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The Prevalence of Diabetic Retinopathy in Prediabetes: A Prospective Observational Study in Kashmir

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ABSTRACT

Background: A condition known as prediabetes occurs when some but not all of the diagnostic requirements for diabetes are satisfied. A retinal vascular condition that develops as a side effect of diabetes mellitus (DM) is the most common cause of blindness in working-age individuals around the globe.
Methods: The present study was carried out in the Postgraduate Department of Medicine, Government Medical College, Srinagar for a period of two years after receiving ethical permission from the institutional ethics committee. Once they met the inclusion requirements, 200 patients in all were enrolled.
Results: Out of a total of 200 patients, diabetic retinopathy was observed in 12 (6.0%) patients only. Of them, 10 (5.0%) had mild retinopathy, while 02 (1.0%) had moderate retinopathy. None of our patients had severe diabetic retinopathy and interestingly all the cases of retinopathy were non-proliferative
Conclusion: the present study revealed that about 8% of people with pre-diabetes also have retinopathy supports the theory that retinopathy may begin in what is now thought of as the pre-diabetic condition and subsequently grow by about 50% shortly after diabetes starts
Keywords: prediabetes; epidemiology; impaired fasting glucose; impaired glucose tolerance; prevalence; retinopathy.

INTRODUCTION

Chronic hyperglycemia is a hallmark of diabetes mellitus, a metabolic condition caused by deficiencies in insulin production, insulin action, or both. The beta-cells are destroyed in type I diabetes, which typically results in an utter lack of insulin. Insulin resistance and relative (as opposed to absolute) insulin insufficiency are features of type II diabetes. [1] The International Diabetes Federation estimates that 381 million people worldwide had diabetes as of 2013. Its prevalence is rising quickly, and it is predicted that by 2030, this number would have doubled. [2]India has the highest number of diabetics in the whole globe. Over 62 million Indians are afflicted with the illness.[2] A condition known as prediabetes occurs when some but not all of the diagnostic requirements for diabetes are satisfied.[3] Impaired glucose tolerance (IGT) and impaired fasting glucose (IFG) are metabolic states that lie between type II diabetes and normal glucose metabolism. IFG patients have non-diabetic hyperglycemia with fasting plasma glucose levels of 6.1 mmol/l or higher (whole blood: 5.6 mmol/l) but less than 7.0 mmol/l (whole blood: 6.1 mmol/l) or higher. Postprandial plasma glucose is increased in IGT patients. IFG is linked to a decreased capacity to maintain appropriate basal insulin secretion as well as a decrease in the liver's insulin sensitivity to regulate hepatic glucose output. The presence of other risk factors, such as age, body mass index (BMI), and a

family history of diabetes, affects how likely a person is to acquire diabetes.[4] Lifestyle intervention, such as nutritional counselling, increased physical activity, and weight loss, is very beneficial at postponing or halt the onset of type II diabetes in people with IGT.[5-7] A retinal vascular condition that develops as a side effect of diabetes mellitus (DM) is the most common cause of blindness in working-age individuals around the globe.[8] Evidence of retinal ischemia, such as microaneurysms, haemorrhages, cottonwool spots, intraretinal microvascular abnormalities, venous calibre abnormalities, and neovascularization, as well as signs of increased retinal vascular permeability, are characteristics of the condition. Numerous factors, such as macular edoema, retinal capillary nonperfusion, and neovascularization that causes vitreous haemorrhage and/or retinal detachment, can even cause vision loss.[8]

The purpose of the current study is to evaluate the prevalence of diabetic retinopathy in individuals with prediabetes.

MATERIAL AND METHODS

The present study was carried out in the Postgraduate Department of Medicine, Government Medical College, Srinagar for a period of two years after receiving ethical permission from the institutional ethics committee. Once they met the inclusion requirements, 200 patients in all were enrolled.

Inclusion criteria

Following screening by fasting blood glucose and a two-hour OGTT, patients were identified as prediabetics based on their diagnosis of impaired fasting glucose or impaired glucose tolerance. Fasting plasma glucose levels should be between 100mg/dl (5.6 mmol/l) and 125mg/dl (6.9 mmol/l) or, in the 75g OGTT, between 140mg/dl (7.8 mmol/l) and 199mg/dl (11.0 mmol/l) at the end of the test.

Exclusion criteria

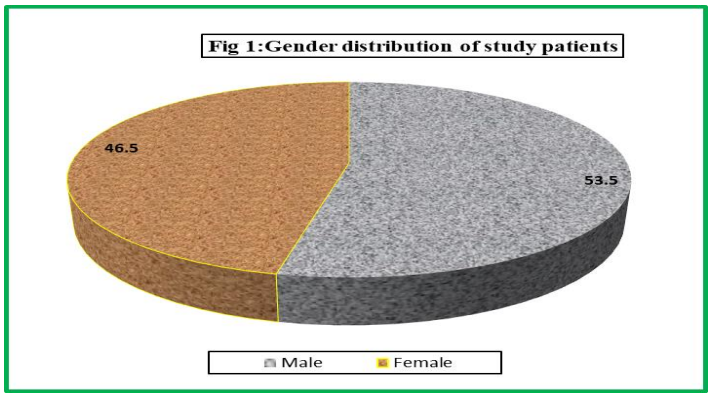
Patients who refused permission, pregnant women, those with preexisting hypertensive retinopathy, and those with other retinal problems were all excluded from the study.

Statistical Analysis

The gathered information was put into a Microsoft Excel spreadsheet, which was then exported to the data editor of SPSS Version 20.0. (SPSS Inc., Chicago, Illinois, USA). Mean and SD were used to represent continuous data, while percentages were used to summarise categorical variables. To compare categorical variables, either the chi-square test or the Fisher's exact test was utilised, depending on the situation. Bar and pie graphs were used to visually display the data. Statistical significance was defined as a P-value <0.05.

RESULTS

In our study, the mean age was 56.7 years, with majority of participants accounting for 87 (43.5%) were between the ages of 50 to 59 years, while 73 (36.5%) were between the ages of 60 and 69. Aged 40 to 49, there were 40 patients (20%). Out of total 200 subjects, 107 (53.5%) were males and 93 (46.5%) were females.



Among the research participants, 89 (44.5%) had hypertension, 64 (32.0%) had hypothyroidism, 41 (20.5%) had no comorbid conditions, and only 6 (3.0%) had both conditions. Out of 200 participants, 120 (60.0%) had fasting blood sugar levels between 118 and 125, followed by 73 (36.5%) with levels between 109 and 117 mg/dl. Only 7 (3.5%) patients had fasting blood pressure between 100 and 108 mg/dl. The average blood sugar level during fasting was 118 mg/dl. When blood sugar levels were examined after two hours of fasting, the majority of patients, 101 (50.5%), had values between 180 and 189, followed by 66 (33.0%) patients with levels between 190–199 mg/dl, and 17 (8.5%) had levels between 170-179 mg/dl. The average postprandial blood sugar level was 186.5g/dl. In our study, 24 (12.0%) patients had HbA1c values of 6.3-6.4, while only 10 (5.0%) patients had HbA1c levels of 5.7-5.8. The majority of patients, accounting for 107 (53.5%), had HbA1c levels of 6.1-6.2, followed by 59 (29.5%) patients with HbA1c levels of 5.9-6.0. Our research participants had a mean HbA1c score of 6.3.

Table 1: Prevalence of retinopathy in study patients

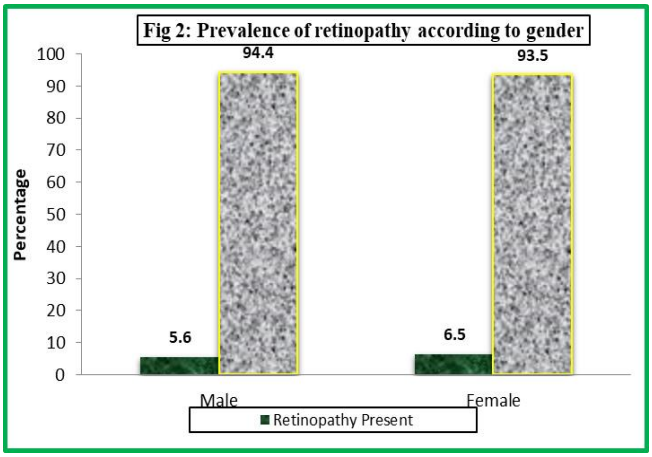
Retinopathy	Frequency	Percentage
Present	12	6.0
Absent	188	94.0
Total	200	100

Out of a total of 200 patients, diabetic retinopathy was observed in 12 (6.0%) patients only. Of them, 10 (5.0%) had mild retinopathy, while 02 (1.0%) had moderate retinopathy. None of our patients had severe diabetic retinopathy and interestingly all the cases of retinopathy were non-proliferative.

Table 2: Prevalence of retinopathy in various age groups

Age (years)	Retinopathy Present		Retinopathy Absent		P-value
	No.	%age	No.	%age	
40-49	0	0.0	40	20.0	0.121
50-59	5	2.5	82	41.0	
60-69	7	3.5	66	33.0	
Total	12	6.0	188	94.0	

When diabetic retinopathy and age were associated, it was evident that patients accounting for 7 (3.5%) aged 60–69 and 5 (2.5%) of patients aged 50–59 had diabetic retinopathy, respectively. Out of 188 (94.0%) patients without diabetic retinopathy, 82 (41%) were in their 50 to 59 years of age, 66 (33%) were in their 60s to 69s, and 40 (20%) were in their 40 to 49 years of age.



There were six men and six females among the total of 12 diabetic retinopathy patients and out of total of 188 non retinopathy cases, 101 (94.4%) were men and 87 (93.5%) were women. However, the difference was statistically comparable with a p-value of 0.769.

DISCUSSION

In our study, the median age of patients was 56.7 years, with 87 (43.6%) of the subjects were between the ages of 50 and 59, and 73 (36.5%) of the patients were between the ages of 60 and 69 years. There were 40 (20%) between the ages of 40 and 49. The median age was 56.1 years. Contemporary to the literature, our findings are in consonance to those of Chen X et al (2012), who discovered a mean age of such patients as 50.33 years in their research.[9] In a likewise study by Sokoowska-Oracz A et al (2017), it was reported that the mean age of prediabetic individuals with ocular abnormalities was 58 years which is comparable with our study.[10] In the present study; out of total 200 individuals; 107 (53.5%) were men and 93 (46.5%) were women, which is comparable with the findings of Chen X et al (2012), who found that there were 45/65 men and women.[9] According to a research by Bhargava M et al. (2014), men were more likely than women to have retinopathy (6.15% versus 4.13%).[11] In our study, 89 (44.5%) of the study participants had hypertension, 64 (32.0%) had hypothyroidism, 41 (20.5%) had no underlying comorbidity, and only 6 (3.0%) had both conditions. In a similar kind of study by Bhargava M et al. (2014), 893 (47.07%) individuals had hypertension which is consistent with our study.[11] Out of 200 participants, 120 (60.0%) had fasting blood sugar levels between 118 and 125, followed by 73 (36.5%) with levels between 109 and 117. Only 7 (3.5%) patients had fasting blood pressure between 100 and 108 mg/dl. The average blood sugar level during fasting was 118.1 mg/dl. When blood sugar levels were examined after two hours of fasting, the majority of the patients, 101 (50.5%), had values between 180 and 189 mg/dl, followed by 66 (33.0%) with (190–199) mg/dl, and 17 (8.5%) patients had levels between (170-179) mg/dl. The average blood sugar level after meals was 186.5mg/dl. We assessed HbA1c level among studied patients and found that majority of patients accounting for 107 (53.5%) had HbA1c of (6.1-6.2)% followed by 59 (29.5%) with HbA1c levels of (5.8-5.9). Around 24 (12.0%) patients had HbA1c levels were (6.2-6.3) while as only 10 (5.0%) were having HbA1c levels of (5.6-5.7)%. Mean HbA1c level in our study patients was 6.3%. Our study is consistent with the findings of Lamparter J et al. (2014) who had 5.91 mean HbA1c levels in their study. [12]The present study revealed that only 12 (6.0%) of the 200 total individuals were found to have diabetic retinopathy. In a likewise study by Rao BP et al (2015) on 100 prediabetic individuals revealed 8% have diabetic retinopathy.[13] Retinopathy in people who are not known to have diabetes has been recorded in seven population-based investigations, five of which were conducted in the USA, one in Australia, and two in Sweden. [14-19] Unfortunately, most of the studies did not adequately rule out diabetes using glucose tolerance testing, and it is likely that people with undiagnosed diabetes and an undetermined number of people with impaired glucose tolerance were included in their research populations. A larger incidence of lesions was linked to advancing age and hypertension, and the retinal lesions observed in these investigations were frequently more consistent with hypertension than with diabetes. The clinical course of retinopathy in Type 2 diabetes has mostly been extrapolated from the research of Type 1 diabetes due to the slow start of Type 2 diabetes. The notion that there is no retinopathy in those who do not have diabetes and the observation of retinal in newly diagnosed Type 2 diabetes led to the estimated 9–12 year delay in diagnosis.[20] The new DPP data show that retinopathy develops over time similarly to Type 1 diabetes, with more than 12% of patients with diabetes developing it within about 3 years of diagnosis. However, the present study revealed that about 8% of people with pre-diabetes also have retinopathy supports the theory that retinopathy may begin in what is now thought of as the pre-diabetic condition and

subsequently grow by about 50% shortly after diabetes starts. In the presence of subdiabetic levels of hyperglycemia, a pattern of development of microalbuminuria, an early sign of diabetic nephropathy, has also been reported.[21] Hypertension and dyslipidemia may increase the chance of developing retinopathy, as has been reported in numerous research.[22,23] Out of a total of 12 diabetic retinopathy patients, 10 (5.0%) had mild retinopathy, and 2 (1.0%) had moderate retinopathy. None of our patients had severe diabetic retinopathy. In their study, Lamparter J et al. (2014) discovered that 7.5% of individuals had mild retinopathy, 0.4% had moderate retinopathy, and 0.2% had severe retinopathy which is almost comparable with our study. All 12 (6%) diabetic retinopathy patients were found to have non-proliferative diabetic retinopathy, with no signs of proliferative diabetic retinopathy. Consistent to this, Rao BP et al (2015), non-proliferative diabetic retinopathy was detected in 8% of the participants.[13] When diabetic retinopathy and age were compared, it was shown that 7 (3.5%) of patients aged 60–69 and 5 (2.5%) of patients aged 50–59 had diabetic retinopathy, respectively. Out of 188 (94.0%) patients without diabetic retinopathy, 82 (41%) were in their 50s, 66 (33%) were in their (60 to 69) years, and 40 (20%) were in their forties. Much similar to this, Rao BP et al (2015)[54] reported in their study that 70% of retinopathy cases aged between 50 to 70 years of age.[13] Out of a total of 12 diabetic retinopathy patients, there were 6 males and females each. There were 87 (93.5%) women and 101 (94.4%) men among the 188 (94.0%) individuals who did not have diabetic retinopathy. The results of the current study are congruent with those of Lamparter J et al (2014) study, who reported 8.2% male diabetic retinopathy patients compared 8.1% female diabetic retinopathy patients which is almost same and consistent with our study.[12]

CONCLUSION

The present study revealed that the prevalence of diabetic retinopathy among prediabetic patients was 6%. Of them, 10 (5.0%) had mild retinopathy, while 02 (1.0%) had moderate retinopathy. None of our patients had severe diabetic retinopathy and interestingly all the cases of retinopathy were non-proliferative. According to current standards, retinal lesions that are indicative of diabetes are evident before the disease starts and become more common very early on. The DPP cohort's more thorough assessment of long-term glycaemia and the documenting of retinopathy in the pre-diabetic condition provide credence to the idea that retinopathy may develop along a wider continuum of glycaemia than is covered by existing diagnostic criteria. These results imply that the existing diagnostic criteria for diabetes, which are mostly focused on the risk for retinopathy, may need to be reevaluated. Considering the clinically benign nature of these lesions and the significant time and money required, early detection of retinopathy in the pre-diabetic condition does not appear to be appropriate at this time and needs more research.

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