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Original Article

Prevalence of Diabetic Retinopathy in Diabetic Subjects Visiting Diabetic Centers of Lahore, Pakistan.

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ABSTRACT

One of the chronic illnesses with the highest rate of growth in the globe and a major contributor to acquired visual loss is diabetes mellitus (DM). Globally, diabetic retinopathy (DR), a particular microvascular consequence of DM, continues to be the primary cause of acquired visual loss. **Objective:** To ascertain the percentage prevalence of diabetic retinopathy in diabetic subjects and the relationship between diabetic retinopathy and potential risk factors. **Methods:** This study was conducted in Services Hospital on Jail Road, Lahore. The time duration of study was from November 2018 to June 2019. The patients were asked to fill a designed questionnaire which contained questions regarding patient's demographic data, habits and history about the disease. **Results:** A total of 1000 diabetic patients were enrolled and among them 511 (51.1%) had diabetic retinopathy. Among 369 males, 173 (46.9%) males had diabetic retinopathy and among 631 females, 338 (53.6%) females had diabetic retinopathy. The mean age of studied population was 53.77±0.35 years. Logistic regression model indicated that age (years), gender, systolic blood pressure (mmHg), diastolic blood pressure (mmHg), HbA1c level (mmol/L), span of diabetes (years), family history of diabetes, sedentary lifestyle were the risk factors for incidence of diabetic retinopathy in this study. **Conclusions:** The occurrence of DR is high in the studied population. Age (years), span of diabetes (years), HbA1c level (mmol/L) and not doing exercise were seen to be exhibiting more important role towards the development of diabetic retinopathy.

INTRODUCTION

Diabetes mellitus (DM) is a metabolic alteration marked by insistently high blood sugar levels, along with alterations in the metabolism of carbohydrates, proteins, and fats. Although the causes and origin of diabetes mellitus (DM) may differ, it is inevitable that changes in either insulin secretion or insulin hormone sensitivity, or both at some point during the natural progression of the disease [1].There are two categories of DM: type I and type II. For those with type 1 diabetes, require an external insulin source, typically administered through injections, is necessary for survival. It is marked by the loss of the pancreatic islets' beta cells responsible for insulin production, leading to insufficient insulin levels. This type can also be classified as idiopathic or immune-mediated. Most cases of type 1 diabetes are immune-mediated, where T cells trigger an autoimmune response leading to the destruction of B cells and consequently insulin [2]. Individuals with type II diabetes have insulin resistance, a disease in which the body or its tissues do not respond effectively to the actions of insulin. Previously referred to as adult-onset diabetes, type 2 diabetes mellitus (T2DM) is characterized by increased blood sugar levels, insulin resistance, and a relative insufficiency of insulin [3].Dietary factors contribute to the risk of developing type 2 diabetes. Excessive consumption of sugar sweetened beverages is linked to a higher risk [4]. It's also important to

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consider the kind of lipids consumed; polyunsaturated and monounsaturated fats lower risk, while saturated and trans fats raise it [5]. Consuming large amounts of white rice and other grains may also increases risk of developing diabetes. It is estimated that 7% of diabetes cases are attributed to lack of physical activity [6]. Diabetes can cause major problems such as ulceration, neuropathy, retinopathy, and nephropathy as it progresses due to tissue or vascular damage. Therefore, a wide range of different disorders are included in the group of diabetes [7]. The International Diabetes Federation estimates that 26.7% of Pakistani adults will have diabetes in 2022, totaling over 33,000,000 cases [8]. Diabetic Retinopathy (DR) is a condition that most DM patients ultimately get. One typical effect of diabetes is diabetic retinopathy (DR), which is brought on by alterations in the retina's blood vessels. Damage to the retina's blood vessels can cause scar tissue, brittle, brush-like branches, and blood leaking. The visual images that the retina transmits to the brain may become distorted or blurry as a result. Blindness might result from it if left untreated. Blindness is typically prevented if detected early and treated appropriately [9]. There are around 93 million DR patients and 17 million Poliferative Diabetic Retinopatht (PDR) patients worldwide. Twenty years after the disease's inception, almost all patients with type 1 diabetes and 58% of those with type 2 diabetes show indications of retinopathy [10]. Modifiable and non-modifiable risk factors can be used to categorize DR risk factors. Obesity, high blood pressure, high cholesterol, and hyperglycemia are among the modifiable risk factors. On the other hand, the non-modifiable risk factors for the onset and advancement of DR are pregnancy, puberty, and the length of diabetes. Tight glycemic control [HbA1c value of 7% or below] might minimize the risk of DR onset and progression in T1DM and T2DM patients, respectively, according to two seminal clinical trials: the Diabetes Control and Complications Trial (DCCT) and the UKPDS [11,12]. Countless investigations have revealed that the pathophysiology of diabetic retinopathy includes long-term diabetes, persistent hyperglycemia, hyperlipidemia, and hypertension. It should come as no surprise that many routes have been implicated in the incompletely understood processes by which increased glucose triggers the vascular disruption in retinopathy [13]. In order to enable prompt identification and subsequent therapy of the illness, diabetic individuals must undergo routine eye screenings because diabetic retinopathy is primarily asymptomatic in its early stages [14].

In practice, the early clinical symptoms of this problem are visible in the fundus on ophthalmoscopic examination, even if the first diagnosis of diabetic retinopathy may be based on functional abnormalities in electroretinography, retinal blood flow, and retinal blood vessel calibre [15]. Based on the existence of vascular lesions and those that are closely related, as well as the presence or lack of neovascularization, diabetic retinopathy is now classified. A quarter of those with vision-threatening diabetic retinopathy (VTDR), which is defined as severe non-proliferative DR, proliferative DR (PDR), and diabetic macular edema (DME), reported DR symptoms in 2010 out of an estimated 285 million persons with diabetes globally [16]. Current study aimed to assess the prevalence of diabetic retinopathy in individuals with the disease as well as any possible risk factors associated with the condition.

METHODS

This cross sectional study was planned to evaluate DR prevalence in diabetes by visiting hospital of Lahore, namely Services Hospital after receiving permission from their institutional review board (IRB/2018/483/SIMS) and consent from the patients. The study was conducted during November 2018 to June 2019. A questionnaire was designed to collect information from the diabetic patients regarding length of life (years), sex, body mass index (Kg/m^2), blood pressure (mmHg), Glycemic status, type of diabetes, span of diabetes, family history of diabetes, treatment (insulin, medicine or both), life style (active or sedentary), smoking, diet control and exercise. The sample size was determined by taking into account the incidence of diabetes mellitus in Pakistani society. The data collected were entered on the MS Excel sheet by using Microsoft Excel and statistically analyzed by SPSS (version 20.0). Mean values were calculated and expressed as Mean ±SEM. Independent t-tests were used to calculate the significance between metric variables while chi square tests were used to calculate significance among categorical variables. Logistic regression model was used to predict the factors affecting the development of diabetic retinopathy. Confidence level of 95% was taken into account. The p-value of ≤0.05 was taken as significant.

RESULTS

There were 1000 diabetic patients who registered in the study and among them 511 (51.1%) had diabetic retinopathy. Among 369 males, 173 (46.9%) males had diabetic retinopathy and among 631 females, 338 (53.6%) females had diabetic retinopathy. The average age of studied population was 53.77±0.353 years. There were 92 (9.2%) diabetic patients that had type I diabetes mellitus while 908 (90.8%) had type II diabetes mellitus. Among 1000 diabetic patients, 166 (16.6%) had mild non-proliferative diabetic retinopathy (NPDR), 193 (19.3%) had moderate NPDR, 97 (9.7%) had severe NPDR and 55 (5.5%) patients had proliferative diabetic retinopathy (PDR) shown in table 1.

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Table 1: Number of Patients According to the Stage of Diabetic Retinopathy

Stages of Diabetic Retinopathy	N (%)
Mild NPDR	166 (16.6%)
Moderate NPDR	193 (19.3%)
Severe NPDR	97 (9.7%)
PDR	55 (5.5%)
Total	511 (51.1%)

The demographic characteristics of enrolled subjects were shown in Table 2. All the risk factors for diabetic retinopathy were tested using a logistic regression model. The factors included were age (years), BMI (Kg/m^2), gender, fasting blood glucose (mm/Hg), random blood glucose (mg/dl), systolic blood pressure (mg/dl), diastolic blood pressure (mm/Hg), HbA1c level (mmol/L), span of diabetes mellitus (years), treatment, Diabetes type, family history of Diabetes, diet control, life style, smoking and exercise.

Table 2: Characteristics of Studied Population

Variables		All Subjects Mean±S.E.M/ N (%) N=1000	Diabetic Retinopathy Mean±S.E.M/ N (%) N=511	Without Diabetic Retinopathy Mean±S.E.M/ N (%) N= 489
Weight(Kg)		53.77±0.353	55.24±0.477	52.23±0.512
Age (years)		1.61±0.002	1.611±0.004	1.614±.004
Height (m)		73.18±0.449	73.50±0.600	72.85±0.670
Body Mass Index (Kg/m^2)		28.27±0.183	28.46±0.248	28.07±0.270
Fasting blood glucose (mm/dL)		178.53±2.893	178.04±4.153	179.01±4.038
Random blood glucose (mg/dL)		222.11±3.541	225.16±4.932	218.56±5.078
Systolic blood pressure (mg/Hg)		132.90±0.688	134.63±0.963	131.08±0.977
Diastolic blood pressure (mm/Hg)		83.39±0.373	84.23±0.539	82.52±0.513
HbA1c level (mmol/L)		8.76±0.066	9.06±0.092	8.44±0.091
Span of Diabetes mellitus (years)		8.59±0.215	9.95±0.310	7.16±0.284
Gender	Male	222.11±3.541	225.16±4.932	218.56±5.078
	Female	132.90±0.688	134.63±0.963	131.08±0.977
Family history of Diabetes	Yes	83.39±0.373	84.23±0.539	82.52±0.513
	No	8.76±0.066	9.06±0.092	8.44±0.091
Diet control	Yes	590 (59%)	296 (57.93%)	294 (60.12%)
	No	410 (41%)	215 (42.07%)	195 (39.88%)
Life style	Active	169 (16.9%)	74 (14.48%)	95 (19.43%)
	Sedentary	831 (83.1%)	437 (85.52%)	394 (80.57%)
Current Smoker	Yes	52 (5.2%)	20 (3.91%)	32 (6.54%)
	No	948 (94.8%)	491 (96.09%)	457 (93.46%)
Exercise	Yes	486 (48.6%)	216 (42.27%)	270 (55.21%)
	No	514 (51.4%)	295 (57.73%)	219 (44.79%)

P-values for the logistic regression model together with the odds ratio and 95% confidence range. Highly significant factors were those with a p-value of less than 0.01 (Table 3).

Table 3: Utilizing a Logistic Regression Model, Assessment of Risk Factors Associated with Diabetic Retinopathy

Sr. No.	Variables	Odds ratio (95% CI)	p-value
1	Age (years)	1.025 (1.013-1.037)	0.000**
2	Body Mass Index (Kg/m2)	1.012 (0.990-1.034)	0.291^{ns}
3	Gender	1.307 (1.010-1.691)	0.042*
4	Fasting blood glucose (mm/dL)	1.000 (0.998-1.002)	0.866^{ns}
5	Random Blood glucose (mg/dL)	1.001 (0.999-1.003)	0.352^{ns}
6	Systolic blood pressure (mg/Hg)	1.008 (1.002-1.013)	0.010**
7	Diastolic bloodpressure (mm/Hg)	1.012 (1.002-1.023)	0.022*
8	HbA1c level (mmol/L)	1.160 (1.091-1.234)	0.000**
9	Span of Diabetes mellitus (years)	1.066 (1.045-1.087)	0.000**
10	Treatment	0.880 (0.739-1.049)	0.154^{ns}
11	Type of diabetes	1.212 (0.789-1.863)	0.380^{ns}
12	Family history of Diabetes	1.466 (1.143-1.881)	0.003**
13	Diet control	0.913 (0.710-1.175)	0.480^{ns}

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14	Lifestyle	1.424 (1.021-1.987)	0.038*
15	Current smoker	0.582 (0.328-1.032)	0.064^{ns}
16	Exercise	0.594 (0.462-0.763)	0.000**

*Significant p≤ 0.05, **Highly significant p≤ 0.01, nsNon-significant p>0.05

DISCUSSION

With the rise in diabetes, the Diabetic Retinopathy (DR) and vision-threatening DR (VTDR), which includes severe non-proliferative DR (Severe NPDR), proliferative DR (PDR) and diabetic macular edema (DME), has been estimated to rise to 191.0 million and 56.3 million, respectively by 2030 in diabetic subjects [17]. In present study, mean age of patients diagnosed with DR was 55.24±0.47 years, whereas the mean age of patients without DR was 52.23±0.51 years. This shows that with age the chance of developing diabetic retinopathy increases. The logistic regression model showed the odds ratio of 1.025 with confidence interval of 95%, depicting that advancing age is a major risk factor in developing retinopathy in diabetic subjects. Two young patients of 9 and 16 years old were registered in the data who had DM. This occurrence can be credited to the factors relating to inheritances of the patients to cause diabetes at such young age. Hletala *et al.* concluded that age at start of diabetes pointedly transforms the lasting risk of proliferative retinopathy [18]. The maximum likelihood for the disease is in age group 5–14 years at the beginning of disease, whereas the lowest chance is in age group 15–40 years at the beginning of disease [17]. A higher frequency of diabetic retinopathy among females in comparison to males was prominent. Diabetic history of the families of the patients was considerably associated with incidence of diabetic retinopathy in the present study. The probability that a diabetic patient will develop retinopathy increased by 1.466 in patients with diabetic family history. Hereditary elements play vital role in development of the disease. Ancestral investigations in patients with Type 1 or Type 2 DM have provided evidence for the involvement of these genetic components in DR. Thus, it is conceivable that several diabetes-related genes might have varying effects on different phases of DR in diverse genetic backgrounds. With an odds ratio of 1.066 and a 95% confidence interval, the duration of diabetes was a significant risk factor for the development of diabetic retinopathy. After 15 years of diabetes, 41.8% of patients in the CURES Eye trial had DR, and the severity of DR grew in proportion to the length of time the patient had diabetes [19]. Patients with DR had significantly higher average systolic and diastolic blood pressure readings compared to those without DR. The risk of developing diabetic retinopathy rose by 1.008 and 1.012 mmHg, respectively, for every 1 mmHg increase in systolic and diastolic blood pressure. A significant risk factor for the development of diabetic retinopathy was shown to be HbA1c levels. The reason for this high value in older age could be that with advancing age glycemic control gets difficult to maintain. Hyperglycemia also distorts the maintenance of retinal perfusion, causing amplified exposure towards damage from systemic hypertension. Retinal hyperperfusion is a chief cause of damage in diabetic retinopathy correlated with shearing destruction of the capillaries. The present study indicated that with every 1 mmol/L rise in HbA1c level the probability of developing diabetic retinopathy increases by 1.160. Ten years following diagnosis, those without retinopathy in Europe had better glycemic control than the retinopathy population [20].

CONCLUSIONS

In this cross sectional study, the prevalence of diabetic retinopathy is (51.1%). Logistic regression model indicated that age (years), span of diabetes (years), HbA1c level (mmol/L), blood pressure and not doing exercise were exhibiting major influence on the incidence of DR cases. To observe the importance of vision loss due to DR on health of the society, large scale population centered records are desirable in the future.

Authors Contribution

Conceptualization: SS
Methodology: FK
Formal analysis: FM, FK, SN
Writing-review and editing: SS, FM, FK, SN

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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REFERENCES

[1] Bastaki S. Diabetes mellitus and its treatment. International Journal of Diabetes and Metabolism. 2019; 13(3): 111-34. doi: 10.1159/000497580.
[2] Rother KI. Diabetes treatment—bridging the divide. The New England Journal of Medicine. 2007 Apr; 356(15): 1499. doi: 10.1056/NEJMp078030.
[3] Hotel R. National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK).2014.
[4] Hu EA, Pan A, Malik V, Sun Q. White rice consumption and risk of type 2 diabetes: meta-analysis and systematic review. Bmj. 2012 Mar; 344. doi: 10.1136/bmj.e1454.

DOI: https://doi.org/10.54393/pjhs.v5i02.1299

[5] Risérus U, Willett WC, Hu FB. Dietary fats and prevention of type 2 diabetes. Progress in Lipid Research. 2009 Jan; 48(1): 44-51. doi: 10.1016/j.plipres.2008.10.002.

[6] Lee IM, Shiroma EJ, Lobelo F, Puska P, Blair SN, Katzmarzyk PT. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. The Lancet. 2012 Jul; 380(9838): 219-29. doi: 10.1016/S0140-6736(12)61031-9.

[7] Henricsson M, Nyström L, Blohme G, Ostman J, Kullberg C, Svensson M *et al*. The incidence of retinopathy 10 years after diagnosis in young adult people with diabetes: results from the nationwide population-based Diabetes Incidence Study in Sweden (DISS). Diabetes Care. 2003 Feb; 26(2): 349-54. doi: 10.2337/diacare.26.2.349.

[8] International Diabetes Federation. Members [internet]. [Last Cited: 29th Feb 2024]. Available at: https://idf.org/our-network/regions-and-members/middle-east-and-north-africa/members/pakistan/.

[9] Ahmed KR, Karim MN, Bukht MS, Bhowmik B, Acharyya A, Ali L *et al*. Risk factors of diabetic retinopathy in Bangladeshi type 2 diabetic patients. Diabetes & Metabolic Syndrome: Clinical Research & Reviews. 2011 Oct; 5(4): 196-200. doi: 10.1016/j.dsx.2012.02.020.

[10] Yau JW, Rogers SL, Kawasaki R, Lamoureux EL, Kowalski JW, Bek T *et al*. Global prevalence and major risk factors of diabetic retinopathy. Diabetes Care. 2012 Mar; 35(3): 556-64. doi: 10.2337/dc11-1909.

[11] Stratton IM, Kohner EM, Aldington SJ, Turner RC, Holman RR, Manley SE *et al*. UKPDS 50: risk factors for incidence and progression of retinopathy in Type II diabetes over 6 years from diagnosis. Diabetologia. 2001 Feb; 44: 156-63. doi: 10.1007/s001250051594.

[12] Tapp RJ, Shaw JE, Harper CA, De Courten MP, Balkau B, McCarty DJ *et al*. The prevalence of and factors associated with diabetic retinopathy in the Australian population. Diabetes Care. 2003 Jun; 26(6): 1731-7. doi: 10.2337/diacare.26.6.1731.

[13] Ciulla TA, Amador AG, Zinman B. Diabetic retinopathy and diabetic macular edema: pathophysiology, screening, and novel therapies. Diabetes Care. 2003 Sep; 26(9): 2653-64. doi: 10.2337/diacare.26.9.2653.

[14] Jones S and Edwards RT. Diabetic retinopathy screening: a systematic review of the economic evidence. Diabetic Medicine. 2010 Mar; 27(3): 249-56. doi: 10.1111/j.1464-5491.2009.02870.x.

[15] Nguyen TT, Wang JJ, Sharrett AR, Islam FA, Klein R, Klein BE *et al*.Relationship of retinal vascular caliber with diabetes and retinopathy: the Multi-Ethnic Study of Atherosclerosis (MESA). Diabetes Care. 2008 Mar; 31(3): 544-9. doi: 10.2337/dc07-1528.

[16] Mumtaz SN, Fahim MF, Arslan M, Shaikh SA, Kazi U, Memon MS. Prevalence of diabetic retinopathy in Pakistan; A systematic review. Pakistan Journal of Medical Sciences. 2018 Mar; 34(2): 493. doi: 10.12669/pjms.342.13819.

[17] Ting DS, Cheung GC, Wong TY. Diabetic retinopathy: global prevalence, major risk factors, screening practices and public health challenges: a review. Clinical & experimental ophthalmology. 2016 May; 44(4): 260-77. doi: 10.1111/ceo.12696.

[18] Hletala K, Harjutsalo V, Forsblom C, Summanen P, Groop PH, FInndlane Study Group. Age at onset and the risk of proliferative retinopathy in type 1 diabetes. Diabetes Care. 2010 Jun; 33(6): 1315-9. doi: 10.2337/dc09-2278.

[19] Rema M, Premkumar S, Anitha B, Deepa R, Pradeepa R, Mohan V. Prevalence of diabetic retinopathy in urban India: the Chennai Urban Rural Epidemiology Study (CURES) eye study, I. Investigative Ophthalmology & Visual science. 2005 Jul; 46(7): 2328-33. doi: 10.1167/iovs.05-0019.

[20] Jaacks LM, Siegel KR, Gujral UP, Narayan KV. Type 2 diabetes: A 21st century epidemic. Best Practice & Research Clinical Endocrinology & Metabolism. 2016 Jun; 30(3): 331-43. doi: 10.1016/j.beem.2016.05.003.