



The Link Between Diabetes and Eye Health: Managing Diabetic Retinopathy

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Annotation. Background

Diabetes is considered one of the most important factors that greatly affect eye health, as diabetic retinopathy is the most common and prominent cause of vision loss for patients.

Objective:

This study aimed to assess the health outcomes of visual functions for diabetes patients.

Method:

A cross-sectional study was conducted to examine the outcomes of diabetic patients and their relationship to eye health. Demographic data were collected from different hospitals in Iraq, which recruited 113 patients for a period between April 5th, 2022, and November 16th, 2023. All participants between the ages of 30 and 70 years were included. NEI-VFQ-25 questionnaire data



related to asking questions, which included 16 questions in examining eye examinations of participating patients, were identified.

Results:

The results showed that the age of the patients was (60 - 70) years, and the clinical data found that the 68 men who participated in the study were higher than the 45 female participants. These results showed that 64.60% of patients were hypertensive, and 53.10% were smokers. Moreover, this study recorded patient data for diabetic patients, where 59.29% had type 2 diabetes, and the duration of diabetes, which ranged between (10-20) years, was the majority at 70.80%. Diastolic blood pressure was (80.14±8.85). This study showed through the NEI-VFQ-25 questionnaire that it assessed the patient's health in relation to eye diseases, and most of the items included general health 0.75, general vision 0.71, peripheral vision 0.78, and color vision 0.74.

Conclusion:

The type of diabetic retinopathy affects visual function negatively. This study showed that the severity of diabetes and lack of awareness increases the visual impairment of patients.

Keywords: Diabetes, Eye health, cholesterol; and Cronbach alpha scale.

Introduction

Diabetes is a pervasive disease distinguished by elevated blood glucose levels, which can result in severe complications such as vision impairment, cardiac disorders, renal failure, and necessitate limb amputations [1,2]. This disease is diagnosed solely by medical professionals and can lead to a serious complication known as diabetic eye disease, potentially causing complete loss of sight. [3]

Diabetic eye disease encompasses a collection of ocular disorders that arise in individuals suffering from diabetes [4]. The primary conditions include diabetic retinopathy, cataracts, and glaucoma [5]. Notably, the onset of diabetes-related eye disease often occurs without causing any painful symptoms or noticeable alterations in vision. Subsequently, when changes in vision are detected, it may be indicative of significant ocular damage that could culminate in vision loss. [6]

Diabetes manifests in three distinct types, each with unique characteristics. Type 1 diabetes, also referred to as juvenile diabetes, typically emerges during childhood [7]. Consequently, complications associated with this type tend to occur at younger ages [8]. Type 1 diabetes is characterized by the pancreas either producing insufficient insulin or not producing it at all. Insulin functions as a key, facilitating glucose to enter the cells. [9]

On the other hand, Type 2 diabetes transpires when the body either fails to produce the required amount of insulin or the cells disregard the insulin produced [10-12]. Factors such as advanced age, obesity, sedentary lifestyles, hypertension, high cholesterol levels, and a family history of the disease are typically associated with the onset of Type 2 diabetes. [13]

Diabetic retinopathy, a complication of diabetes that impacts the eyes, is the primary cause of blindness among adults in the United States [14]. Certain ethnic groups, such as African Americans and Hispanics/Latinos, are disproportionately impacted by diabetes and, consequently, are at a heightened risk of developing diabetic retinopathy [15]. However, vision loss induced by diabetes can be mitigated by maintaining controlled blood glucose levels and ensuring early diagnosis and prompt treatment of ocular complications. [16-18]

For effective management and prevention of diabetic eye disease, early diagnosis and treatment are imperative [19,20]. It is recommended that individuals with diabetes undergo at least one dilated eye examination annually [21].

Patients and methods

Study design



This research paper presents a cross-sectional study exploring the outcomes of diabetes and their correlation with ocular health. The demographic data were gathered from multiple different hospitals in Iraq. These hospitals enlisted 113 patients in the study, spanning from April 5th, 2022, to November 16th, 2023. The participants comprised of both men and women aged between 30 and 70 years, with a body mass index (BMI) falling within three categories: 18.5-24.9, 25-29.9, and those with a BMI greater than or equal to 30. The clinical findings of these patients were used to gather data on diabetes, focusing primarily on the type of diabetes (Type 1 or Type 2) and the duration of the disease. The study also considered the various types of diabetic retinopathy, such as Type I, Type II, Type III, and Type IV.

Furthermore, this research classified patient data based on variables like blood pressure, smoking habits, and education level. This scholarly work identified the biochemical parameters that influence eye test results, including total cholesterol, HDL-C, LDL-C, triglycerides, diastolic blood pressure, and systolic blood pressure. The study also highlighted the obstacles and challenges patients encountered when obtaining eye examinations, which included factors like cost, lack of awareness, fear, and quality of health services.

Study Participants

The study recruited 113 participants from a pool of diabetic patients undergoing eye health tests. These participants, both men and women, had a body mass index of 18.5-24.9, 25-29.9, or greater than or equal to 30.0, and were diagnosed with either type 1 or type 2 diabetes. The patient data were sourced from different hospitals in Iraq.

Survey Instrument

Data from the NEI-VFQ-25 questionnaire, which included 16 questions on eye examinations, were analyzed. This data was categorized into demographic information, diabetes data, and vision test screening data. Quality of life scores were computed based on eye health examinations and patients' type of retinopathy, using the Cronbach's alpha scale. This scale revealed the quality-of-life outcomes for visual function, illustrated by quality of vision scores, which ranged from 0.6 to 0.8, a range deemed acceptable.

Statistical Analysis

This research project was designed and executed to analyze the results of diabetic patients with impaired visual function during eye tests using the SPSS software (version 22). The study included entry criteria such as duration of diabetes, type of retinopathy, type of diabetes, age, gender, and eye health questionnaire data. Exclusion criteria were also defined, excluding patients with no previous eye surgery history and those free from diabetes or risk diseases. Multivariate logistic regression data were calculated to determine diabetic risk factors affecting eye health.

Results

Table 1: Demographic characteristics of diabetes patients.

Characteristics	Number of patients [113]	[%]
Age [years]		
30-39	15	13.27%
40-49	22	19.47%



50-60	34	30.09%
61-70	42	37.17%
Gender		
Males	68	60.18%
Females	45	39.82%
BMI [kg/m2]		
18.5-24.9	25	22.12%
25-29.9	41	36.28%
≥ 30.0	47	41.59%
Hypertension status		
Yes	73	64.60%
No	40	35.40%
Types of Diabetes		
Type 1	46	40.71%
Type 2	67	59.29%
Diabetes duration [years]		
10-20	80	70.80%
21-30	23	20.35%
> 30	10	8.85%
Type of diabetic retinopathy		
Type 1	9	7.96%
Type 2	18	15.93%
Type 3	6	5.31%
Type 4	80	70.80%
Smoking status		
Smokers	49	43.36%
Non-smokers	64	56.64%
Education level		
Primary school	37	32.74%
Secondary school	16	14.16%
College	60	53.10%



Table 2: Results of the biochemical data of the diabetic patients that influence the test of the eye examination.

Variables	Outcomes
Total cholesterol (mg/dl)	167.52 ± 44.11
HDL-C (mg/dl)	39.5 ± 8.2
LDL-C (mg/dl)	106.51 ± 35.61
TG (mg/dl)	124.30 ± 69.51
Diastolic blood pressure (mm Hg)	80.14 ± 8.85
Systolic blood pressure (mm Hg)	128.57 ± 14.36

Table 3: Determine difficulties or reasons that prevent patients from having eye screen.

Difficulties	Number of patients	[%]
Poor awareness	57	50.44%
Lack of access to primary eye services	8	7.08%
Cost	33	29.20%
Fear	15	13.27%

Table 4: Assessment of health outcomes diabetes patients by Cronbach alpha scale.

Items	Test Scores
General Health	0.75
General vision	0.71
Ocular pain	0.81
Practice activities	0.76
Social functioning	0.70
Mental health	0.69
Color vision	0.74
Peripheral vision	0.78



Table 5: Multivariate logistic regression of risk factors for diabetes mellitus in patients with eye examinations.

Variables	OR (95% CI)	P-value
Age	0.96 [0.90-1.014]	0.225
Diabetes	0.88 [0.85-1.17]	0.238
Sex	1.2 [0.564-2.31]	0.82
High cholesterol	3.61 [2.1-6.7]	0.27
Duration of diabetes	3.51 [2.4-7.1]	0.0316
Smoking	2.74 [0.6 -4.5]	0.24

Discussion

The study revealed a patient age range between 60 to 70 years. Among the participants, 68 were male, outnumbering the 45 female participants. It was discerned that 41.59% of the total patients exhibited a Body Mass Index (BMI) of 30 or higher. Furthermore, it was determined that 64.60% of the patients suffered from hypertension, while 53.10% engaged in smoking. An investigation into the prevalence of diabetes revealed that 59.29% of the patients were diagnosed with type 2 diabetes, with the majority (70.80%) having endured the disease for a period ranging between 10 to 20 years.

In the quest to analyze the biochemical parameters of diabetic patients, the study discovered that the average cholesterol level stood at 167.52 ± 44.11 mg/dL, HDL-C was 39.5 ± 8.2 mg/dL, LDL-C was 106.51 ± 35.61 mg/dL, and TG was 124.30 ± 69.51 mg/dL. The systolic and diastolic blood pressure readings averaged at 128.57 ± 14.36 and 80.14 ± 8.85 , respectively.

As for the outcomes of eye health evaluations, the study highlighted the challenges that patients encountered, with the majority citing poor awareness (57 patients) and prohibitive costs (33 patients) as key obstacles. Using the NEI-VFQ-25 questionnaire, a correlation was established between a patient's health and eye diseases, with the majority of items including general health (0.75), general vision (0.71), peripheral vision (0.78), and Color vision (0.74). This study identified risk factors, including duration of diabetes, high blood pressure, high cholesterol, age, and smoking habits.

Previous studies show that diabetes is one of the eye health complications that can have a negative impact on quality of life [22], as diabetes can cause eye health problems that affect the performance of patients, which can lead to a decrease in visual function, as most diabetics suffer from deterioration in their eye health, which increases their overall well-being. In their eye health, which affects their overall wellbeing [23,24]. The American study captured the severity of the disease and treatment, causing a decline and poor quality of health for patients, which affects their social life and makes it difficult for them to participate in most of their daily activities, negatively affecting their quality of life. Social support is seen as an important factor for patients, as the lack of awareness of diabetes and its negative impact on eye health has led to an increase in complications, leading to mismanagement of their condition, resulting in loss of vision. [25,26]

Conclusion



Diabetes is a fundamental complication leading to visual impairment. Our findings indicate that male patients are more prone to infection and are more negatively affected than their female counterparts. Risk factors such as hypertension, high cholesterol, prolonged duration of diabetes, and smoking were found to adversely impact the quality of life. The type of diabetic retinopathy plays a crucial role in negatively affecting visual function. The findings also highlight that the severity of diabetes and lack of awareness exacerbate the visual impairment of patients.

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