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Incidence of Retinopathy and Factors Leading it in Type II Diabetics Attending Liaquat University Hospital Hyderabad

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ABSTRACT

Background: Diabetic retinopathy's severity and occurrence are connected to the stage of life at which it is diagnosed and the length of diabetes mellitus (DM); by the second decade of life, 60 percent to 80 percent of Type 2 diabetics experience diabetic retinopathy, which is a disorder that worsens with time and is aggravated by inadequate glycemic management. **Objective:** The objectives of this study was to determine the frequency of retinopathy and its leading factors among type 2 diabetics attending at Liaquat University Hospital Hyderabad/Jamshoro. **Study Design:** Cross-sectional study. **Settings:** Study was performed among Type 2 diabetics who attended at Liaquat University Hospital Hyderabad/Jamshoro Pakistan. **Duration:** From May 2017 to November 2017. **Methods:** All the known/diagnosed cases (male or female) of type 2 DM (T2DM) were enrolled. Patients underwent fundus examination through dilated pupils by using fundoscopy for the evaluation of presence/absence of retinopathy. For positive cases of diabetic retinopathy, a preformed proforma was used to collect data by means of history taking and medical record of the study subjects including demographic information, duration of diabetes, measurement of blood pressure and BMI. The data analysis was performed using SPSS 26.0. **Results:** A total of 1605 patients presented with T2DM, among which 260 (16.2%) patients observed with diabetic retinopathy. Multinomial regression analysis indicated that diabetic retinopathy was significant linked to the fasting blood glucose level of 175 mg/dl, HbA1c of around 9 %, Hypertension of 68.5%, BMI of nearly around 30 kg/m^2 and the mean diabetes (DM) duration of 11 years. Diabetic retinopathy had no significant correlation with other variables including cholesterol and triglyceride. Although duration of diabetes, univariate analysis indicated that duration of diabetes >5-years is linked with raised risk for diabetic retinopathy (OR = 3.09, 95% CI 1.5–8.35) and those having duration of diabetes >10-years had four times higher risk of acquiring diabetic retinopathy (p- 0.001). **Conclusion:** Incidence of the diabetic retinopathy was observed to be the (16.2%) patients of Type 2 diabetes. After controlling for various confounders, factors including fasting Sugar Level, HbA1C, BMI, and hypertension were significantly linked to diabetic retinopathy.

Keywords: Diabetic retinopathy, Diabetes duration, Factors, Poor glycemic control, Hyperlipidemia, Hypertension, Obesity.

INTRODUCTION

Diabetes mellitus is the commonest metabolic condition marked by raised glucose level and the glucose intolerance, as well as decreased insulin production and peripheral sensitivity, as well as eventual b-cell failure.[1] Because of its associated microvascular complications, like as neuropathy, retinopathy and nephropathy, as well as macrovascular complications, including cardiovascular events leading to stroke, myocardial infarction (MI) chronic hyperglycemia is associated with a high rate of mortality and morbidity.[1,2]

Diabetic retinopathy is indeed a commonest blinding diabetic condition. It is the most common cause of eyesight loss worldwide. Around one-third of the world's 285 million individuals having diabetes mellitus have indications of Diabetic retinopathy, with a further one-third having vision-threatening Diabetic retinopathy,

such as diabetic macular edema (DME).[3] Diabetic retinopathy is marked by abnormalities in the retinal microvasculature that evolve over time, resulting in regions of retinal non-perfusion, increased vascular permeability, and pathologic intraocular proliferation of retinal arteries.[4] If not treated promptly and appropriately, problems such as macular edema and uncontrolled neovascularization, known as proliferative diabetic retinopathy (PDR), can lead to significant and permanent visual loss. The most prevalent cause of vision loss is diabetic retinopathy among working-age individuals around the world. More than 90% of vision loss caused by PDR can be prevented with proper medical and ophthalmologic care.[4,5]

There are several publications on the prevalence and incidence of diabetic retinopathy, as well as the risk factors linked with this condition, from various nations. In Pakistan, there are few studies on the risk factors for diabetic retinopathy.[6] The most common factors were the duration of illness, male gender, age at presentation, raised total cholesterol, elevated LDL and the microalbuminuria.[6] Some studies corroborate the hypothesis that the length of diabetes, hemoglobin A1c (HbA1c), and hypertension are critical determinants in the progression of diabetic retinopathy; nevertheless, maintaining normal glycemic concentrations does not guarantee that the illness will not worsen.[7,8]

Individuals having diabetic retinopathy were much more likely to have poor glycemic control, as evidenced by an elevated glycated hemoglobin, prolonged diabetes duration and the uses of insulin therapy for the management, according to another study. Smoking, gender, obesity and hyperlipidemia have all been linked to diabetic retinopathy, although studies have come up with conflicting results.[9] After taking above controversial findings regarding incidence and responsible factors of the diabetic neuropathy, this study has been done to evaluate the frequency of retinopathy and its leading factors among type 2 diabetics attending at Liaquat University Hospital Hyderabad/Jamshoro.

METHODS

This cross-sectional research study was performed among patients of diabetes-type 2 (T2DM) who attended Liaquat University Hospital Hyderabad/Jamshoro between 5th May 2017 and 4th November 2017. Subjects were selected for this study by applying non-probability purposive sampling technique. All the known/diagnosed cases (male or female) of type 2 DM as per the WHO's criteria of having fasting glucose level above 126-mg/dl at two different times or symptoms of DM (polydipsia, polyuria and un-explained weight-loss) besides random plasma glucose >200-mg/dl on one occasion. All the Patients having bilateral cataract or corneal opacities, patients having history of any sort of eye surgery, history of head or eye injury and patients with stroke (either ischemic or hemorrhagic). All type 2 diabetics underwent fundus examination through dilated pupils by using fundoscopy for the evaluation of presence/absence of retinopathy. For positive cases of diabetic retinopathy, a preformed proforma was used to collect data by means of history taking and medical record of the subjects selected for the study after obtaining well-informed consent. The proforma included demographic information, duration of diabetes (in years), measurement of blood pressure (systolic and diastolic), measures of weight and height (for calculating body mass index to assess obesity). Fasting blood specimens were taken for lipid profile and glycosylated hemoglobin (HbA1c) level. Duration of diabetes was categorized as less than 5-years, 5 to 10 years, more than 10-years. The data analysis was performed using SPSS version 26.0.

RESULTS

Patients presented with type 2 diabetes during the study period at Liaquat University Hospital Hyderabad/Jamshoro were 1605 among which 260 (16.2%) patients presented with diabetic retinopathy. Among these 260 cases of diabetic retinopathy there were 62.3% females and 37.7% males. Mean age of study population was 60.2±10.0 years. Overall average BMI was 25.4±3.5 kg/m^2, average fasting plasma glucose level was 174.6±39.6 mg/dl, average total cholesterol role was 206.4±29 mg/dl, mean Triglyceride was 167.6±91.6 mg/dl and mean HbA1c was 8.4±1.5 mg/dl. Out of all 178(68.5%) cases were hypertensive and most of the cases 140(53.8%) had duration of diabetes was >10 years as shown in Table.1

Table 1: Descriptive statics of demographic characteristics (n=260)

Variables		Statistics
Age		60.2 ± 10 years
BMI		25.4 ± 3.5 kg/m^2
Fasting Plasma Glucose		174.6 ± 39.6 mg/dl
Total Cholesterol		206.4 ± 29 mg/dl
Triglyceride		167.6 ± 91.6 mg/dl
HbA1c		8.4 ± 1.5 mg/dl
Hypertension	Yes	178 (68.5%)
	No	82 (31.5%)
Gender	Males	98 (37.7%)
	Females	162 (62.3%)
Duration	<5 years	46 (17.7%)
	5-10 years	74 (28.5%)
	>10 years	140 (53.8%)
	Average	10.9 ± 6 years

Table 2: Association between risk factors and diabetic retinopathy adjusting for other variables simultaneously

Variables	Crude OR	95% CI	Adjusted OR	95% CI	p-value
Body mass index (kg/m²)					
<23.0	1		1		
23-24.9	0.49	0.24-1.00	0.20[a]	0.08-0.49	<0.01*
25-29.9	0.86	0.46-1.62	0.36 [a]	0.16-0.83	0.016*
≥30.0	0.37	0.15-0.89	0.10 [a]	0.03-0.32	<0.001*
Fasting plasma glucose (Mg/dl)					
≤120	1		1		
121-140	2.10	0.65-6.74	2.17[b]	0.58-8.10	0.249
141-160	2.40	0.77-7.43	2.97 [b]	0.83-10.68	0.095
161-180	2.80	0.88-8.84	3.82 [b]	1.02-14.24	0.045*
>180	5.05	1.64-5.60	5.98 [b]	1.66-21-56	0.006* 0.001**
HbA1C (%)					
<7	1		1		
7-9	1.80	0.94-3.41	2.07 [b]	0.99-4.13	0.051*
>9	3.26	1.56-6.77	4.09 [b]	1.66-9.92	0.002* 0.001**
Hypertension					
No	1		1		
Yes	3.47	2.08-5.79	5.00[c]	2.64-9.46	0.039*
Total cholesterol (mg/dl)					
<200	1		1		
≥200	1.28	0.78-2.11	1.26[a]	0.68-2.34	0.460
Triglyceride (mg/dl)					
<200	1				
≥200	1.32	0.72-2.38	1.56[a]	0.74-3.24	0.235
Duration of diabetes (years)					
<5	1		1		
5-10	1.47	0.72-2.98	1.52[a]	0.66-3.57	0.032
>10	3.09	1.5-8.35	1.79[a]	0.73-4.34	0.005 0.001**

**p-value <0.05, Chi-square test*
***Chi-square for trend*
[a] adjusted for FPG, HT, total cholesterol, triglyceride, type of therapy, age at onset, duration, smoking, alcohol consumption, BMI
[b] adjusted for HT, total cholesterol, triglyceride, type of therapy, age at onset, duration, smoking, alcohol consumption, BMI
[c] adjusted for FPG, total cholesterol, triglyceride, type of therapy, age at onset, duration, smoking, alcohol consumption, BMI

The diabetes duration and diabetic retinopathy had a statistically significant relationship (P<0.001). Diabetic retinopathy was found to have an inverse relationship with BMI. Subjects with a BMI ≥30 kg/m2 showed a lower likelihood of retinopathy development (P=0.095) than those with a BMI < 23 kg/m2. Patients with FPG levels >180 mg/dl were 5.05-fold more susceptible than the patients with FPG levels ≥120 mg/dl to experience diabetic retinopathy. (P<0.001). There was a significant link between diabetic retinopathy and HbA1c (P<0.001). It means that the people with a HbA1c of >9% were 3-fold more susceptible to diabetic retinopathy. Diabetics with comorbidity of hypertension exhibited a significantly higher likelihood of acquiring retinopathy as compared to diabetic patients without any hypertension (P<0.001). After doing a basic analysis, FPG, BMI, HbA1c, diabetes duration, and hypertension were found to be substantially correlated with the development of diabetic retinopathy. Confounding variables may have an impact on this relationship. The correlation between diabetic retinopathy and BMI was discovered in both multivariate and univariate analyses. BMIs of 23 to 24.9, 25 to 29.9, and ≥30 kg/m2 were all correlated with the development of diabetic retinopathy (OR = 0.20, 95%CI 0.08 – 0.49, OR = 0.36, 95%CI 0.16 – 0.83 and OR = 0.10, 95%CI 0.03 – 0.32, respectively) as shown in table.2

DISCUSSION

Diabetic retinopathy (DR) is the major cause of permanent blindness and one of the most prevalent and serious microvascular consequences of diabetes.[7] Diabetic retinopathy, a degenerative illness of retinal microvasculature, causing vision impairment due to early-onset cataract and diabetic retinopathy. Diabetic retinopathy was responsible for 1.8 million (4.8 percent) of the 39 million individuals worldwide who were blind due to various eye illnesses.[10,11] In this study out of 1605 diabetic cases 260 (16.2%) patients found with diabetic retinopathy. These findings were almost similar to the study of Riaz S *et al*[12] as in their study, 14.43 percent of people had diabetic retinopathy. Raja SA *et al*[13] also demonstrated that the overall incidence of diabetic retinopathy was 22.6%. Blindness affects 1.5 billion people worldwide, with 0.4 million people suffering from DR. Despite the fact that global blindness and vision problems have decreased, DR-related blindness has grown from 0.2 to 0.4 million, with moderate to severe visual disorders increasing from 1.4 million to 2.6 million between 1990 and 2015.[14,15]

In this study Mean age of study population was 60.2±10.0 years and out of 260 cases of diabetic retinopathy there were 62.3% females and 37.7% males. Consistently Riaz S *et al*[12] reported that the 270 (68.4%) of the 395 diabetes patients were females, whereas 125 (31.6%) were males and average age of diabetic patients were 52.93 years. On other hand Rasheed M *et al*[16] reported that the study enrolled a total of 84 cases, with an average age of 52.39.7 years and there were 55 females (66%) and 29 males (34%) among these patients. In this study overall average BMI

was 25.4±3.5 kg/m^2, average fasting plasma glucose level was 174.6±39.6 mg/dl, average total cholesterol role was 206.4±29 mg/dl, mean Triglyceride was 167.6±91.6 mg/dl and mean HbA1c was 8.4±1.5 mg/dl and out of all 178(68.5%) cases were hypertensive and most of the cases 140(53.8%) had duration of diabetes was >10 years. Among these findings few are comparable with study of Sohail M *et al*[17] as the patients' average RBS and HbA1c levels were 219.2 82.4 mg/dL and 8.9 2.5 percent, respectively, and overall average age was 52.9 10.5 years, while diabetes had been present for an average of 8.8 5.1 years.

In this study FPG, BMI, HbA1c, systolic blood pressure, and hypertension were found significantly linked to diabetic retinopathy and these findings were consisting with the results of Tilahun M *et al*[15] as the diabetic retinopathy was discovered in 23.9 percent of type II diabetes cases, and it was linked to older age, male gender, diabetes duration, elevated total cholesterol and LDL including albuminuria and insulin therapy. Raja SA *et al*[13] also demonstrated that the diabetic retinopathy was linked to a prolonged duration of Diabetes, poor control, and the prevalence of microalbuminuria, however it was lower in the older populations. It is critical to promote good control from the time of DM diagnosis and to implement immediate and efficient retinopathy management. Our finding is in line with prior research on diabetes have shown that insulin therapy improves glycemic control, treatment satisfaction, and quality of life in newly diagnosed Type 2 diabetics.[17] Generally, there are two types of risk factors of the diabetic retinopathy: modifiable and non-modifiable ones. Hyperglycemia, high blood pressure, high cholesterol, and overweight are modifiable risk factors, while prolonged diabetes duration, ethnicity, gender, puberty, and pregnancy are nonmodifiable risk factors.[7,18] There were several limitation has been faced during this study, hence further large scale studies with long-term follow-up should be done to observed the accurate responsible factors.

CONCLUSION

The univariate analysis showed that FPG, BMI, HbA1c, systolic blood pressure, and hypertension were significantly linked to diabetic retinopathy. After controlling for various confounders, 4 factors including fasting Sugar Level, HbA1C, BMI, and hypertension were significantly linked to diabetic retinopathy. Hyperglycemia (as evaluated by HbA1c, FPG, BMI) and hypertension were independent risk factors for diabetic retinopathy. It is well known that if hyperglycemia and hypertension are not regulated properly, diabetic retinopathy will worsen. Routine diabetic retinopathy screenings and more aggressive hypertension and glycemia control might help to lower the burden of diabetic retinopathy. These findings can be used in a preventative and control program for diabetic retinopathy, especially in the much more serious treatment of hypertension and glycemia regulation.

LIMITATIONS

No significant limitations.

SUGGESTIONS / RECOMMENDATIONS

Diabetic retinopathy cases must be treated quickly and closely monitored to prevent the severe progress of diabetic retinopathy. A prospective investigation on the link between risk factors and diabetic retinopathy is needed.

CONFLICT OF INTEREST / DISCLOSURE

No conflict of interest is involved.

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