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Original article

Cataract Prevalence and Risk Factors Among Type 2 Diabetics in Derna Teaching Hospital

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ABSTRACT

This study aimed to assess the prevalence of cataracts among type 2 diabetic patients attending the ophthalmology department at Derna Hospital and to identify key diabetic risk factors associated with cataract development. A hospital-based case-control study was conducted from 2 November 2023 to 27 February 2024 at Alwahda Teaching Hospital in Derna City. Among 220 type 2 diabetic patients attending the ophthalmology department during this period, approximately 180 were diagnosed with cataracts. Participants provided consent for participation, and those with cataracts due to reasons other than diabetes were excluded. Data were collected through face-to-face interviews using a multidata questionnaire, followed by comprehensive eye examinations and relevant tests. Risk factors including sex, age, duration of diabetes, fasting blood sugar, and hypertension were compared between patients with and without cataracts. Statistical analysis was performed using percentages, proportions, and the Chi-square test. The results showed that gender and smoking were not significantly associated with cataract incidence ($p > 0.05$), but age, duration of diabetes, HbA1c levels, hypertension, and fasting blood sugar were significantly higher in the cataract group ($p < 0.05$). Multiple regression analysis indicated that the duration of diabetes was significantly correlated with the presence of cataracts ($p < 0.05$). In conclusion, the duration of diabetes was identified as the most significant risk factor for cataracts in diabetic patients, highlighting the importance of cataract screening programs for diabetic patients to prevent visual impairment and related disabilities.

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INTRODUCTION

Cataract is the primary cause of blindness worldwide [1] is considered one of the most widespread eye diseases globally, posing a significant threat to vision loss, especially in countries Laking health awareness programs and regular screenings. Cataract can be defined as a condition where the natural lens of the eye become cloudy, affecting its primary function of transmitting and focusing light into retina [2] while Diabetes is considered one of the most widespread non-communicable diseases globally, according to the International Diabetes Federation (2021) reports that 10.5% of the adult population (20-79 years) has diabetes, with almost half unaware that they are living with the condition [3].

By 2045, IDF projections show that 1 in 8 adults, approximately 783 million, will be living with diabetes, an increase of 46% [3], the World Health Organization, also stated that over the past 3 decades the prevalence of type 2 diabetes has risen dramatically in countries of all income levels [4]. DM patients have increased risk of cataract formation compared to non-DM population [5]. Age, longer duration of DM, increased level of glycated hemoglobin (HbA1c) and DM treatment were all considered as associated factors [5].

Type 2 diabetes affects how your body uses sugar (glucose) for energy. It stops the body from using insulin properly, which can lead to high levels of blood sugar if not treated [4]. In other words**,** is a medical condition characterized by the body's resistance to insulin, a hormone crucial for regulating blood sugar levels. This resistance leads to elevated blood sugar levels, potentially causing serious health complications. This study was conducted in an attempt to assess the prevalence of cataract among individuals with type 2diabetes in the city of Derna. Also, this study aims to analyses the risk factors associated with cataract development, compare cataract prevalence by age and gender, and provide recommendations for further research.

METHODS

Study design and setting

This was a hospital-based case control study conducted in the Ophthalmology department at AL-Wahda Hospital in Derna. The total number of participants in this study was 180 type 2 diabetic patients with cataract [94 male-86 female], mean age (66.4667 ± 1.75) representing the overall count of patients with both conditions attending the ophthalmology department from November 2023 to February 2024. Another group of diabetic patients who are not affected by cataracts were included in the study to investigate the causative factors of cataract formation in both groups (40 patients) with mean age about (52 ± 2.67) years [18 female -22male]. The second step after obtaining verbal consent from the patients to participate in this study, involved conducting face to face interviews with each patient for approximately ten minutes.

Data collection

A pre-prepared questionnaire was then filled out, capturing data such as the patient's age, gender, duration of T2D, smoking status, presence of hypertension, and the specific medications used for diabetes treatment. Blood tests for fasting and glycated hemoglobin levels were requested for each patient [FBS-HbA1c]. Assessment of the presence of cataract in patients was examined by using dilatation drops, one drop per eye, repeated when necessary and waiting for about 20 to 30 minutes before examining the eye lens by using Slit-Lamp bio microscopy. Risk factors like sex, age, duration of diabetes, fasting blood sugar, hypertension, HbA1c, type of diabetic treatment and others were compared between patients with and without cataracts.

Inclusion and exclusion criteria

The study includes type 2 diabetic patients with and without cataract, while we exclude individuals with cataract due to reasons other than diabetes type 2, patients who underwent cataract surgery in both eyes and very ill patients who declined to participate in the study.

Statistical analysis

Values were expressed as means ± standard deviation (± SD). Statistical significance was determined using the Chi-square test. A probability value of less than 0.05 was considered significant. Multiple logistic regression analysis was employed to explore the independence of risk factors associated with the development of cataract among type2 diabetic patients.

RESULTS

The total number of patients was 220, with 180 of them having cataracts, which accounts for 82%, and 40 of them not having cataracts, which accounts for 18%. The results indicated that gender and smoking are both not directly correlated with cataract incidence (p-value > 0.05). While hypertension, residential area (region) rural\urban, and the type of diabetes treatment used are strongly associated with cataract formation (P-value < 0.05) (Table 1).

Regarding the comparison of the mean age between the two groups, the results indicated that while the mean age for all participants was approximately 63 years, there was a clear difference in the mean age between those with cataracts and those without cataracts (P-value 0.00 < 0.05) (Table 2). The mean age for patients with cataract is around 66 years, while the mean age for patients without cataract is around 52 years. With the knowledge that the average duration of diabetes for all participants was approximately 9 years, it is noteworthy that there was a significant difference in the mean duration of diabetes between diabetic patients with cataracts and those without cataracts (p value 0.00 < 0.05).

Table 1. Chi-test for Clinical characteristics of subject studied

Subject	Total (N= 220)	With cataract (N = 180)	Without cataract (N =40)	p- value
Gender – (Male: female)	117: 103	95: 85	22: 18	0.799
Hypertension (yes: no)	131: 89	119: 61	12: 28	0.000
Smoking (yes: no)	53: 167	45: 135	8: 32	0.504
Region – (urban: rural)	101: 119	69: 111	32: 8	0.000
Type of Treatment (Tab: Insulin: Mix)	36: 159: 25	27: 128: 25	9: 31: 0	0.032

Another significant difference observed in comparing the results related to fasting blood sugar analysis between the two groups is that this test showed higher results in the group of patients with cataracts (p value 0.00 < 0.05). Regarding the analysis of the average HbA1c levels between the two groups, it was found to be higher in the group affected by cataracts compared to the group not affected by cataracts (p value 0.00 < 0.05). (Table 2).

Table 2. T-test for Clinical characteristics of subject studied

Subjects	Total (N= 220)	With cataract (N = 180)	Without cataract (N =40)	p- value
Age (years)	63.8364 ± 1.6897	66.4667 ± 1.75	52 ± 2.67	0.000
Duration of diabetes	9.1409 ± 0.83	10.36 ± 0.92	3.65 ± 0.43	0.000
FBS	200.3386± 9.25	215.0694 ± 9.59	134.05 ± 7.74	0.000
HbA1c	8.9874± 0.2897	9.3872 ± 0.32	7.1885 ± 0.26	0.000

From table 3, results of a logistic regression model determined the risk factors on cataract incidence. The most risk factor is duration of diabetes (P-value 0.005 < 0.05). After that, the second risk factor is fast blood sugar level (P-value 0.002 < 0.05). The last risk factor is average blood sugar HbA1c (P-value 0.059 < 0.10). The rest of variables do not seem to affect the cataract incidence all their P-values > 0.05.

Table 3. Results from logistic regression model

Independent variables	Logistic coefficients	p- value
Age	0.026	0.325
Duration of diabetes	0.438	0.005
FBS	0.034	0.002
HbA1c	-0.514	0.059
Gender	-.281	0.595
Hypertension	0.672	0.244
Smoking	0.360	0.623
Region	0.309	0.663
Type of treatment (1)	-18.217	0.998
Type of Treatment (2)	-17.872	0.998

DISCUSSION

The aim of this study was to assess the prevalence of cataract and identify its mostly associated factors among the Libyan DM patients in the city of Derna. From a total of 220 diabetic patients, 180 patients (81.82%) had cataracts, of which 94 were males and 86 were females, 44 patients without cataract 22males and 18 females. The prevalence rate of cataracts among type 2 diabetic patients in the city of Derna was about 9.3%, while The Libyan national non communicable diseases survey in 2009 reported a prevalence of diabetes of 16.4% [6]. The prevalence of cataracts in one or both eyes in a previous study conducted in Benghazi city was 13.1% [7]. The prevalence of cataracts varies across different populations, 16% in the Sudan [15], 50% in Korea [9], in Palestine 47.8% [10], 15.1% in Tunisia, and 8.2% In Algeria [4]. This difference may be attributed to variations in the characteristics of each study population and the methods and criteria used to assess the presence of cataracts.

According to the results of our study, gender is not correlated with an increased prevalence of cataracts and is not considered a direct factor. On the other hand, in a previous study conducted in Benghazi, it was found that cataracts are more prevalent in males [14]. However, in other study, it was observed that cataracts are more prevalent in females

among diabetic patients [9] an increased risk of cataract for diabetic women compared to men has also previously been reported in the UK [11].

When comparing the age distribution between the two groups of diabetic patients, those affected and those not affected by cataracts, we observed a difference in the mean age between the two groups, with the cataractous group having a higher mean age of 66.4667 years (±1.75). and this may relate to the types of cataracts that we not involved in our study. However, in multiple regression tests, age, was not a significant factor for cataract incidence with diabetes mellitus. The duration of diabetes significantly influences the incidence of cataracts in diabetic patients, with longer durations correlating to higher incidence rates.

Duration is defined as the period between the year of disease diagnosis and the year of clinical examination. Unlike type 1 diabetes, type 2 diabetes typically has a slow onset, and many type 2 patients are unaware of the symptoms of diabetes. As a result, they often seek medical advice after many years of living with the disease or when they develop long-term complications. The mean duration of diabetes mellitus in patients with cataracts was 10.36 years (±0.92). Several reports indicate the presence of lenticular opacity when blood sugar levels exceed 225 mg%, with these elevated rates increasing with longer durations of diabetes.

Glycemic control is found an important factor to be considered in the evaluation of incidence and progression of cataract among diabetic patients in Derna, the fasting blood sugar level was higher in the cataract group than in the control group (215.0694 ± 9.59 mg/dl VS 134.05 ± 7.74 mg/dl; p=0.001). Also, the level of HbA1c was higher in the cataract group than in the control group (9.3872 ± 0.32 VS 7.1885 ± 0.26), this result may be due to Most of the patients in the study were elderly and did not adhere to normal blood sugar level maintenance standards. This can be explained at the molecular level by glycation of lens proteins, oxidative stress and the polyol pathway have been reported to be linked with the development of cataract [12], Hence, the importance of regular screening for diabetic patients to maintain blood sugar levels within reasonable ranges in order to preserve eye health becomes evident.

Despite free availability of insulin and antidiabetic medications in Libya, many diabetic patients exhibit poor blood sugar control, likely due to inadequate follow-up with healthcare providers and low awareness of diabetes complications, especially among the elderly with limited education. Our comparison revealed that diabetic patients with a history of high blood pressure are more likely to develop cataracts compared to those without such a history at a ratio of 131 to 89.

Cataracts occur more frequently among diabetic patients residing outside the city in rural areas, with a ratio of 119/101 for patients inside the city of Derna (p value 0.000). Lifestyle differences between rural and urban areas may contribute to this higher occurrence of cataracts among diabetic patients in rural areas. T2DM was treated with different modalities, including diet control, insulin, and oral antidiabetic drugs. In our study, insulin was used by 159 (72.2%) of participants, out of them, 128 were diagnosed with cataracts, while 31 were not. About 36 out of a total diabetic patient using oral medication for diabetes treatment, approximately 27 were diagnosed with cataracts, while9 did not have cataracts. Around 25 patients among the participants were using a combination of oral medications and insulin, these patients are diagnosed with cataracts, and there are no individuals from the non-cataract group using this combination therapy. It is worth mentioning that both groups of diabetic patients do not use dietary regulation as their sole treatment.

In epidemiologic studies published in European countries, factors such as a long duration of diabetic disease, advanced age at the time of clinical diagnosis and poor control of blood sugar level are reported as risk factors for cataract in diabetic [7,8], This aligns with the results we obtained, which confirm the direct relationship between the duration of diabetes, elevated blood sugar levels, high blood pressure, and their impact on the early onset of cataracts in patients with type 2 diabetes, also, the diabetic period ($p<0.001$) was the significant factor associated with cataracts in patients with diabetes in Korean patients [9] and in UK [16]. The second reason regarding factors related to cataract formation in diabetic patients is the elevation of fasting blood sugar and glycosylated hemoglobin levels FBS – HBA1C this is consistent with a prior study conducted in West Africa, which indicates a strong positive association between fasting plasma glucose (FPG) levels and cataract formation [11]. While smoking is not considered one of the factors associated with cataract formation in diabetic patients in our study, this contradicts a study conducted in Iran which found increased rates of cataract formation among diabetic patients who smoke [12].

CONCLUSION

The duration of diabetes emerged as the most significant risk factor for cataracts in type 2diabetic patients in the city of Derna underscoring the importance of implementing cataract screening programs for diabetic individuals. This proactive approach is essential for preventing visual impairment and associated disabilities. Moreover, it emphasizes the crucial role of diabetes control and regular follow-up in managing diabetic eye complications effectively.

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Conflicts of Interest. Nil

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انتشار إعتام عدسة العين وعوامل الخطورة بين مرضى السكري من النوع الثاني في مستشفى درنة التعليمي

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المستخلص

تهدف هذه الدراسة إلى تقييم انتشار السَاد بين مرضى السكري من النوع الثاني الذين يراجعون قسم طب العيون في مستشفى درنة، وتحديد عوامل الخطر الرئيسية المرتبطة بتطور السَاد. تم إجراء الدراسة مقارنة حالة في مستشفى من 2 نوفمبر 2023 إلى 27 فبراير 2024 في مستشفى الوحدة التعليمي في مدينة درنة. من بين 220 مريضًا من مرضى السكري من النوع الثاني الذين راجعوا قسم العيون خلال هذه الفترة، تم تشخيص حوالي 180 منهم بإصابات بالساد. قدم المشاركون موافقتهم للمشاركة، وتم استبعاد من يعانون من الساد بسبب أسباب أخرى غير مرض السكري. تم جمع البيانات من خلال المقابلات المباشرة باستخدام استبيان متعدد البيانات، تلاها فحوصات شاملة للعين والاختبارات ذات الصلة. تم مقارنة عوامل الخطر بما في ذلك الجنس، العمر، مدة مرض السكري، مستوى السكر في الدم الصائم، وارتفاع ضغط الدم بين المرضى المصابين بالساد وغير المصابين به. تم إجراء التحليل الإحصائي باستخدام النسب المئوية، والنسب، واختبار كاي تربيع. أظهرت النتائج أن الجنس والتدخين لم يكونا مرتبطين بشكل كبير بحدوث السَاد ($p > 0.05$)، ولكن العمر، مدة السكري، مستويات السكر التراكمي، ارتفاع ضغط الدم، ومستوى السكر في الدم الصائم كانت أعلى بشكل كبير في مجموعة المصابين بالساد ($p < 0.05$). أشار تحليل الانحدار المتعدد إلى أن مدة مرض السكري كانت مرتبطة بشكل كبير بوجود السَاد ($p < 0.05$). في الختام، تم تحديد مدة مرض السكري كأهم عامل خطر للسَاد لدى المرضى السكريين، مما يبرز أهمية برامج فحص السَاد لمرضى السكري لمنع تدهور الرؤية والإعاقات ذات الصلة.

الكلمات المفتاحية. إعتام عدسة العين؛ العمى؛ مرض السكري.