

Ministry of Higher Education
and Scientific Research



Journal of Kufa for Chemical Sciences

A refereed

Research Journal Chemical Sciences

Vol.2 No.9

Year 2022

ISSN 2077-2351

مجلة الكوفة لعلوم الكيمياء

Pathophysiological and Biochemical Association with Diabetic Retinopathy in Patients with type 2 Diabetic Mellitus

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ABSTRACT:

Diabetic retinopathy (DR) is the most common micro vascular complication of diabetes and the leading source of vision loss in patients with diabetes mellitus all over the world; other potential causes, such as glaucoma, age-related macular degeneration, and cataract must be considered

Objective: Describe the pathophysiological and biochemical associated with diabetes mellitus DM in patients with type-2 diabetes mellitus.

Method: Participants of one hundred and fifty patients with type two diabetes mellitus 2DM aged 20-70 years old who were diagnosed and treated at specialized diabetic clinic in Baghdad hospitals. All the individuals subject to questionnaire interview ,serum biochemical analysis and assessment of their blood sugar at the day of detect presence or not any form of retinopathy by direct ,indirect ophthalmoscopes using slit-lamp bio microscopy with 3-mirrors and +90Dlenses,detecting of whole blood. Blood pressure were tested also.

Results: It was shown that older ages of the persons with 2DM are the greater the chance of progression the DR, the majority of patients developing DR were with age more than sixty years. From the data it was found male were more susceptible to DR than women .Positive family history had a significant role from parents to sons

Conclusion: The most important of eye disorders is diabetic retinopathy which is severe ocular complexities causing loss of sight and blindness in 2DM patients, the main factors leading to developing diabetic retinopathy is poor regulation of diabetic and uncontrolled hypertension, also aged male gender are highly associated with aggravate of diabetic retinopathy.

Keywords: Diabetes, retinopathy, macular, type-2, blindness.

Abbreviations: Diabetes mellitus DM, Type-1 diabetes mellitus T1DM, Type-2 diabetes mellitus T2DM, Diabetic Retinopathy DR.

INTRODUCTION:

Diabetes Mellitus (DM) is the most frequent metabolic disorder, including the levels of blood glucose are abnormally high. The most common subtypes of DM are Type 1 Diabetes Mellitus (T1DM) which is marked by Immunological devastation of pancreatic β cells, resulting in insulin insufficiency and Type 2 Diabetes Mellitus (T2DM), which is defined by insulin impedance and relative lack in insulin coding [1, 2]. T1DM appeared in children or teens, while T2DM is likely to afflict middle-aged and older persons who have long-term hyperglycemia as a results of unhealthy lifestyle and nutritional selection. T1DM and T2DM is vastly dissimilar, and each type has distinct etiologies, presentations, and treatments. (T2DM) is the most common type of diabetes mellitus which affects over 90% of patients [3]. Hyperglycemia is known to be primary contributor to the progression of diabetic complexity. It's linked with long-range complications of micro vascular and macro vascular [4]. The general micro vascular complications of T2DM are Retinopathy, nephropathy, and neuropathy [5, 6]. Diabetes involves a number of overlapping and interconnected routes that might lead to blinding problem, such as diabetic retinopathy and macular edema [7]. It is defined by raise the development of specific morphological defect in the retinal microvasculature which may can remains stable or lead to diabetic macular edema or proliferative DR, which are the primary causes of severe visual loss in working age individual particularly in developed countries [8-10]. DR had a range of severity from non-proliferative and pre-proliferative to most severe proliferative diabetic retinopathy, in which aberrant vessels development occurs [11, 12]. The evolution of DR can be slowed by early detection and optimal treatment of risk factor [13].The prevalence of DR varies by countries, owing to differences in populations and management of risk factors for DR [14, 15].

MATERIALS AND METHODS:

When collecting samples for biochemical tests, the venous blood sample is taken in a centrifuge tube without anticoagulant at the early morning before breakfast, and then a process for estimating the level of glucose in the blood is performed. Blood pressure for 2DMpatients was assessed at the same time as the blood samples were taken. To detect about retinopathy by direct, indirect

ophthalmoscopes using slit-lamp bio microscopy. Test were performed by automated devices.

RESULTS:

Table (1) Distribution of patients with diabetic retinopathy and with diabetes no retinopathy according to age range.

Age range (Year)	Diabetic Retinopathy		Diabetic No Retinopathy		Probability
	No.	%	No.	%	
20-29	3	3.37	5	7.58	0.001
30-39	8	8.99	7	10.60	0.001
40-49	20	22.47	17	25.76	0.001
50-59	26	29.21	15	22.73	0.001
≥60	32	35.96	22	33.33	0.001
Total	89	100	66	100	

Table (2) Distribution of patients with diabetic retinopathy and with diabetes no retinopathy according to body mass index (kg/m²).

BMI(Kg/m2)	Classes	Diabetic Retinopathy		Diabetic No retinopathy		Probability
		No.	%	No.	%	
<20	under weight	36	40.45%	8	12.12%	0.0001
20→24.9	health weigh	19	21.35%	3	4.55%	0.0001
25→29.9	over weight	16	17.98%	30	45.45%	0.0001
≥30	obesity	18	20.22%	25	37.88 %	0.0001
Total		89	100%	66	100%	

Table (3) Distribution the patients with diabetic retinopathy and with diabetes no retinopathy according gender

Groups	Male	Female	Total	%	Probability
Diabetic Retinopathy	54	35	89	57.42	0.001
Diabetic No Retinopathy	30	36	66	42.58	0.001

Table (4) Distribution the patients with diabetic retinopathy and with diabetes no retinopathy according family history

Groups	Family history		No family history		Total	
	No.	%	No.	%	No.	%
Diabetic Retinopathy	68	76.4%	21	23.6%	89	100
Diabetic No Retinopathy	23	34.8 %	43	65.2%	66	100
Total	91	58.7	64	41.3	155	100

Table (5) Evaluate the levels of glucose and duration of diabetic in patients sera.

Group	No.	Level Mean $\pm$ Std. (mg/dl)	Duration Mean $\pm$ Std (Years)	Probability
Diabetic Retinopathy	89	210 $\pm$ 89. 93	13.28 $\pm$ 4.6	0.0001
Diabetic No Retinopathy	66	162 $\pm$ 74.2	7.03 $\pm$ 5.32	0.0001

Table (6) Comparison between levels of blood pressure for male and female patient's sera.

Groups	Male		Female		Total	Probability
	No.	Mean $\pm$ Std. SYSTOLIC mm Hg	No.	Mean $\pm$ Std. SYSTOLIC mm Hg		
Diabetic Retinopathy	54	136.54 $\pm$ 20.45	35	125 $\pm$ 12.18	66	0.0001
Diabetic No Retinopathy	30	123 $\pm$ 15.23	36	120 $\pm$ 19.21	89	0.0001
Total	84		71		155	

Discussion:

This study were performed on a population of 155 Iraqi persons with 2DM aged 20-70 years, the data obtained from this research which was presented in the research results section, were revealed that as mentioned in table (1) the patients with 2DM with older age more than 60 years old were more likely to develop DR than those of young ages. This finding matched that of other Arab gulf countries, north Jordan and Yamen [15-20], and Qatar also, the results of this study are consistent with what was found in other studies that demonstrated that the risk of infection is more exposed in people of higher ages.[21-24]. In comparison to research [25-28]that revealed a lower BMI is linked to DR our study as in table (2) showed that higher BMI categories were observed in lower DR .A low BMI indicates a lack of metabolic regulation and decreased blood glucose level regulation [29-34] In our population men have a higher proportion of DR implying that female have a lower risk of DR, as mentioned in table(3) one of the explanation is variation in gender it's possible that it's related to the female hormones protective role in the development of DR. [35-40]. According to focus of this research on the parental history of diabetes and DR table (4), discovered that patients with 2DM who had parental history of the disease had a significant frequency of DR.[41-44] Moreover this research illustrated that the prevalence of retinopathy was higher in persons with a family history than in those without family history [45,46] this finding showed great similarity with that considered DR complication associated with family history of the disease which related to the effects of both genetic and unhealthy lifestyle[25] [47-49]. Our finding revealed a substantial relationship between DR and duration of diabetes that illustrated in table (5),which is consistent with the finding of the majority of prior investigations[50-58] also, the patients with DR had mean of duration of diabetes

longer compared to those without DR[28,43][59-62].When delving into the study of the effect of 2DM on development of DR, we found many studies that are consistent with that we found in our study ,a major impacting element for microangiopathy development has been identified as persistent uncontrolled hyperglycemia[63-72],now there is a lot of evidence that hyperglycemia is linked to the complication and damage neural cells and microvascular of retina [73-78], this is due to the fact that the beginning of the 2DM is predominating insidious , and may the patients prior to diagnosis untreated hyperglycemia [28,79],also there are some researchers advocate suppression of glycolysis because of inactivity enzymes of glycolytic as a substantial cause for development of DR [80].The data of this study in table (6) demonstrated that DR advancement more quickly when blood pressure levels are higher this information agreed with many studied that interpreted that according to the hypertension is might participate to the evolution of DR through two technique first high blood pressure lead to rise perfusion of the retina caused dysfunction of endothelial cells secondly regulation of blood pressure by endocrine system involved in the DR pathogenesis[60,81-85]. It's clearly shown from the data blood pressure was for men more than women this explained by the differences in sex-gender and lifestyle found in rise rate of DR in men although the role of sex hormones [86-88].

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