Evaluation of Frequency of Different Types of Retinopathy in Type 2 Diabetic Patients in Tertiary Care Hospital

Zille-Huma [1], Akhtar Ali Baloch[2], Farnaz Siddiqui[3], Zunaira Nawaz [4], Tayyaba Iqbal[5], Maria Khan[6], Ihsan Bashir [7]

Abstract

Objective: To evaluate and decrease the long-term complication of different types of retinopathy in Type 2 diabetic patients.

Methods: It was Cross-sectional study conducted in department of General Medicine and Eye of Dow University Hospital OPD. Structural Performa was designed. A total of 350 diabetic patient 30 years old and 80 years old were recruited in the study between January 2021 to December 2021 and bio data and investigations of patients were documented. Routine investigations regarding Diabetes Mellitus were done. After that clinical examination of eye of patient was done by ophthalmologist.

Results: Out of 350 recruited diabetic patients retinopathy was present in 98 patients (28%) while absent in 252 (72%). Regarding types of retinopathy mild Non Proliferative Diabetic Retinopathy (mild NPDR) was present in 36 (36.7%), moderate non proliferative diabetic retinopathy (moderate NPDR) was found in 16 (16.3%) and severe non proliferative diabetic retinopathy (severe NPDR) in 4 (4.1%). Proliferative retinopathy in 6 (6.1%). Maculopathy was present in 6 (6.1%). Clinical significant macular edema in 14 (14.3%) and advance retinopathy in 16 (16.3%) of diabetics. Cup to disk ratio was normal in 90 patients while higher in 8 patients with retinopathy. Males (63.3%) were having retinopathy as compared to female (36.7%). Out of 98 patients with retinopathy, 44 patients (44.9%) were <55 years of age and 54 (55.1%) were >55 years of age. Patients having retinopathy, 30 (30.6 %) have duration <10 years while 68 (69.4%) have duration >10 years. Uncontrolled diabetics 76 (77.6%) develop retinopathy more frequently than controlled ones.

Conclusion: Diabetic retinopathy is one of the major complications of diabetes, so in order to prevent visual loss it is vital to detect it early. We conclude that chances of developing retinopathy in diabetics is directly related to age of patients, duration of disease and control of diabetes.

Key words: Diabetes mellitus, type 2, frequency, retinopathy

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Introduction

Diabetes mellitus is a metabolic disorder in which there is prolonged raised blood glucose level. It is a major health problem all over the world[1]. Diabetes mellitus is defined as fasting plasma glucose equal to or more than 126mg/dl, random blood sugar equal to or more than 200mg/dl and HbA_1c 6.5 or above. According to World Health Organization (WHO), the estimated prevalence of diabetes in 2016 was 9.8% which is expected to increase in future [2]. According to International Diabetes Federation (IDF) 2019 ATLAS, 9th edition currently 463 million people in the world are suffering with diabetes mellitus, most of these are type 2 which is expected to increase to 700 million by 2045. Three hundred and fifty two million people are of the ages between 20 to 64 years old i.e., normal working age group[3].It is now considered as epidemic [4]. Over the past two decades the burden of diabetes mellitus has been increased. In 2007 more than 110 million Asian people, most of which were young adults, were diagnosed with mellitus diabete-

[1,2,4] Department of General Medicine,
Dow University of Health Sciences
[3] Department of Eye. Dow International Medical College.
Dow University of Health Sciences
[5] Department of Dermatology, Dow University of Health Sciences
[6] Department of Anatomy, Dr. Ishrat-ul-Ebad Khan
Institute of Oral Health Sciences. Dow University of Health Sciences
[7] Fellow in Diabetes and Endocrinology in BIDE Karachi

Correspondence: Dr. Zille-Huma
Department of General Medicine,
Dow University of Health Sciences
Email: zille.huma@duhs.edu.pk
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s[5]. According to recent meta-analysis the occurrence of diabetes mellitus in Pakistan is 14.6% and the factors contributing to its increase are increasing age, family history, hypertension, and overweight [6].

Diabetes mellitus is categorized into two types: Type 1 diabetes mellitus (T1DM) and type 2 diabetes mellitus (T2DM). Type 1 diabetes mellitus also known as insulindependent diabetes mellitus (IDDM) is due to decrease insulin secretion. It is an autoimmune disease in which there is destruction of islets B cells present in pancreas. Common symptoms of type 1 DM are polyuria, polydipsia, parasthesias and weight loss. Type 2 diabetes mellitus or non-insulin-dependent diabetes mellitus (NIDDM) is due to tissues become insensitive to insulin as a result there is increase resistance of action of insulin [7]. This type of disease occur mostly in adults i.e. more than 40 years but it can occur in children also. Patients may be asymptomatic but polydipsia, polyuria may be presenting complain. Candida vaginitis may be first manifestation. Obesity is the most common risk factor responsible for insulin resistant. Visceral obesity in which there is deposition of fat in omentum and mesentery is mainly responsible for insulin resistance as compared to subcutaneous abdominal fat. Metabolically obese is a term used for patients who are not grossly obese but their visceral fat content is increased. Diabetes mellitus can be secondary to other causes like increase secretion of growth hormone in acromegaly, cortisol in Cushing syndrome, increase secretion of glucagon in glucagonoma, increase secretion of catecholamine in pheochromocytoma. Certain drugs like thiazide diuretics, pentamidine, phenytoin, some antipsychotics calcineurin inhibitors etc. by reducing insulin secretion cause hyperglycemia and hence secondary diabetes mellitus. Diabetes mellitus can involve almost all organs of the body causing many complications. Diabetes and its complications are a great social and economic burden on patient and relatives especially in a developing country like Pakistan. Vascular complications of DM may be either microvascular or macrovascular[8]. Longer duration and early onset of the diabetes increases the risk of vascular complications suggested by a Korean study[9]. Macrovascular complications of diabetes mellitus include ischemic heart disease, stroke and peripheral artery disease and microvascular complications include nephropathy, neuropathy and retinopathy. In diabetic retinopathy (DR), increase blood glucose level causes death of pericytes, which are the cells forming outer layer of blood vessels of retina and thickening of basement membrane. Retinal blood barrier is altered by these changes and permeability of blood vessels is increased. As a result soft and hard exudates, hemorrhages and new vessel formation occur. Diabetic retinopathy can lead to irreversible blindness[10]. Patients may be asymptomatic in early stages. With the progression of retinopathy, patient might develop spots or eye floaters, dark or empty spots in vision, blurring of vision, fluctuated vision and flashes of light. Diabetic patient should be referred to ophthalmologist as early as possible even when vision appears normal. Diabetic retinopathy can be prevented by tight control of diabetes, avoid smoking, annual eye checkup by eye specialist and control of lipids. Duration and severity of diabetes affects the risk of development of retinopathy in type 2 diabetic patients[11]. Visual loss can be prevented through early detection and treatment of retinopathy. Diabetic Retinopathy is classified according to International clinical diabetic retinopathy disease severity scale as under [12]:

1. Mild NPDR in which there is microaneurysms only
2. Moderate NPDR which is more than just microaneurysms but less than severe NPDR
3. Severe NPDR which contains any of the follow ing (4:2:1 rule)
   · More than 20 intraretinal hemorrhages in each of four quadrants
   · Definite venous beading in two or more than two quadrants
   · Intraretinal microvascular abnormality (IRMA) in one or more quadrants
4. Proliferative diabetic retinopathy (PDR) which having either of the following

.

· Neovascularization
· Vitreous/preretinal hemorrhage.

This study was planned with the aim that diabetic retinopathy can lead to blindness hence by early detection of retinopathy blindness can be prevented.

Patients and Methods

It was a cross-sectional study conducted in General Medicine and Eye OPD of Dow University Hospital Karachi Pakistan. Sample size was calculated by using open Epi sample size calculator with prevalence of diabetic retinopathy was found in the type 2 diabetes was 34.6 %, taking from the study, Ref "Alharbi AM, Alhazmi AM. Prevalence, risk factors, and patient awareness of diabetic retinopathy in Saudi Arabia: a review of the literature. Cureus. 2020 Dec 9; 12(12)'' [13,] at 5% margin of error and 95% C.I., the minimum participants required for study is, n=348.

A total of 350 diabetic patients more than 20 years old were recruited in the study between January 2021 to December 2021 with the inclusion criteria was Type 2 diabetic patients between age 30 years and 80 years. Exclusion criteria was Type 1 diabetic patients, age more than 30 years and more than 80 years, patients not giving consent, mentally retarded patients, patients having any other advanced systemic disease like chronic liver disease, cardiac disease, chronic renal failure, chronic obstructive pulmonary disease and malignancy.

After registration and obtaining informed consent, patient demography was enquired and documented. Patient was examined and routine investigations regarding diabetes mellitus like fasting blood sugar, random blood sugar, and HbA1c were done. After that patient was referred to eye OPD where clinical examination of eye of patient was done by ophthalmologist.

Each subject had visual acuity assessment by using Snellens Visual Acuity Chart. Anterior segment examination was done by Top Con Slit lamp and fundoscopy was done by Top Con Slit lamp bio microscopy with Volk +90 Diopter lens. All patients were dilated with eye drops Tropicnamide 1% prior to fundoscopy and it was instilled every ten minutes for thirty minutes. After fundoscopy the diabetic retinopathy was classified according to its severity into nonproliferative diabetic retinopathy, proliferative diabetic retinopathy and diabetic maculopathy

Data was entered and transferred to SPSS Software and statistical analysis was performed. One way ANOVA and Chi Square tests are applied. Quantitative variables like age, disease duration, and HbA1c were presented as mean and standard deviation. Qualitative variables like gender, age group, family history, length of diagnosis of diabetes, level of control of diabetes etc. were presented as frequency and percentages.

Results

The descriptive statistics of our study variables are summarized in table 1 and frequency of demographic and clinical variables in table 2.

A total of 350 patients were included in this study. In our study mean age of total patients was 54.7 ± 9.9. Mean age of participants who have retinopathy was 56.1 ± 8.3 years while of those without retinopathy it was 54.1 ± 10.4. Mean duration of diabetes of total patients was 9.3 ± 7.3 years. Duration of diabetes with retinopathy was 13.1 ± 7.6 years while those without retinopathy was 7.9 ± 6.7 years with p value of 0.001. Mean HbA1c of total participants was 8.7± 1.7. Mean HbA1c in diabetics with retinopathy was 8.8 ± 1.6 while in those without retinopathy was 8.6 ± 1.8.

Out of 350 patients there were 168 (48%) males while 182 (52%) females. Out of 168 male patients 62 (36.9%) have DR while 106 (63.1%) do not have DR. While out of 182 female patients 36 (19. 8%) have DR and 146 (80.2%) do not have it. Showing that DR is more common in males. Out of 98 patients with retinopathy, 62 (63.3%) were males while 36 (36.7%) were female and among those without retinopathy 106 (42.1%) were male and 146 (57.9%) were female. Age of 171 (48.9%) diabetic patients were less than 55 years out of which, 44 (25.7 %) have retinopathy while 127 (74.3%) do not

have retinopathy. Out of 179 patients of age >55 years, 54 (30.2%) have retinopathy while 125 (69.8%) do not have it emphasizing the impact of increasing age on developing DR.

Out of 98 patients with retinopathy, age of 44 (44.9%) of patients was <55 years and 54 (55.1%) was >55 years while those without retinopathy 127 (50.4%) were <55years and 125 (49.6%) were >55 years as shown in table 2. Family history of diabetes was present in 113 (32.3%) patients while absent in 237(67.7%). Family history of diabetes in patients with retinopathy was present in 40 (40.8%) while absent in 58 (59.2%). In patients without retinopathy it was present in 73 (29%) while absent in 179 (71%).

Duration of diabetes was less than 10 years in 197 (56.3%) while it is more than 10 years in 153 (43.7%) of patients. Out of 350 diabetic patients, 197 have duration of diabetes <10 years out of which 30 (15.2%) have DR and 167 (84.8%) do not have it. Out of 153 whose duration is >10 years DR is present in 68 (44.4%) and it is absent in 85 (55.6%). Patients having retinopathy, 30 (30.6%) have duration <10 years while 68 (69.4%) have duration >10 years while those without retinopathy 167 (66.3%) are of duration <10 years and 85 (33.7%) are of duration >10 years.

Diabetes is controlled i.e., HbA1c <7 in 86 patients out of which 22 (25.6%) have retinopathy while 64 (74.4%) are without retinopathy. No. of patients having uncontrolled diabetes is 264 out of which DR is present in 76 (28.8%) and absent in 188 (71.2%) patients. HbA1c was <7 in 22 (22.4%) with retinopathy while rest i.e.76 (77.6%) have >7. It is <7 in 64 (25.4%) and >7 in 188 (10.7%) of patients without retinopathy.

Table 1. Descriptive Statics and Comparison of Study Variables

Total No of Patients	Retinopathy			
		Present	Absent	
Variable	Mean± SD	Mean ± SD	Mean ± SD	P-value
Age(Years)	54.7 ± 9.9	56.1 ± 8.3	54.1 ± 10.4	0.08
DiseaseDuration (Years)	9.3 ±7.3	13.1 ± 7.6	7.9 ± 6.7	0.001
HbA1c(%)	8.7 ± 1.7	8.8 ± 1.6	8.6 ± 1.8	0.04
Cup to Disk Ratio	0.3 ± 0.1	0.3 ± 0.1	0.3 ± 0.1	0.2

Table 2. Demographic and Clinical Variables

Variables	N=350 (%)	Retinopathy Present (n=98) (%)	Absent n=252(%)	P-Value
Gender				
Male	168 (48.0)	62 (63.3)	106 (42.1)	
Female	182 (52.0)	36 (36.7)	146 (57.9)	0.001
Age Groups (Years)				
< 55	171 (48.9)	44 (44.9)	127 (50.4)	
> 55	179 (51.1)	54 (55.1)	125 (49.6)	0.3
Family History of Diabetes				
Present	113 (32.3)	40 (40.8)	73 (29.0)	
Absent	237 (67.7)	58 (59.2)	179 (71.0)	0.03
Disease Duration (Years)				
<10 Years	197 (56.3)	30 (30.6)	167 (66.3)	
>10 Years	153 (43.7)	68 (69.4)	85 (33.7)	0.001
HbA1c (%)				
Controlled (<7.0%)	86 (24.6)	22 (22.4)	64 (25.4)	
Uncontrolled (>7.0%)	264 (75.4)	76 (77.6)	188 (74.6)	0.5
Cup to Disk Ratio				
Normal (< 0.5)	315 (90)	90 (91.8)	225 (89.3)	
Abnormal (> 0.5)	35 (10.0)	8 (8.2)	27 (10.7)	0.4

Frequencies of different types of retinopathies are shown in table 3

Out of 350 recruited diabetic patients retinopathy was present in 98 patients (28 %) while absent in 252 (72 %). Regarding types of retinopathy mild non proliferative diabetic retinopathy (mild NPDR) was present in 36 (36.7%), moderate non proliferative diabetic retinopathy (moderate NPDR) was found in 16 (16.3%) and severe non proliferative diabetic retinopathy (severe NDPR) in 4 (4.1%). Proliferative retinopathy in 6 (6.1%). Maculopathy was present in 6 (6.1%). Clinical significant macular edema in 14 (14.3%) and advance retinopathy in 16 (16.3%) of diabetics. Cup to disk ratio was normal in 90 patients while higher in 8 patients with retinopathy.

Table 3: Retinopathy and its Types

Variable	N=350 (%)
Retinopathy	
Yes	98 (28.0)
No	252 (72.0)
Types of Retinopathy (n=98)	
Mild NPDR	36 (36.7)
Moderate NPDR	16 (16.3)
Severe NPDR	4 (4.1)
Proliferative Retinopathy	6 (6.1)
Maculopathy	6 (6.1)
Clinically Significant Macular Edema	14 (14.3)
Advance Retinopathy	16 (16.3)

Discussion

Diabetes mellitus is increasing worldwide like an epidemic [4] Diabetes and its many complications are responsible for a great burden to society. Diabetic retinopathy is a microvascular complication of it. Prolonged hyperglycemia increases retinal vessel permeability. Due to these leaky vessels various changes occur leading to retinopathy. Diabetic patients are four times more prone to develop visual impairment than nondiabetics[14].

A total of 350 patients were recruited in this study, out of which retinopathy was present in 28% of diabetic patients while it was 12.3% in Catalonia (Spain)[15], 15.9% in Pakistan[16], 16.3% in Portugal[17], 17.5% in Pakistan[18], 19.3%, 24.9% in South Africa[19], 27.9% in Tanzania[10], 30.2% in Wales[20], 55. 3% in Karachi Pakistan[21]. The reason of this wide variation in frequency may be due to usage of different screening methods and grading system, lifestyle and environmental factors and also whether study conducted was community or hospital based.

In our study, males (63.3%) outnumbered females (36.7%) in having retinopathy. Similar results were obtained in other studies done in Khartoum[22] and Pakistan [21]. It might be due to males attend OPD more as compared to females.

In present study duration of diabetes is a strong risk factor for the development of retinopathy. Duration of diabetes is >10 years in 69.4% of patients which is also observed in other studies done in Tanzania [10] and Sudan [22]. It may be due to the effect of chronic hyperglycemia on small blood vessels causing microvascular complications and impending retinal perfusion and new vessel formation in retina. We also observed that incidence of retinopathy also increased as age advances, it might be due to associated comorbidities.

Diabetic retinopathy was found to be associated with uncontrolled diabetes, 77.6% of patients with retinopathy had uncontrolled diabetes (i.e. HbA1c >7). Uncontrolled diabetes is also a risk factor in a study done by Sharjeel Sultan et al [18.] This is because hyperglycemia leads to retinal damage secondary to alteration in retinal vessels.

In literature Non Proliferative Diabetic Retinopathy was more prevalent than proliferative one [22]. Which is also observed in our study i.e., 6.1% proliferative as compared to 57.1% of non-proliferative retinopathy. Regarding types of retinopathy, in present study mild Non Proliferative Diabetic Retinopathy was present in 36.7% of patients while in other studies it was 40.5% [21] and 45% [23] which is close to our results. Moderate non proliferative diabetic retinopathy was present in 16.3% while it was 5.8% [21] and 15% [23] in other studies. Severe non proliferative diabetic retinopathy was 4.1% in this study while others found it to be 1.9% [21] and 2% [23]. Proliferative retinopathy was 6.1% in our study while 2.9% to 7% in others [10, 18, 21, 23]. Advanced diabetic retinopathy was 16.3% in our study while in a study done by Saleh Memon et al in Karachi it was 1% [23]. In this study 14.3% of diabetic patients had clinically significant macular edema while its percentage was 36% [21], in other.

Conclusion

Diabetic retinopathy is one of the major complications of diabetes so in order to prevent visual loss it is vital to detect it early. We conclude that chances of developing retinopathy in diabetics is directly related to age of patients, duration of disease and uncontrolled diabetes. The onset and progression of diabetic retinopathy can be prevented by increasing awareness of hyperglycemia on eyes and early referral to eye specialist for regular eye checkups for screening.

Conflict of Interest

Authors have no conflict of interest and no grant/funding from any organization

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