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Contemporary trends in diabetic retinopathy and its complications among type 2 diabetes mellitus patients visiting a tertiary care hospital in Lahore

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ABSTRACT

Background and Objectives: Diabetes mellitus is a chronic or long-term disorder with comorbidities like hypertension nephropathy, stroke, ischemic heart disease, and retinopathy. Diabetic retinopathy is a serious complication of the retina and a cause of the long-term existing condition of diabetes mellitus. Diabetic retinopathy is a threatening condition of blindness. It contributes 2.6% and 1.9% of visual impairment globally by 2010 and is expected to increase over time. To find out the frequency of diabetic retinopathy among patients with known diabetes mellitus type-2.

METHODOLOGY: A cross-sectional study of 09 months duration was carried out with 375 participants after the IRB approval. The sampling technique was a non-probability convenient sampling technique. Data was received on a self-structured questionnaire and analyzed by the software SPSS 26 and the results were presented in figures.

RESULTS: A total of 375 participants including 164 (43.7%) males and 213 (56.13%) females were assessed with the mean age group of 53 with a standard deviation of 9.22. Co-morbid conditions like hypertension were noticed in 244 (65.1%), dyslipidemia in 155 (41.3%), obesity in 109 (29.1%), and Ischemic heart disease in 123 (32.8%) participants. A higher incidence was noted in participants with Diabetes Mellitus present for more than 5 years. Results also showed that 244 (65.1%) participants were on oral treatment. 97 (25.9%) visited regularly to a general physician and 48 (12.8%) visited an ophthalmologist regularly. Diabetic retinopathy was noted in 321 (43%) participants in both eyes, Mild non-proliferative diabetic retinopathy was found in both eyes in 108 (28.8%) participants, moderate in 148 (39.4%) participants, and severe in 64 (8.2%) participants. Proliferative diabetic retinopathy was found in 105 (28%), while macular edema was found in 116 (30.85%) participants.

CONCLUSION: Diabetic retinopathy is a global public health issue that leads to blindness with a marked prevalence. Awareness may resolve the condition for preventing and controlling blindness caused by diabetes mellitus.

KEYWORDS: Diabetes mellitus, Diabetic retinopathy, Visual impairments, Retinal Complications. Awareness

INTRODUCTION

Diabetes is a chronic condition that can affect various body systems, including the eyes. Elevated blood sugar levels associated with diabetes can cause damage to the blood vessels in the retina, the light-sensitive tissue at the back of the eye. This damage can lead to vision loss in people with diabetes.1 Diabetes is a serious disease and causes many retinal complications like diabetic retinopathy resulting in many factors which are age, hypertension, high lipid profile, duration of uncontrolled diabetes, and general behavior to consult a general physician and ophthalmologist to control diabetes and prevent retinopathies. Hard exudates are also commonly seen in moderate and severe non-proliferative diabetic retinopathy. Diabetic retinopathy lesions, micro-aneurysms, and hemorrhages are a cause of non-proliferative diabetic retinopathy (NPDR), early signs of retinal complications caused by DM. 2

Diabetic retinopathy remains the most common cause of vision loss in the general diabetic population. This occurs when high blood sugar levels damage the blood vessels in the retina. The damaged blood vessels can leak fluid or blood into the retina, which can blur or distort vision. 3

Proliferative diabetic retinopathy is a more advanced category of DR with neovascularization on the retina.

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Traction of fibrovascular leads to fractional retinal detachment a cause of severe vision loss and ultimately blindness.4

Diabetic macular edema occurs when fluid builds up in the central part of the retina (the macula) and causes it to swell. This can cause vision loss or vision changes. 5

Both diabetic retinopathy and diabetic macular edema may be treated with medications, laser therapy, or surgery. However, early detection and treatment are important to prevent or minimize vision loss. People with diabetes should have regular ophthalmic examinations to check for these conditions. 6

Other potential causes of vision loss in people with diabetes include cataracts (clouding of the lens of the eye) and glaucoma (increased pressure in the eye). Both of these conditions can be treated with surgery or medications. 7

The term 'Diabetes' was first introduced by Aretaeus of Cappadocia, a famous physician, residing in Alexandria and Rome during the 2nd century AD. He used the Greek word ―diabaino‖ giving meaning, to pass through and showing the condition where a large quantity of urine passes through the kidneys. 13 Ancient Indians mentioned the disease as ―Madhumeha‖ corresponds to the modern term ―Diabetes Mellitus. It was also thought that this disease was present in India as a most common disease but with unknown prevalence.8

Diabetes Mellitus has been a common disease since the 2nd century A.D. and the link with ophthalmological pathology was unknown before the middle of the 19th century. In 1846, French ophthalmologist Apollinaire Bouchard (1806-1886) stated the development of visual loss in the absence of cataracts in diabetes. Edward Jaguar (1818-1884) first observed diabetic macular changes in 1855. 9 Anemia is the long-term complication of DM and leads to the development, progression, and proliferation of diabetic retinopathy and other co-morbidities associated with diabetes mellitus. The intensity of the retinopathy issue is inversely associated with the hematocrit values.10

According to Report 22 of the Early Treatment Diabetic Retinopathy Study (ETDRS), the serum lipid profile measured in the 2709 patients enrolled showed that patients with high-level of total serum cholesterol or serum low-density lipoprotein cholesterol levels at baseline were twice as likely to have retinal hard exudates as patients with normal levels. There was a high risk of developing hard exudate during the study in patients. The risk of reduced visual acuity was associated with the extent of hard exudate even after adjusting for the extent of macular edema.11

Klein et al assessed the serum lipid levels in the subjects who participated in the Wisconsin Epidemiologic Study of Diabetic Retinopathy. There was a significant trend for increasing severity of diabetic retinopathy and of retinal hard exudates with increasing cholesterol levels were not associated with the severity of other ocular condition in patients of older age group.12 In another study done by Raza A, khan at KPK, Peshawar Pakistan, a total of 351 patients were examined (65.2 % were male and 84.8 were female), 76% had a family history of DM, 66 % had DM from the last 10 years 87.2 % knew that diabetes can cause diabetic retinopathy and knowledge significantly associated with education level. 80.9 % agreed with the fact that diabetic retinopathy is preventable if controlled at an early stage and after an early diagnosis of diabetes. Awareness at a mass level as a campaign in the general population at the primary level is needed.13 A cross-sectional study conducted by Sami H Alzahrani et al stated that 82.6 % of people have the awareness that DM can harm their eyes and also clear that the source of information was radio, TV, internet, newspaper, and friends, but only 7 % patients were diagnosed DR by an ophthalmologist, while 37 % were diagnosed by physicians. According to the facts discussed in the study more than 58 % were never diagnosed with DR and about 35% did not go for their eye checkups 59 % had awareness regarding DR and knew that it can be a cause of vision loss and even blindness.14

In a cohort study carried out by Adil et al stated suboptimal diabetes control, only 48 % stated that their healthcare worker advised them for a routine yearly eye examination and detailed the need for fundus evaluation, while 62 % of the cohort had decreased visual acuity and 52% did not receive the eye examination. The majority of the respondents were unaware of the diabetic ophthalmic retinal complications and finally not received any management plan. In the study, it is suggested to educate the population about the complications of diabetes and sustainable, patient-centered development of education models to increase eye and general literacy and awareness to improve the eye and general health within the community.15

METHODOLOGY

A total of 375 participants were included in this cross-sectional study with a non-probability sampling technique, among the participants, visiting the ophthalmology department of Gulab Devi Teaching Hospital Lahore with known diabetes mellitus. Data was collected using a self-structured ques Sample size for this study was calculated by using the appropriate sample size calculation formula, used for a cross-sectional study.16 The sample size was estimated using the prevalence of diabetic retinopathy in patients having diabetes mellitus type 2, using the following formula:

$$n = \frac{z^2_{1-\frac{\alpha}{2}}\, p(1-p)}{d^2}$$

The sample size (n) calculated was 375 patients

While each participant was examined under influence of dilating drops and signs of diabetic retinopathy were noted. Before dilatation, participants have undergone the process of refraction and visual acuity was recorded. Refraction was performed following retinoscopy and prescribed glasses for any refractive error anomaly. Data were analyzed by SPSS 25 and presented by graphs, charts, and figures accordingly.

RESULTS

This normal curve in the histogram shows that in all 375 (n=375) participants examined during the study, the mean age was 53.03 with a standard deviation of 9.22. The Minimum age was 29 and the maximum age of 78 was recorded. The highest frequency was recorded between the ages of 55 and 57 (number of participants 29). The lowest frequency was in the ages of 53 years (n=26) and in the ages 29, 30, 37,52,74,78 years (n=29) among a total number of participants.

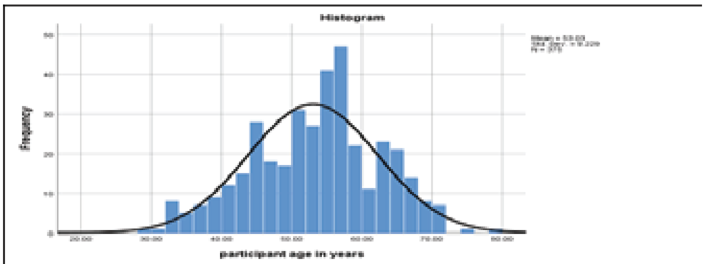

Figure 1: Information about the age of participants (in years)

This figure shows the results regarding control of diabetes mellitus patients including 5 males and 11 females total of 16 individuals presented with very strict control of diabetes. 129 Individuals including 49 males and 80 females had strict control of diabetes mellitus. 230 individuals 110 males and 120 females were presented with diabetes control not strictly.

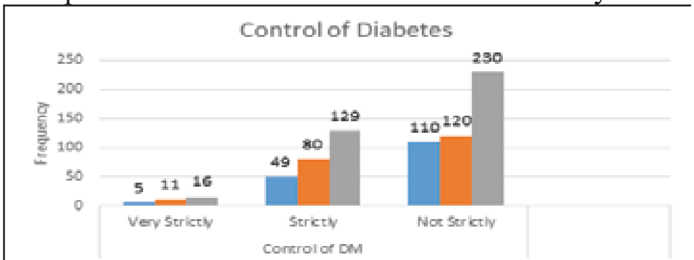

Figure 2: Control Diabetes Mellitus

34 males and 63 females of a total of 164 (43.73%) reported regular visits to a general physician for diabetic control. Individuals 125 males and 142 females of total 211(56.26%) reported visits to a general physician not regularly. In 5 males and 6 females, a total of 11 (2.93%) reported no visit to a general physician for advice on diabetes.

Of individuals 15 males and 33 females, a total of 48 (12.8%) reported regular visits to an ophthalmologist for advice on diabetic retinopathy. Individuals 89 males and 99 females of a total, of 188 (50.13%) regular visits to an ophthalmologist. Of individuals, 60 males and 79 females, a total, of 139 (37.06%) reported never visiting an ophthalmologist for treatment or advice on diabetic retinopathy.

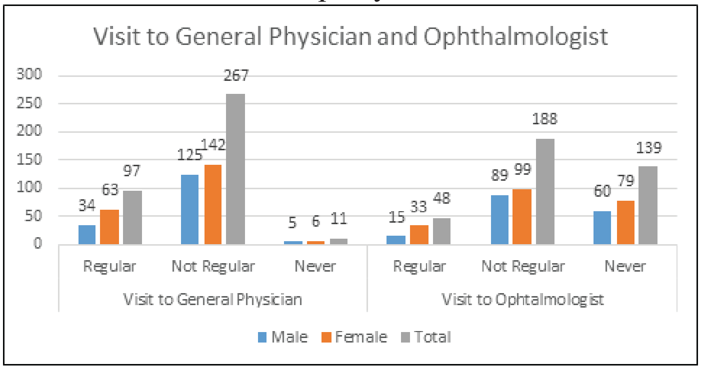

Figure 3: Visit to the general physician

As shown in the figure the complications of diabetic retinopathy were recorded in 79 males and 93 females, of 172 total with 45.866%. Nephropathy was recorded in 59 males and 65 females, 124 total with 33.06%. Neuropathy was recorded in 24 males, and 17 females, of 41 total with 10.93%. Stroke was recorded in 15 males, and 17 females, of 26 total with 6.93%.

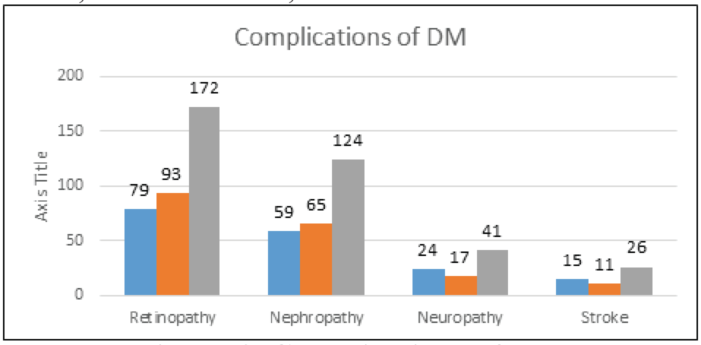

Figure 4: Complications of DM

Diabetic retinopathy was present in 74 males, and 87 females, of 161 (42.93%) while in other individuals 90 males, and 124 females, a total of 214 (57.06%) were found without DR changes in the right eye.

Diabetic retinopathy was present in 73 males, and 87 females, of a total of 160 (42.66%) while in other individuals 91 males, and 124 females, a total of 215 were found without DR changes in the left eye.

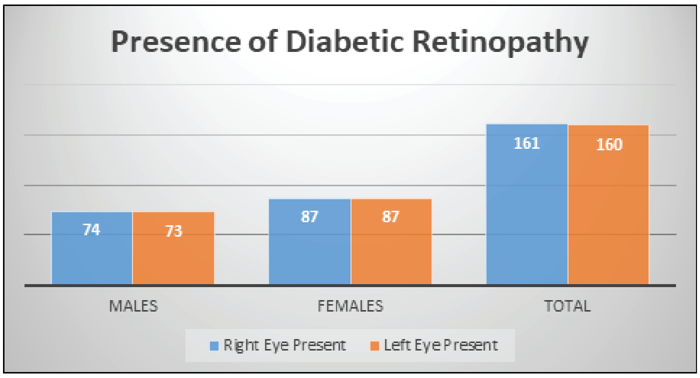

Figure 5: Diabetic retinopathy in right and left eye.

Mild non-proliferative diabetic retinopathy was found in individuals 180 males, and 34 females, of the total of 52 participants (13.86%) in the right eye while individuals 20 males, and 34 females 56 participants (14.93%) were found to have non-proliferative diabetic retinopathy in the left eye.

Moderate non-proliferative diabetic retinopathy was found in individuals 41 males, and 35 females of the total of 76 participants (20.26%) in the right eye while moderate diabetic retinopathy was found in individuals 40 males and 32 females of a total of 72 participants (19.2%) in the left eye.

Severe non-proliferative diabetic retinopathy was found in 15 males, and 17 females of a total of 32 participants (8.53%) in the right eye while severe non-proliferative diabetic retinopathy was found in 14 males and 18 females of a total of 32 participants (8.53%) in the left eye.

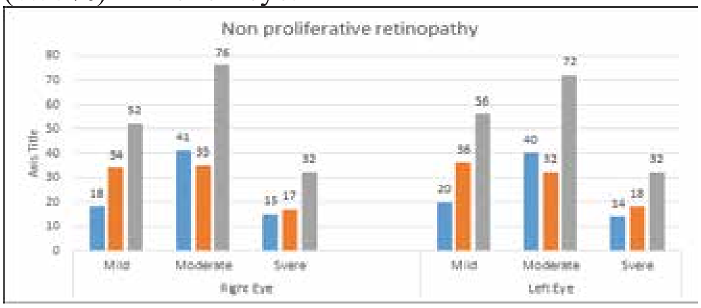

Figure 6: Non-proliferative diabetic retinopathy in right and left eye.

Proliferative diabetic retinopathy was found in individuals 27 males, and 22 females with a total of 49 participants (13.06%) in the right eye while proliferative diabetic retinopathy was found in individuals 28 males and 28 females of a total of 65 (17.33%) in the left eye.

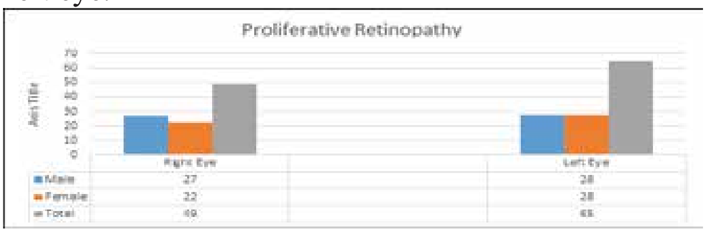

Figure 7: Proliferative diabetic retinopathy

Macular edema was found in individuals 25 males, and 33 females of a total of 57 participants (15.2%) in the right eye while macular edema was found in individuals 30 males and 29 females of a total of 59 participants (15.73%) in the left eye.

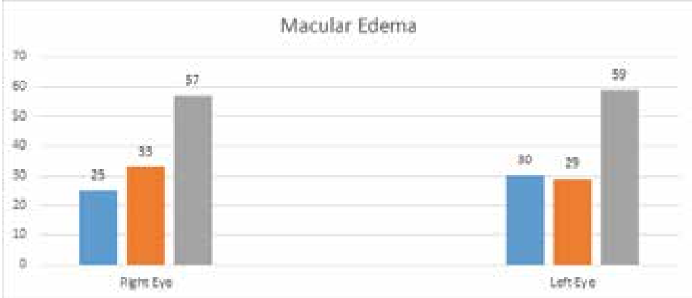

Figure 8: Macular Edema in right and left eye

DISCUSSION

This study was carried out in the ophthalmology outpatient department of a tertiary care hospital in Lahore. Risk factors including heart diseases, nephropathy, neuropathy, and retinopathy associated with diabetes mellitus type-2 in other studies are the same as in this study. Elevation of blood sugar levels in the human body is strongly associated with retinopathy but strict control of blood sugar levels decreases its incidence. Hypertension is the major risk factor for DM type 2 in many studies, tight control of DM and hypertension lowers the risks of developing retinopathy. This study also confirms it. 17

Duration of diabetes is an important predictor of retinopathy along with associated hyperglycemia. The present study explained that duration was the main factor in diabetic retinopathy. Control of Diabetes Mellitus using pills remains the favorite mode of treatment in many studies. Studies also showed that the group of patients taking pills for the treatment of DM was dominant in number as compared with the group of patients taking insulin for treatment. 18.

A review of many studies suggested that consultation with physicians and ophthalmologists to control DM and retinopathy was the best approach to cope with diabetic complications including diabetic retinopathy. Patient attitude needs to be changed regarding DM control with the patient-doctor consultation approach. Currently, as the present study suggested, we lack this approach. As a result, patients do not consult physicians or Ophthalmologists and remain without treatment for a long 19.

In the study conducted in Northwest Ethiopia, there was a high prevalence was found due to a longer duration of DM, poor control, hypertension, and obesity. In another study done in Nigeria among 214 patients with DM, retinopathy was 36% and cataract was found in

2.6% of patients. A screening program was also suggested in that study for individuals with DM 20 .

In a study done in a tertiary care hospital in North-West Ethiopia, the prevalence was high in context with poor control, long duration, and lack of awareness regarding diabetes and associated eye diseases caused by DM. Early screening of diabetes-related retinal complications was also suggested in the study.21 In the present study, the prevalence of NPDR was 42.66%, a result confirmed by many studies with little or no difference. The same results were in cases of PDR, which is a vision-threatening complication of the retina. Another study stated that (42.2%) had DR and was significantly associated with the form of therapy. Proliferative DR was found at 5.7%. DME was seen in 3.6% of the patients. Vision-threatening DR was seen in 10.7% of patients DR was found in 28%, NPDR 27%, and PDR was found in 6% of type 2 diabetic patients. This study suggests that DR screening and management in patients with diabetes should focus more attention on interventions to prevent the progression of the disease. A population-based study conducted in Sudan on 316 individuals showed that DR was 82.6%, NPDR prevalence was 42.7%, and PDR was 39.9%. Similarly, the duration of DM was 72.2% in individuals who had DM for more than 10 years. In our study, the results are almost the same as in many studies regarding the prevalence of DM and associated retinal complications DM was present among (43.7%) of males, and (56.13%) of females were included with the mean age group of 53. Co-morbid conditions like hypertension were noticed in (65.1%), dyslipidemia in (41.3%), obesity in (29.1%), and Ischemic heart disease in (32.8%) of participants. A higher incidence was noted in participants with Diabetes Mellitus present for more than 5 years. Results also showed that (65.1%) of participants were on oral treatment. (25.9%) visited regularly to a general physician and (12.8%) visited an ophthalmologist regularly. Diabetic retinopathy was noted in (43%) of participants in both eyes. Mild non-proliferative diabetic retinopathy was found in both eyes in (28.8%) of participants, moderate in (39.4%) of participants, and severe in (8.2%) of participants. Proliferative diabetic retinopathy was found in (28%) of participants, while macular edema was found in (30.85%) of participants.

Studies also showed that the attitude toward treatment to control DM was not specifically appreciated regarding medication in our study only 15% of individuals had a practice of controlling DM very strictly and 61% of individuals had not bothered to control the disease properly. This attitude may be improved by counseling the patients regarding the control and prevent DM by any means like oral medication, insulin, or a combination of both as advised by a health professional. 22

Many studies showed the results regarding consultation with general physicians and ophthalmologists to control and prevent complications of diabetes, the attitude seems good as patients who had the attitude of consulting doctors had results of remarkable value. Our study also had significant results as 44% of individuals consulted a general physician to control the DM, regularly while 56% reported irregular visits. Eye examination and 23 %referral to ophthalmologists by the general physician were reported in the study conducted in Indiana.23, 24

In our study, the opinion of general physicians and ophthalmologists also with limitations associated with a lack of awareness, and a majority of the sample population did not consult ophthalmologists for the prevention of DR.

CONCLUSION

Diabetic retinopathy, caused by uncontrolled diabetes mellitus is a public health issue and is a global threat. The disease is mainly caused by high blood sugar levels and the fact that most people do not visit general physicians and ophthalmologists for an opinion about the control of diabetes and its complications.

Recommendations

Awareness campaigns through eye health screening at the community level may help to prevent vision loss and blindness.

A multidisciplinary approach may contribute greatly to preventing, retinal complications.

Screening for early detection of retinal changes in patients is a priority, especially for patients of 40 years of age, as a routine eye examination. Non-mydriatic fundus cameras may be beneficial for screening purposes and also save time. The private sector may be encouraged to use the same criteria and to establish an effective referral chain for detailed retinal examination. As a support, eye health professionals like optometrists, ophthalmic nurses, and specially trained staff may be helpful in screening, early detection, and managing the patient for further clinical proceedings.

Proper counseling about strict diabetic control to prevent complications. Effective working relationships between general practitioners and eye health professionals may save the vision of patients suffering from diabetes. Conflict of Interest: There is no conflict of interest in this study.

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Authors Contributions:

Muhammad Iqbal Javaid: Substantial contributions to the conception and design of the work. Design of the work and the acquisition.

Tahira Ashraf and Ahsan Iqbal: Drafting the work. Final approval of the version to be published.

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