with previous studies which reported that over 60% of patients with type II diabetes develop DR after 20 years of disease duration, regardless of treatment type (15, 16, 17, 18, 19). Age was shown to significantly influence the severity of DR in our study,

especially in the 51–60 and over 60 age groups. As noted by other researchers, age may serve as a predictor of the duration and severity of DR (20).

Glycemic control was another significant factor. The mean HbA1c level among patients with DR was 10.3%, compared to 8.5% in those without DR, supporting the view that prolonged poor glycemic control increases the risk of DR (21, 15). Chronic hypertension also showed a strong association with DR in this study, consistent with findings from other literature (16, 21).

Smoking appeared to be a contributing factor, with 30.4% of the DR group being smokers versus 22% in the non-DR group. A meta-analysis confirmed that smoking significantly increases the risk of DR among patients with type I diabetes (22). Further, one study reported that while no correlation existed between diabetes duration and proliferative DR in non-smokers, among smokers, the incidence of proliferative DR increased with longer disease duration (23).

The duration of diabetes was one of the strongest predictors of DR in our study. The mean disease duration among DR patients was 14 years, compared to only 6.8 years in the non-DR group. This is supported by other studies that found a significant association between DR and diabetes duration, fasting blood glucose, and HbA1c levels (24). In multivariate analysis, diabetes duration was identified as an independent risk factor for DR development and progression, with odds ratios of 5.7 for disease durations between 5 and 10 years and 32.3 for durations exceeding 10 years in non-proliferative DR (25). In a study from Nepal, DR was found in 24.8% of patients with less than 5 years of diabetes, and in 90.3% of those with more than 20 years (26).

Our findings also indicated that type I diabetes carried a higher risk for DR compared to type II. DR was present in 20.2% of type I diabetics versus 14.3% of type II diabetics, consistent with previous research (27, 28, 29, 30). However, no statistically significant

association was found between educational level and DR in our study. Although other studies have shown higher awareness of DR among individuals with higher socioeconomic or educational backgrounds (31), this was not reflected in our results.

CONCLUSION

The prevalence of DR was observed to be fair among Iraqi diabetic patients in this study. Diabetic retinopathy is significantly linked to high HbA1c levels, hypertension, and smoking. Our findings suggest that governments and healthcare professionals in Iraq should make greater efforts to ensure diagnoses of DR in diabetic individuals and that risk factors linked with DR are better controlled. Diabetes and diabetic retinopathy education programs for the general public, as well as the Diabetes self-management and care can be improved with ongoing medical education, as well as prevent ophthalmic problems.

RECOMMENDATIONS

We recommend education programs on Diabetes Retinopathy awareness and screening programs to early detection of any level of diabetic retinopathy.

ACKNOWLEDGMENTS

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Abbreviations

DR: Diabetic retinopathy

VTDR: vision-threatening diabetic retinopathy

PDR: proliferative Diabetic retinopathy

DME: diabetic macular edema

DCCT: Diabetes Control and Complication Trial

ETDRS: Early Treatment Diabetic Retinopathy Study

Ethical Clearance:

In accordance with the 2013 WMA Helsinki Declaration, all ethical aspects of this study were approved. Before enrolling the participants, an informed oral consent was obtained from their families as an ethical agreement. Additionally, approval from the hospital administrator was obtained.

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Nil.

Conflicts of interest:

There are no conflicts of interest**.**

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