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Original Research Paper

Evaluation of fasting Blood Sugar, Glycosylated Hemoglobin, and total Cholesterol in in the individuals affected with Diabetic Retinopathy.

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ABSTRACT:
Background: Individuals who have diabetes are at an increased risk for several microvascular and macrovascular issues, including the well-known microvascular condition diabetic retinopathy (DR). Those who have diabetes have an increased risk for a variety of cardiovascular and vascular disorders. **Aim**: Therefore, the aim of this study is to study glucose profile and total cholesterol in diabetic retinopathy. **Materials & methods**: After institutional ethics committee approval, research authors would commence. Participants gave informed consent before the study began. The study included 100 diabetic retinopathy patients and 100 healthy controls. Indore's Index Medical College & Research Centre (IMCRC) outpatient departments would evaluate both groups. This prospective observational study follows Indore IMCHRC Ophthalmology patients. Ophthalmoscopy and a fundus fluorescein angiography were also components of this test. After that, the ETDRS Grading System was utilized to provide each patient with a score that reflected the degree to which their retinopathy was affected. **Results & Conclusion**: FBS levels correlated with diabetic retinopathy severity. This study compared diabetic retinopathy patients to healthy controls. HbA1c values correlated with diabetic retinopathy stage. HbA1c levels were significantly inversely related to diabetic retinopathy severity. Whole blood cholesterol levels were linked to diabetic retinopathy severity in this investigation of healthy controls and DR patients. Twenty-three of fifty-seven retinopathy patients had elevated total cholesterol.

INTRODUCTION:

Individuals who have diabetes are at an increased risk for a number of microvascular and macrovascular issues, including the well-known microvascular condition diabetic retinopathy (DR) [1-5]. Those who have diabetes have an increased risk for a variety of cardiovascular and vascular disorders [6]. Diabetes is a disease that affects the body's blood sugar levels. It was found that the prevalence of diabetic retinopathy in India was 17.7%, which was considered to be a much lower rate in comparison to the prevalence of diabetic retinopathy in the United States (50.3%), the United Kingdom (33.6%), and Australia (29%) [1-8]. Because the findings of previous studies on the connection between DR and lipid profile, zinc, magnesium, IL-5 and glucose profile levels have yielded results that are incongruent with one another, a study of this kind is urgently required [7]. This is because the findings of previous studies on the connection between diabetic retinopathy and cholesterol levels [8]. We can greatly cut down on the number of mistakes that are caused by the vast number of different ethnic groups that we investigate as a result of the fact that the majority of our research is concentrated on the population of this particular region. If there is a major impact that lipid levels play in diabetic retinopathy, then maintaining management of lipid levels could be advantageous for diabetic retinopathy [9,10]. Because the findings of previous studies on the connection between DR and glucose profile and total cholesterol (TC) levels have yielded results that are incongruent with one another, a study of this kind is urgently required [11-18]. In addition, as part of this investigation, the effect that controlling cholesterol levels has on the prevention of diabetes related complications and the slowed progression of the disease in our community is being investigated [19-21]. This will be accomplished by analyzing the differences in lipid levels between the individuals of the present study. Therefore, the aim of this study is to study glucose profile and total cholesterol in diabetic retinopathy.

MATERIAL AND METHODS:

After institutional ethics committee approval, research authors would commence. Participants gave informed consent before the study began. The study included 100 diabetic retinopathy patients and 100 healthy controls. Indore's Index Medical College & Research Centre (IMCRC) outpatient departments would evaluate both groups. This prospective observational study follows Indore IMCHRC Ophthalmology patients.

All individuals in both groups underwent a general physical examination by a certified physician from the hospital's medicine department, following procedure and the current study's exclusion and inclusion criteria. The healthy control group had 100 age- and gender-matched non-diabetic retinopathy patients. 100 T2DM patients comprised the second group. The American Diabetes Association's guidelines diagnosed diabetes and diabetic retinopathy. Normal-glycemic age- and gender-matched humans would make up the control group. All subjects underwent a regular physical checkup by a licensed doctor. The American Diabetes Association's guidelines identified T2DM.

• Controls excluded type 1 diabetes and diabetic retinopathy patients with fewer than five years of proven T2DM duration and pathological conditions. Hazy media include corneal opacity, cataract, vitreous hemorrhage, pre-existing retinal disorders other than DR, high myopia, advanced glaucoma, and severe anemia, renal disease, and hypertension. Healthy controls were non-diabetic, did not use multivitamin supplements, and did not have any other secondary diseases. DR patients must be above 40, male or female, and have had T2DM for 5 to 15 years.

One hundred patients who fulfilled both the inclusion and the exclusion criteria were selected to go through a full ophthalmological examination at the time of their initial presentation. Ophthalmoscopy and a fundus fluorescein angiography were also components of this test. After that, the ETDRS Grading System was utilized to provide each patient with a score that reflected the degree to which their retinopathy was affected. Following the collection of some blood, tests to assess FBS, HbA1c, and cholesterol were performed.

Collection of Samples:

Fasting venous blood (5ml) was drawn into EDTA and plane vials, after informed written consent from all the study group subjects. Serum and plasma were separated by centrifuging the blood at 3000 rpm for 20 minutes and stored in aliquots at -20o C until assayed.

Parameters Analyzed:

Plasma glucose was estimated by Glucose Oxidase and Peroxidase (DPEC – GOD/POD) method. purchased from Avantor Performance Materials India Limited, Dehradun, Uttarakhand, India. Serum TC was estimated by using the method of Cholesterol Oxidase and Peroxidase (CHOD/POD). Serum TAGs was estimated by using the method Glycerol Phosphate Oxidase and Peroxidase (Liquid stable). Steps were followed as per the instructions given by the supplier.

Statistical Analysis:

Newest version of IBM SPSS was used for all statistical analysis. The Unpaired t-test is the appropriate tool to employ when contrasting the averages of variables from two independent samples. In order to learn more about the link between the two variables, we used the Pearson correlation. This finding is statistically significant because the significance level is smaller than.05.

RESULTS:

According to the findings of our study (Table 1), diabetics who do not have retinopathy have mean levels of FBS that are 128.7, but diabetics with NPDR have mean levels of 153.2, and diabetics with PDR have mean levels of 196.3. Because of this, the p value for the association between FBS levels and the severity of diabetic retinopathy is < 0.05, which suggests that there is relevance between the two. This is because the value indicates that there is correlation between the two. According to the findings of our study (Table 2), diabetics who do not have retinopathy have mean levels of HbA1c that are 6.8, but diabetics with NPDR have mean levels of 7.2, and diabetics with PDR have mean levels of 8.2. Because of this, the p value for the association between HbA1c levels and the severity of diabetic retinopathy is < 0.05, which suggests that there is relevance between the two. This is because the value indicates that there is correlation between the two. According to the findings of our study (Table 3 & $), diabetics who do not have retinopathy have mean levels of total cholesterol that are 188.1, but diabetics with NPDR have mean levels of 198.9, and diabetics with PDR have mean levels of 197.8. Despite this, the p value for the association between blood cholesterol levels and the severity of diabetic retinopathy is < 0.05, which suggests that there is relevance between the two. This is because the value indicates that there is correlation between the two. TC in DR patients: Twenty-two of the fifty-seven patients with retinopathy had increased serum total cholesterol levels, while thirty-five of the fifty-seven retinopathy patients had cholesterol levels that were desired.

Table 1: Fasting blood sugar (FBS) levels of the DR subjects in the present study

	Healthy controls (a)	No DR (b)	NPDR (c)	PDR (d)
Mean	98.1	128.7	153.2	196.3
SD	38.1	43.4	58.3	61.2
P value	a vs b: < .05 a vs c: < .05 a vs d: < .05	b vs c: < 0.05 b vs d: < 0.05	c vs d: < 0.05	

Table 2: Glycosylated hemoglobin (HbA1c) levels of the DR subjects in the present study

	Healthy controls (a)	No DR (b)	NPDR (c)	PDR (d)
Mean	5.1	6.8	7.2	8.2
SD	1.8	2.4	3.3	1.2
P value	a vs b: < .05 a vs c: < .05 a vs d: < .05	b vs c: < 0.05 b vs d: < 0.05	c vs d: < 0.05	

Table 3: Total cholesterol levels of the DR subjects in the present study

	Healthy controls (a)	No DR (b)	NPDR (c)	PDR (d)
Mean	146.8	188.1	198.9	197.8
SD	36.9	42.1	55.6	49.2
P value	a vs b: < .05 a vs c: < .05 a vs d: < .05	b vs c: > 0.05 b vs d: > 0.05	c vs d: > 0.05	

Table 4: Total cholesterol levels of the DR subjects in the present study

		Diabetic Retinopathy (DR)		Total
		NPDR	PDR	
NCEP-ATP classification of TC	<200 (Desirable)	28	7	35
	200-239 (Boderline high)	12	0	12
	≥ 240 (High)	7	3	10
Total		47	10	57

DISCUSSION:

According to the findings of our study, diabetics who do not have retinopathy have mean FBS levels that are 128.7, whereas diabetics who have NPDR have mean FBS levels that are 153.2 and diabetics who have PDR have mean FBS levels that are 196.3. These differences can be attributed to the presence of retinopathy. Because of this, the p value for the correlation between FBS levels and the severity of diabetic retinopathy is less than 0.05, which shows that there may be a connection between the two variables. The FBS levels are an indicator of how severe diabetic retinopathy is. In addition to the findings of our research, we discovered that diabetics who did not have retinopathy had HbA1c levels that averaged 6.8, whereas diabetics with NPDR had HbA1c levels that averaged 7.2, and diabetics with PDR had HbA1c levels that averaged 8.2 over the course of their diabetic journey. Because of this, the p value for the correlation between HbA1c levels and the severity of diabetic retinopathy is less than 0.05, which suggests that there is a significance between the two variables. In other words, the correlation between the two variables is significant. This is because the value indicates that there must be some kind of connection between the two in order for this to be the case. According to the findings of the studies [4,5], the degree of hyperglycemia plays a part in both the early stages of diabetic retinopathy and

the progression of the condition. The research conducted on type 2 diabetes all over the world showed that glycemic management played a protective role in the prevention and non-progression of diabetic retinopathy [6,7]. This was proved in the research that was conducted. According to the findings of yet another study, the likelihood of developing diabetic retinopathy rose by a factor of 1.7 for every 2% increase in HbA1c level. On the other hand, the findings of the UKPDS study showed that the risk of ocular disorders dropped by 19% for every 1% reduction in HbA1c level [1,2]. The phenomenon of ongoing beneficial effects on diabetic complications after a period of improved glycemic control, even if followed by a return to usual (often poorer) metabolic control, has been described as representing metabolic memory by the investigators of the DCCT/EDIC and as a legacy effect by the investigators of the UKPDS [22]. Both of these terms refer to the phenomenon of continued beneficial effects on diabetic complications that occur after a period of improved glycemic control. This process takes place even if an improvement in glycemic control is followed by a return to the typical (and frequently inferior) level of metabolic control. On the basis of the theories presented thus far, it has been suggested that insulin therapy be initiated as soon as possible [23]. This illustrates the necessity of maintaining a level of blood sugar management over an extended length of time, as our research [23] also revealed. It is common knowledge that anemia is a risk factor for diabetic retinopathy. One theory to explain the connection between the two conditions is that retinal tissue receives less oxygen when anemia is present. A low hematocrit was determined to be an independent risk factor for the development of high-risk PDR and visual impairment [16]. According to the findings presented by [24,25] patients whose hemoglobin levels were low had a significantly elevated risk of developing severe diabetic retinopathy. This risk was multiplied by a factor of five. Those individuals who were experiencing symptoms of anemia were excluded from our study [22].

Another study [9] concluded that the mean blood total cholesterol and LDL levels, as well as the mean total/HDL cholesterol and mean LDL/HDL cholesterol ratios, were significantly higher in the diabetic maculopathy group in comparison to the group that did not have retinopathy. This was the case regardless of whether the diabetic maculopathy group had retinopathy. In addition to this, it was found that the mean serum levels of HDL cholesterol, VLDL cholesterol, and triglyceride were equivalent in both groups [20]. According to the findings of a different study [10] that was published in 2004, the severity of retinopathy was shown to have a positive connection with triglycerides and a negative association with HDL cholesterol in type 1 diabetics. This was proven to be the case. According to the findings of one study [14], diabetic patients who have higher levels of total cholesterol, low-density lipoprotein, or triglycerides are more likely to have or develop retinal hard exudates. This condition can be associated with an increased risk of vision loss regardless of the severity of macular edema. They also noticed that the risk was enhanced by a factor of two in instances where there was an elevated level of LDL-c and total cholesterol in the serum. A study that was conducted on the role of atorvastatin in diabetic maculopathy and was a randomized controlled trial [21] concluded that there was a decrease in the visible retinal lipid exudates as well as a beneficial influence on the visual result of patients who were affected by the condition.

CONCLUSION:

FBS levels were revealed to have a strong link with the degree to which diabetic retinopathy presented itself. In the current study, healthy controls were compared to diabetic retinopathy patients. HbA1c levels and the stage of diabetic retinopathy were shown to be significantly related. There was a statistically significant inverse relationship between HbA1c levels and the severity of diabetic retinopathy. In the current study, healthy controls were compared to persons with DR, and a significant link was found between total serum cholesterol levels and the severity of diabetic retinopathy. Twenty-three of the fifty-seven people diagnosed with retinopathy had abnormally high total cholesterol levels in their blood.

Conflict of interest:

No existence of conflict of interest among the authors of the study.

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