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Prevalence and Correlation of Risk Factors in Diabetic Retinopathy Progression at the Ophthalmology Department, Tobruk Medical Center, Libya.

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Abstract

Diabetic retinopathy is a condition of the eyes that can affect people with diabetes. This is the degree at which the retina's blood vessels are damaged by high blood sugar. These vascular structures can expand and rupture. Additionally, the vessels might close, preventing the circulation of blood. Sometimes, abnormally new blood vessels might grow on the retina. Any of the foregoing changes could impair your vision.

The aim of this study is to identify risk factors that may enhance the development of diabetic retinopathy and explore strategies for reducing the possibility of visual impairment caused by this condition.

A prospective cross-sectional study of diabetic patients registered at the Eye Department of Tobruk Medical Center in Tobruk, Libya between (01.06.2023 to 29.02.2024). Data was collected using a self-administered questionnaire. Grading of DR (diabetic retinopathy) was done by slit-lamp examination and fundoscopy by an ophthalmologist. Descriptive analysis included percentage, mean of age, and p-value by using SPSS 25.

Result: There were 85 diabetic patients, with a mean age of 63.5 and an age range of 31 to 85 years. Of these, 98.8% were of Libyan nationality and 96.4% were place of residencein Tobruk. Forty-three women were present. Compared to individuals with diabetes for less

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تم استلام الورقة بتاريخ: 30/ 6/2024م وتم نشرها على الموقع بتاريخ: 30/ 7/2024م

than ten years, those with diabetes for eleven to fifteen years had an almost five-fold increased chance of having diabetic retinopathy disease (DR). Patients with poor diabetes control (HbA1c > 9) had a 25-fold increased chance of developing PR compared to those with adequate control (HbA1c < 7.5).

Conclusion: Patients with uncontrolled diabetes and those with the disease for a longer period of time are more likely to develop diabetic retinopathy and experience visual impairment.

Key word: Diabetic retinopathy, poor diabetes control, longer period of diabetes, Tobruk, Libya.

مدى إنتشار عوامل الخطر وارتباطها في تطور إعتلال الشبكية السكري في قسم طب العيون، مركز طبرق الطبي، ليبيا

***فتحي عبد المجيد**

قسم العيون– جامعة طبرق

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الملخص

إعتلال الشبكية السكري هو حالة من حالة مرضية التي يمكن أن تؤثر على الناس المصابين بالسكري. هذه هي الدرجة التي تتضرر فيها الأوعية الدموية في شبكية العين من جراء ارتفاع نسبة السكر في الدم. ويمكن لهذه الاوعية أن تتوسع وتتمزق. وبالإضافة إلى ذلك، قد تغلق الأوعية، مما يحول دون سريان الدم. في بعض الأحيان، نمو الأوعية الدموية الجديدة بشكل غير عادي قد تؤثر على شبكية العين. وأي تغيير من التغييرات السالفة الذكر يمكن أن يضعف رؤيتك.

أهداف الدراسة: تحديد عوامل الخطر التي يمكن أن تعزز تطور اعتلال الشبكية السكري و استكشاف استراتيجيات للحد من إمكانية الإصابة بإعاقة بصرية ناجمة عن هذه الحالة. دراسة مستقبلية شاملة لمرضى السكري المسجلين في قسم العيون بمركز طبرق الطبي

تم استلام الورقة بتاريخ: 30/ 6/ 2024م وتم نشرها على الموقع بتاريخ: 30/ 7/ 2024م

في طبرق، ليبيا وقد تم إجراءه بين (2023/06/01 إلى 2024/02/29)، و قد جُمعت البيانات باستخدام استبيان ذاتي. تم تصنيف (الاعتلال الشبكي السكري) عن طريق إجراء فحص لقاع العين من قبل أخصائي العيون بالقسم.

الاستنتاج: من الأرجح أن يصاب المرضى الذين يعانون من مرض السكري غير الخاضع للمراقبة الجيدة والذين يعانون من هذا المرض لفترة أطول من الزمن باعتلال في الشبكية السكري ويصابون بإعاقة في البصر.

Introduction:

Diabetes mellitus is a chronic metabolic disease characterized by hyperglycemia or hypoglycemia, damage to large blood vessels (macrovascular), like cardiovascular and cerebrovascular disease, and damage to the small blood vessels (microvascular), like nephropathy or retinopathy. (Jennifer 2019) (Moudgil 2021)

One of the most widely common microvascular complications associated with diabetes mellitus is diabetic retinopathy. In the western world, diabetic retinopathy (DR), is among the leading causes of adult blindness. (Sahiledengle 2022) (Ashraf 2022)

Diabetic retinopathy is more common in patients with type 1 (insulin-dependent DM) than in those with type 2 (insulin-dependent DM) and was found to be related to both, the severity of hyperglycemia and the presence of other chronic diseases like hypertension. (Alharbi 2020)

Diabetic retinopathy is typically discovered in its advanced stages. Due to low motivation for routine healthcare and a lack of knowledge about the disease's risk in our nation, diabetic people in our community typically receive consultations after the condition has manifested symptoms. (Silva 2017) Early detection of DM, good control blood sugar in blood and effective diabetes management with diet and exercise can significantly decrease progression of diabetic retinopathy. (Alali, N.M 2022) (Sahiledengle 2022)

On an international scale, diabetes-related retinal degeneration is one of the most prevalent causes of blindness. Due to continuous

تم استلام الورقة بتاريخ: 30/ 6/2024م وتم نشرها على الموقع بتاريخ: 30/ 7/2024م

exposure and insufficient monitoring of blood sugar, the retinal blood vessel is damaged. (Esmaeil 2023)

When diabetic retinopathy initially appears, it is typically asymptomatic. This is because patients with DR are often not diagnosed until a long time later, and if management is delayed, the disease will eventually progress into further advanced stages. (Esmaeil 2023) There are various stages of diabetic retinopathy (DR), ranging from mild non-proliferative stages with small microaneurysms of retinal blood vessels to severe proliferative stages with the growth of new, fragile retinal blood vessels. These stages can cause problems such as vitreous hemorrhage, macular ischemia, and retinal detachment, which can result in advanced blindness. (Yasir ZH 2019) (Aiello 2018)

Pan-Laser-Photocoagulation (PRP) was an essential component of DR treatment over the previous ten years in order to lower the risk of severe visual loss by lowering the possibility that DR would develop to proliferative diabetic retinopathy (PDR). Our current DR classification systems cannot be formally employed to prognosticate such eyes that have received disease-modifying treatment because typical DR lesions including hemorrhage, microaneurysms, and neovascularization tend to recur after successful PRP. (Silva 2017) A formal classification for these post-PRP eyes was really not necessary because PRP had a persistent and long-lasting effect on minimizing retinal ischemia. However, with the current treatments, we can utilize for DR and diabetic macular edema (DME) therapies such intravitreal anti-vascular endothelial factor (anti-VEGF) and corticosteroid injections have been shown to improve the fundus' appearance. (Flaxel 2020) (Moudgil 2021)

The objective of this study

Objectives to calculate the frequency and determine the relationship between risk factors such as patient age, diabetes type, duration, and lack of control in patients with diabetes mellitus who visit the Tobruk Medical Eye Department in Tobruk, Libya, and experience progressive diabetic retinopathy.

تم استلام الورقة بتاريخ: 30/ 6/2024م وتم نشرها على الموقع بتاريخ: 30/ 7/2024م

Materials and Methods

A prospective cross-sectional study of diabetic patients registered at Eye department of Tobruk medical center in Tobruk-Libya between (01.06.2023 to 29.02.2024). We employ self-administered questionnaires in combination with in-person interviews to obtain a high collaboration rate and an effective data collection process. A dilated comprehensive eye exam with an emphasis on evaluating diabetic eye disease was done for all individuals with diabetes. A thorough medical and ocular history, along with information on the length of diabetes, glucose control, and current medications, all were included. VA (visual acuity) evaluation, slit-lamp bio-microscopy, IOP (intra ocular pressure) measurement, pupillary assessment, gonioscopy, as well as indirect ophthalmoscopy examination of the periphery of the retinal examination by an expert ophthalmologist. Descriptive analysis includes percentage and mean, median, and p-value by using NPar- Wilcoxon signed Ranks test use SPSS 25.

The Hba1c is recommended as a standard of care for testing and monitoring of diabetes according to the American Diabetes Association (ADA); Hba1c < 7.5% is considered a controlled diabetic patient, and >7.5% are poor controlled diabetes mellitus patients. Diabetic retinopathy grades are divided into non-proliferative diabetic retinopathy (mild, moderate, and severe) and proliferative diabetic retinopathy when complications start with new blood vessels in the retina.

According to the WHO visual loss classification, the following categories of visual impairment were classified: subtotal blindness [hand movement (HM) or perception of light (PL)], complete blindness [no perception of light (no PL)], mild visual impairment between (0.4-0.8), moderate visual impairment between (0.1-0.3), sever visual impairment between (>HM-0.05), and good or normal vision considered > 0.8.

According to the Early Treatment DR Study (ETDRS) diabetic retinopathy classification, DR was classified into; non-proliferative and proliferative diabetic retinopathy, non-proliferative DR divided

تم استلام الورقة بتاريخ: 30/ 2024/6م وتم نشرها على الموقع بتاريخ: 30/ 2024/7م

into mild, moderate, and severe stages. Maculopathy - can be further classified as: focal oedema, diffuse oedema, ischemic, and mixed.

Result:
In this study, there were 85 diabetic patients, ages ranging between 31 and 85 years, with a mean of 63.5 Years old; the majority (98.8%) were Libyan nationals living in Tobruk (96.4%). There were 43 (50.6%) females and 42 (49.4%) males.

Table 1. Distributions of diabetic retinopathy in this study

Distributions in this study	No. of Cases	Percentage
Patients with no diabetic retinopathy	19	22.40%
Patients with mild non proliferative diabetic retinopathy	23	27.10%
Patients with moderate non proliferative diabetic retinopathy	11	12.90%
Patients with severe non proliferative diabetic retinopathy	4	4.70%
Patients with proliferative diabetic retinopathy	28	32.90%
Total	**85**	**100%**

The prevalence of diabetic retinopathy was 77.6% of all the study cases; the Table (1) showing: mild non-proliferative diabetic retinopathy was in 23 patients (27.1%) of all cases (34.8% of those with DR), whereas moderate non-proliferative type was 12.9% of patients and severe non-proliferative diabetic retinopathy was 4.7%. Whereas, the proliferative type was present in 28 patients (32.9%) of all studying patients (42.4% of those with DR). you can also see that in figure (1). There were 22 out of 28 patients with proliferative diabetic retinopathy (PDR), considered the advanced stages of PDR, because these cases were complicated by such severe complications as vitreous hemorrhage, glaucoma, and retinal detachment. In this study, 15 patients were complicated with vitreous hemorrhage, 10 patients had retinal detachment, and 3 patients had glaucoma.

تم استلام الورقة بتاريخ: 30/ 2024/6م وتم نشرها على الموقع بتاريخ: 30/ 2024/7م

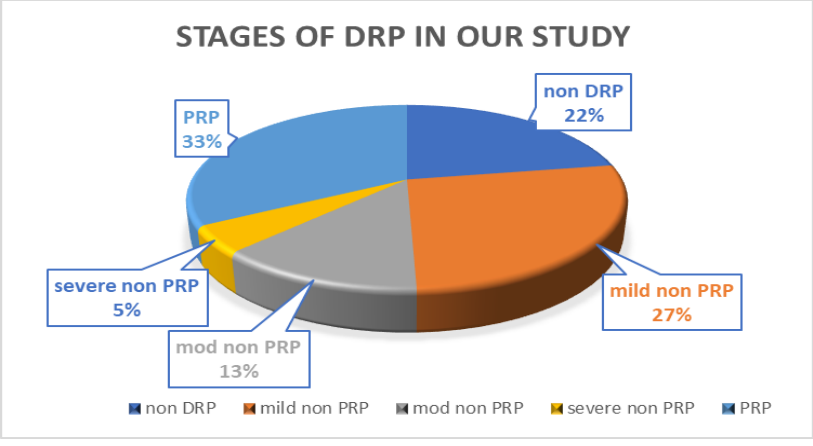

Figure 1. The stages of diabetic retinopathy

Table 2. The ocular and systemic complication of diabetes millets

Correlation ocular and systemic complications in diabetic patients	No. of Patients	Percentage
Diabetic retinopathy	66	77.60%
Cataract	45	52.90%
Glaucoma	4	4.70%
Uveitis	1	1.20%
Hypertension	33	38.80%
Cardiac disease	11	12.90%

Table (2) shows, the most common diabetic eye complication was DR in 66 patients (77.6%), followed by cataracts was in 45 patients (52.9%), glaucoma in 4 patients (4.7%), and uveitis in one patient. Systemic-associated diseases like systemic hypertension were observed in 33 patients (38.8%) and cardiac disease in 11 patients (12.9%).

Table 3. Duration of DM in this study

Duration of diabetes mellitus in the current study	No. of Patients	Percentage
Duration of diabetes mellitus less than 10 years	14	16.50%
Duration of diabetes mellitus between 10-15 years	33	38.80%
Duration of diabetes mellitus more than 15 years	38	44.70%

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Part 2 المجلد
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ISTJ
تم استلام الورقة بتاريخ: 30/ 6/2024م وتم نشرها على الموقع بتاريخ: 30/ 7/2024م

The duration of diabetes ranged between (3 – 35) years; Table (3) shows there were 14 patients (16.4%) with a duration of diabetes <10 years, whereas 38 patients (44.7%) exceeded 15 years, and 33 patients (38.8%) ranged between 10 and 15 years. The type II diabetes mellitus non-IDDM patients were 77 (90.6%), who indicated that they were treated with oral medication and diets, and the type 1 IDDM patients were 8 patients, who were treated with insulin.

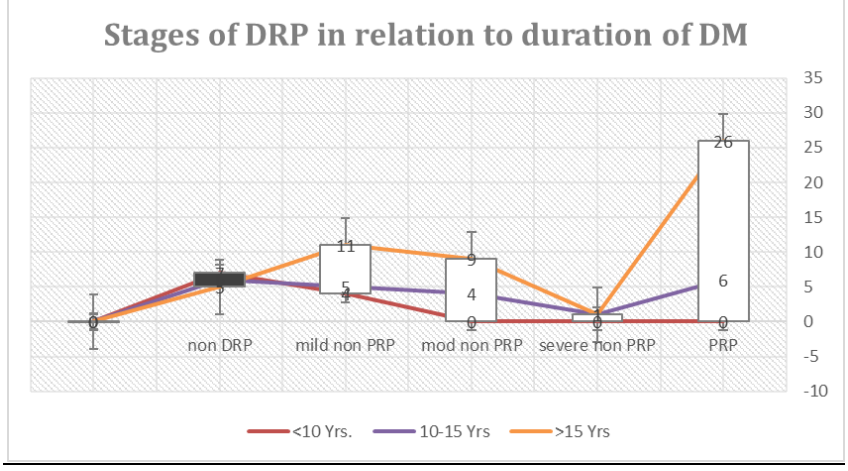

Figure 2. The progression of DRP in relation to duration of diabetes Miletus

Table (4) showing correlation between risks of diabetic retinopathy with increase duration of DM

Duration of DM	Non DRP	Patients with DRP	Total number
Less than 10 Years	7	4	**11**
Between 10-15 Years	6	16	**22**
More than 15 Years	5	46	**52**
Total number	**18**	**66**	**85**

The results of multivariate analysis, it was considered that patients with a duration of diabetes ranging between 11 and 15 years were (16 patients) at an almost four-fold higher risk of developing DR compared to those with a duration <10 years (4 Patients); patients

تم استلام الورقة بتاريخ: 30/ 6/2024م وتم نشرها على الموقع بتاريخ: 30/ 7/2024م

with a duration of diabetes >15 years (46 Patients) had more than a two-fold higher risk of developing DR than cases with a duration <15 years (20 Patients), look at table (4). In proliferative diabetic retinopathy (PRP), most of the cases have a have a duration of diabetes >15 years (25 Patients), five times longer than the cases with a duration of diabetes <15 years (5 Patients). Additional details are shown in figure (2).

There were 71 patients (83.5%) with poor control of diabetes mellitus (Hba1c >7.5%), and only 14 of the participants looked to have controlled DM (Hba1c <7.5%). Only one out of eight patients of type I (IDDM) look to be had controlled Hba1c not exceeded 7.5%.

Table 5. Stages of diabetic retinopathy in compression to degree of diabetes control by HBA1c control and blood sugar level

Degree of control of DM	Non DRP	Mild non-PDR	Mod. Non-PDR	Sever non-PDR	PDR
Good controlled*	6	5	0	1	1
Mod controlled*	8	11	5	1	4
Non controlled*	4	7	6	2	25

*Good controlled HbA1c <7.5, moderate controlled HbA1c (7.5-9), poor controlled HbA1c >9

As you observe in Table (5), it was considered that patients with poor control of blood sugar and HbA1c > 9 throughout the disease (25 patients) were at an almost five-folded risk of developing PRP compared to those with moderately controlled diabetes (4 patients), which had HbA1c between (7.5-9), and patients with poor control of diabetes and HbA1c >9 were (25 Patients) at a 25-folded risk of developing PRP than cases with good control HbA1c <7.5 (only 1 Patient), NPar-Wilcoxon signed Ranks test (P. value 0.058).

As the table (6) shows, the majority of uncontrolled cases (66 Patients) had HbA1c > 7.5 throughout the disease and had some degree of diabetic retinopathy.

تم استلام الورقة بتاريخ: 30/ 2024/6م وتم نشرها على الموقع بتاريخ: 30/ 2024/7م

Table 6. Relation between DM control and formation of DR

DM control	Non DRP	Patients with DRP	Total number
Good controlled pts.	6	7	**13**
Moderate controlled	8	21	**29**
Non-controlled pts.	5	38	**43**
Total number	**19**	**66**	**85**

Deterioration of vision as an indicator for the function outcome of the eye was recorded in the majority of the cases. There were 64 tested eyes recorded as having mild visual impairment, with visual acuity > 0.3 on the Snellen chart. Whereas moderate visual impairments were considered in 62 eyes (visual acuity between 0.1-03), severe visual impairment in 18 eyes, visual acuity between (0.05 - > HM), legal or subtotal blindness (vision HM or PL) resulted in 20 eyes, and total blindness (no PL) in 6 eyes of the study. Increase severity: The deterioration of vision is corelated with the severity of the diabetic retinopathy, NPar- Wilcoxon signed Ranks test (P value = 0.008) and has a significant relationship with poor control in diabetic patients. NPar-Wilcoxon signed Ranks test (P value = 0.003). See additional details table (7).

Table 7. Significant P value statistical analysis

Frequencies	Vision & Severe stage DRP	Vision & Poor controlled DM	DRP& Poor controlled DM
	N	N	N
Negative differences	26	24	23
Positive differences	50	53	54
Ties	9	8	7
Total	85	85	85
Test Statistics a. Sig Test.			
Z	-2.638	-3.925b	-2.932
Asymp. Sig. (2-tailed)	0.008	0.003	0.058

تم استلام الورقة بتاريخ: 30/ 2024/6م وتم نشرها على الموقع بتاريخ: 30/ 7/2024م

Discussion:

Diabetic retinopathy is one of the diabetes mellitus complications that can lead to loss of vision if not early discovered and properly controlled. For this, we should know the DR problem, identify its associated risk factors, and routinely conduct fundus examinations to detect the RP in the early stages, which is essential for the achievement of better management and improving the outcome. (Alharbi 2020) (Ashraf 2022)

Our study's overall DR prevalence was 77.6%, which is almost higher than the projected global prevalence of 34.6% among people with diabetes that has been documented, but because most cases come to our department symptomatic and come to get consultation, which can explain our higher prevalence. (Mounirou 2022)

In general, DR formation in diabetic patients was significantly associated long duration of disease, uncontrolled HbA1c, adherence to medications and an unhealthy diet, irregular diabetes follow-up, irregular fundus examination, patients with a history of hypertension (HTN), patients with diabetic complications (cataract, glaucoma, and heart failure), and patients with a higher body mass index (BMI). Patients' nationality, marital status, place of residence, and family history of diabetes were not significantly associated with the development of DR. (Alemu 2022)

The most frequent risk factors for the detection of DR are the type of diabetes, disease duration, poor glycemic control (high HbA1c levels), and the presence of other systemic diseases like hypertension, which are associated with an increased probability of developing DR. (Alali, N.M 2022)(Hassan 2023), a report from (Alemu 2022)] found that smoking was associated with a higher risk of developing diabetes mellitus. The fact that there were fewer people who smoked in the group we studied might be responsible for the above finding. (Donald 2004)

Of course, there was a significant increased risk of developing diabetic retinopathy (DR) among uncontrolled people who did not take their medications on a regular schedule, those who had diabetes, and those who were not receiving regular ophthalmological follow-up. (Hassan 2023) In the current study,

تم استلام الورقة بتاريخ: 30/ 6/2024م وتم نشرها على الموقع بتاريخ: 30/ 7/2024م

diabetic patients with a long duration of diabetes (10 and 15 years) were at the highest risk for developing DR. The same has been documented in other studies. (Mounirou 2022)

Concerning the distribution and grading of the retinopathy, the results we obtained from our study are consistent with many other studies, (Yasir ZH 2019, Sahiledengle B 2022, Li, X 2020), but in our study, the frequency of proliferative retinopathy was higher than in the other studies. (Yasir ZH, Salem A. 2021) The current study revealed a prevalence of a prevalence of proliferative diabetic retinopathy that was higher than the KSA study (Ahmed 2016) and also higher than that reported from Ethiopia (Alemu 2022).

One of the complications of diabetes that can lead to blindness is diabetic retinopathy. The first 10 years following a diabetes diagnosis have been marked by a significant decline in visual acuity. (Flaxel 2020) Our study's findings support the majority of previous studies in showing that retinopathy worsens with a prolonged period of diabetes. Individuals who have just received a clinical type 2 diabetes diagnoses should be informed that even though age-related vision loss is inevitable, additional diabetes-related vision loss can be largely avoided with careful ophthalmological monitoring and surgical intervention. (Mounirou 2022)

Diabetes control, which includes routine doctor visits, a nutritious diet, exercise, and early management with retinal laser photocoagulation and anti-VEGF therapy, is one strategy to lessen vision loss from diabetic retinopathy. (Moudgil 2021)

In addition, patients with type 1 DM were at a higher risk of developing DR (87.5%). The same has been documented in Saudi Arabia, (Alharbi 2020) and in Ethiopia. (Alemu 2022) The mechanism of the association between DR and insulin use is still unclear (Mounirou 2022)

Conclusion:

Despite the improvements in health care services, DR is still a leading cause of reduced daily life activity and emotional distress due to visual acuity impairment.

تم استلام الورقة بتاريخ: 30/ 2024/6م وتم نشرها على الموقع بتاريخ: 30/ 2024/7م

DR is a serious problem. Early detection and treatment of DR can save the vision. For that, we need to plan DR services to avoid complications of DR as vision loss and to health strategy to improve management of diabetes to decrease the risk of DR.

Declaration:

"We hereby declare that the clinical research paper titled '[Prevalence and Correlation of Risk Factors in Diabetic Retinopathy Progression at the Ophthalmology Department, Tobruk Medical Center, Libya.]' has received ethical approval from the Tobruk Medical Centre Ethics Committee, prior to its initiation. This statement serves as an assurance that the research study conducted for this paper adheres to the highest ethical standards, ensuring the safeguarding of human subjects and upholding the integrity of the research process.

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