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The Prevalence of Eyesight Deterioration in People Aged Over 50 Years and Its Correlation With Type II Diabetes in Trinidad

B. Shivananda Nayak[a, b], Joshua Ramoutar[a], Satesh Ramkesson[a], Varisa Ramkissoon[a], Tarun Ramlogan[a], Johann Ramnarine[a], Shania Ramnarine[a], Sharvana Ramoutar[a], Kesley Rampersad[a]

Abstract

Background: The aim of the study was to determine the prevalence of eyesight deterioration and its correlation with type II diabetes in people aged 50 years and above. In addition, this study specifically focuses on assessing the relationships between demographics, various eye conditions and regression with respect to type II diabetes.

Methods: This was a retrospective study which comprised 268 patients with eyesight problems. These participants were selected from the ophthalmology and diabetic clinics of two major health authorities in Trinidad. Both males and females over the age of 50 years of different ethnic groups with a history of eyesight problems or form of eyesight deterioration and/or type II diabetes were included in this study. Random stratified sampling was utilized to obtain samples from both hospitals. Data collection was done via questionnaires.

Results: Data of our study showed that the people affected with eye problems were in the age group of 60 - 75 years. Of the study participants, 59.3% were affected with cataract followed by glaucoma (19.4%). Data also showed that 181 were diabetic and affected with one or the other eye problem. There was a correlation between incidence of eyesight deterioration and type II diabetes in people aged over 50 years.

Conclusion: This study determined that there is, to an extent, a correlation between the incidence of eyesight deterioration and type II diabetes in people aged over 50 years.

Keywords: Eyesight; Type II diabetes; Cataract; Glaucoma

Introduction

Diabetes refers to a disorder of metabolism in which the body either does not make enough insulin, or unable to use the insulin that it produces, or a combination of both. Type II diabetes involves the production of some insulin, but the amount produced may not be enough for the needs of the body or the body's cells may be resistant to it. The body's inability to secrete enough insulin to overcome the burden of insulin resistance leads to increased glucose production from the liver and inadequate uptake of glucose peripherally [1]. As glucose levels in the blood increase and as these levels become too high, it can cause damage to tiny blood vessels, vessels in the kidneys, the heart, eyes and the nervous system. This study specifically focuses on the relationship between eyesight deterioration and type II diabetes.

Type II diabetes can cause microvascular complications whereby small vessels throughout the body are affected [2]. One of the main areas of the body where the disease process is of particular danger is the retina of the eye [3]. Diabetes can affect the eyes in a number of ways. Some forms of eye disease which may arise include cataracts whereby the lens may be affected by reversible osmotic changes in patients with acute hyperglycemia causing blurred vision and external ocular palsies, especially of the third and sixth cranial nerves [4]. An individual with type II diabetes may also develop a rare condition called neovascular glaucoma in which new vessels grow on the iris of the eye and block the normal flow of fluid and raise eye pressure.

The most serious eye disease which is associated with type II diabetes is diabetic retinopathy [3]. This disease is related to high blood sugar levels and damage to small blood vessels in the retina of the eye. Diabetes causes increased thickness of the capillary basement membrane and increased permeability of retinal capillaries leading to blurred, distorted or patchy vision, problems with balance, reading, watching television and recognizing people, being overly sensitive to glare and difficulty seeing at night.

The risk of developing retinopathy increases with higher HbA1c values, higher blood pressure and increasing duration of having had diabetes. There are other types of this condition called background retinopathy, diabetic maculopathy and proliferative retinopathy.

Materials and Methods

The retrospective study was conducted to determine the preva-

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[a]Department of Preclinical Sciences, Faculty of Medical Sciences, The University of the West Indies, St. Augustine, Trinidad and Tobago
[b]Corresponding Author: Shivananda Nayak, Department of Preclinical Sciences, Faculty of Medical Sciences, The University of the West Indies, St. Augustine, Trinidad and Tobago. Email: shiv25@gmail.com

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Table 1. Number and Percentage of Participants With Various Eye Conditions and Demographic Information

	Number (%)
Eye condition	
Cataracts	159 (59.3)
Glaucoma	52 (19.4)
Long sighted	13 (4.9)
Short sighted	14 (5.2)
Blurriness	16 (6.0)
None	6.0 (2.2)
Diabetic retinopathy	8.0 (3.0)
Age	
50 - 55	39 (14.6)
56 - 60	40 (14.9)
61 - 65	55 (20.5)
66 - 70	52 (19.4)
71 - 75	49 (18.3)
76 - 80	22 (8.2)
> 80	11 (4.1)
Gender	
Male	137 (51.1)
Female	131 (48.9)
Ethnicity	
Indo-Trinidadian	206 (76.9)
Afro-Trinidadian	60 (22.4)
Caucasian	2.0 (0.7)

lence of eyesight deterioration and its correlation with type II diabetes in people aged 50 years and above. This study comprised 268 participants from the clinics of major health authorities in Trinidad. The study was approved by the Campus Ethics Committee, The University of the West Indies (Ref: CEC 380/11/17). All ethnicities of both male and female participants aged 50 years and above present in the eye and diabetic clinic were included in our study. The primary data collection instrument utilized was a questionnaire which was pretested on a small sample group of 20 students and 15 patients in the ophthalmology clinic at the Eric Williams Medical Sciences Complex. The questionnaire comprised mostly closed-ended questions and few open-ended questions which were specifically related to this study.

Statistical analysis

A statistically based software package (SPSS version 25, IBM Corp., Armonk, NY, USA) was installed and used to enter and analyze the data collected. Chi-square analysis was conducted to deduce the relationships between the nominal and continuous data. Regression analysis was also done to determine whether the variables had a significant impact on the incidence of various eye conditions whereby the significance was calculated to determine whether the alternate or null hypothesis would be accepted.

Table 2. Types of Eye Conditions and Its Correlation With Diabetes

	Diabetes	
	Yes	No
Type of eye condition		
Cataracts	110	49
Glaucoma	32	20
Long sighted	8	5
Short sighted	7	7
Blurriness	11	5
None	5	1
Diabetic retinopathy	8.0	0
Total	181	87

Results

The study comprised 268 respondents, of whom 51.1% were males, while 48.9% were females. The majority of participants belonged to the 61 - 65 age group (n = 55), followed by the 66 - 70 age group (n = 52) and then the 71 - 75 age group (n = 49). The over 80 age group had the least number of participants (n = 11). Most participants were of the Indo-Trinidadian ethnicity (76.9%), followed by Afro-Trinidadian (22.4%) and then lastly Caucasian (0.7%).

Out of all the eye diseases, the most prevalent disease was cataracts with 59.3% (159) of participants affected. The second most common disease was glaucoma with 19.4% (52) of respondents affected and the least common disease was diabetic retinopathy with 3.0% of people affected. In addition, 2.2% (n = 8) of participants had no eye conditions (Table 1).

Of the participants with eyesight conditions, 181 had type diabetes, while 87 did not, indicating a correlation between diabetes and eyesight deterioration. The most common diabetic eyesight condition was cataracts (n = 110), while 49 had cataracts without having diabetes (Table 2). The least common eyesight condition was diabetic retinopathy with eight participants. Only five participants had diabetes with no eyesight conditions.

Regression analysis was done to determine if demographics (age, gender and ethnicity) affect the type of eye condition that people had. The significance was calculated to be 0.014, hence less than 0.05, therefore, the study found the association between demographics and the type of eye conditions that people developed.

After performing a Chi-square test at the 5% level of significance on the types of eye conditions along with whether people had diabetes or not, the asymptotic significance of the likelihood ratio was calculated to be 0.119. This value is greater than 0.05, hence we accept the null hypothesis. Therefore,

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there is no association between whether a person is diabetic or not, and what type of eye condition they develop.

Discussion

Based on the data collected, it was determined that from a total sample population of 268 participants diagnosed with an eyesight condition, 181 had type II diabetes, whereas 87 did not. From this information as well as the evidence obtained from pre-existing literature, it can be said that there is some relationship between eyesight deterioration and people with type II diabetes. MacGill [5] stressed upon the fact that long-term uncontrolled diabetes can lead to increased blood sugar levels which can cause damage to the small blood vessels in the eye over time. The research also stated that a patient with type II diabetes can also experience short-term blurriness when blood sugar levels increase due to a fluid shift into and out of the eye resulting in a swollen lens. Symes et al [6] also stated in their study that diabetic eye disease is the third most important cause of visual loss after age-related macular degeneration and glaucoma. The findings of this research are similar to those of McGill as well as Tufail et al [5, 6], since 67.5% of the sample population stated that their eyesight became worse either after being diagnosed with type II diabetes or due to a complication of pre-existing diabetes.

The data also highlighted the prevalence of specific eye conditions in the entire sample population. From the findings, it was seen that 59.3% of all the participants surveyed suffered from cataracts which was the most common eye condition followed by glaucoma reported by 19.4% of the test population. A mere 6% experienced blurred vision, 5.2% with short sightedness, 4.9% with long sightedness, 3% with retinopathy and 2.2% with no signs of vision loss or complications.

Out of a total of 159 participants with cataracts, 110 were in fact previously diagnosed with type II diabetes. Based on this information, it can be proposed that diabetes may have contributed to this condition or possibly caused it. This can be supported by studies done by Li et al (2014) where the researchers conducted surveys involving 20,837 subjects [7]. They found that the risk of any cataract, more specifically posterior subcapsular cataract in type II diabetes patients, was higher than that in non-diabetic subjects and up to 20% of all cataract procedures are performed for diabetic patients. Klein et al further indicated that glycemia can be a risk factor for cataracts in type II diabetes patients based on the molecular mechanisms associated with the development of diabetic cataract [8]. Kim et al reported that patients who had type II diabetes for more than 5 years had lenticular cataract opacity and that majority of the opacities of the lens manifested in 64% of diabetic patients under treatment [9]. Both studies conducted by the researcher as well as other researchers suggest that cataract is indeed prevalent among diabetic patients and that there is an increased risk involved.

According to the findings, it was also observed that the incidence of other eye conditions such as glaucoma, diabetic retinopathy and overall blurred vision was higher among diabetic patients compared to the non-diabetic patients. While diabetics are more prone to develop cataracts, Symes et al [6] showed that the progression of diabetic retinopathy was significantly affected by the amount of glycosylated hemoglobin. Findings by Sayin et al (2015) support the conclusion that ocular complications which are associated with type II diabetes are in fact progressive and often lead to microvascular damage resulting in neovascular glaucoma, diabetic retinopathy and blurred vision [10]. The information gathered by the researcher with respect to the occurrence of certain eye conditions, specifically among the diabetic participants, was similar to the results of previous studies done by various other researchers.

Research data revealed that there is a relationship between demographics and eyesight deterioration. Among the sample population of 268 individuals, more than 20% belonged to the 61 - 65 age group. Other researchers support these findings by stating that all types of lens opacities are strongly associated with increasing age [11, 12]. It was also said that specifically in the diabetic population, all types of cataract were likewise highly affiliated with age. The research also showed that majority of people with some form of eyesight deterioration belonged to the Indo-Trinidadian ethnic group. According to Mohan (2004), it was shown that East Indians and people of East Indian descent were more predisposed to type II diabetes due to environmental and lifestyle changes resulting from migration to more urban settings [13]. It was further mentioned that Indians have a greater degree of insulin resistance and stronger predisposition to diabetes and thus the development of diabetes-related eye conditions. Regression analysis indicated that there is an association between demographics and the type of eye conditions people developed.

Conclusion

The study determined that there is, to an extent, a correlation between the incidence of eyesight deterioration and type II diabetes in people aged over 50 years. A significant association was also noticed between people of East Indian descent and diabetes and hence, diabetes-related eyesight problems. These findings can be used to promote awareness both within the medical community and the public at large to aid management as well as prevention of eyesight deterioration associated with type II diabetes.

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Conflict of Interest

The authors declare that they have no conflict of interest.

Financial Disclosure

None.

Informed Consent

Informed consent was obtained from the participants who fit the inclusion criteria.

Author Contributions

All authors are equally responsible for planning, data collection, analysis and writing the article.

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