

Evaluation of Contrast Sensitivity in Type II Diabetics

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Abstract

Background: Type 2 diabetes is the most common type of diabetes, accounting for around 90% of all diabetes cases. An investigation of the role of contrast sensitivity in diabetes, as well as its correlation with Hb1Ac, is being conducted in this research.

Purpose: The fundamental purpose of the study was to assess contrast sensitivity in type 2 diabetes was the goal of this investigation.

Methodology: The related research was done at treetops eye and Medical Centre Lahore. A self-designed Performa was used to gather the data. Visual acuity was taken by the Snellen chart. After recording visual acuity performed refraction. After performing refraction then check contrast sensitivity on the Pelli Robson chart. Afterward, the findings were recorded on the Performa. entering and analyzing the data, the IBM Spss version was used.

Results: There was a relationship between contrast sensitivity and hb1ac value in type 2 diabetes. People with normal contrast sensitivity in the right eye with a percentage of 46% are higher than both less than severe with 25% and more than moderate at 29.0% and in the left eye 52% are higher than both less than moderate with 22% and more than severe with 26%.

Conclusion: Thus, from the present study, it is concluded that Type 2 diabetes and contrast sensitivity are shown to be closely linked in this research.

Keywords: Contrast Sensitivity; Hba1c; Type 2 Diabetes

Introduction

Insulin deficiency or insulin dysfunction may lead to dangerously high blood sugar levels in people with diabetes. The pancreas may not produce enough insulin, or the cells of the body may become resistant to insulin, resulting in the development of type 2 diabetes [1]. Vascular and metabolic variables play an important role in diabetes mellitus (DM), which has a profound effect on retinal neurophysiology. According to the World Health Organization (WHO), there are several reasons why individuals

are unable to see well [2]. Eye diseases that induce color blindness are referred to be "acquired" in this scenario. Approximately 8% of males and 5% of females worldwide have lost their capacity to distinguish between colors [3].

The capacity to recognize precise, distinct, and clear outlines of very small things is known as contrast sensitivity (CS) [1]. It is also described as having the capacity to distinguish between dimly light areas that are not clearly divided by borders. The ratio of an object or target's whiteness to its darkness is known as its contrast [4].

Luminance, target, grating velocity, and grating form all affect CS differently. A more in-depth understanding of the mechanism of CS can be gained from the neural mechanism and channel theory. Refractive error; aging, cataract and refractive surgery, diabetic retinopathy, optic neuropathy, and pituitary adenoma are some of the conditions that can impair CS [5]. Research in our sector tends to focus on the CV of diabetic patients, which has been connected to DR a great deal, therefore we decided to focus on color vision and color cognition (CS). Legal visual insufficiency is the leading cause of blindness in persons aged 20 to 74 throughout the globe, but effective glycemic control may help avoid it [6]. This implies that the number of rods and cones in your eyes determines how effectively you can perceive colors. Rods aid our vision in both daylight and darkness. Cones aid our perception of color [7]. Patients with diabetes mellitus (DM) may have a gradual decline in CS, making it harder for them to do daily activities such as reading, driving, and recognizing faces. When diabetic retinopathy worsens the capacity to differentiate affect ability disappears [8].

Diabetic retinopathy patients, or those who have just been diagnosed with it, may benefit from the contrast sensitivity test in determining the health of their retina. Contrast sensitivity may be reduced in the presence of good vision [9]. Type 2 diabetes is linked to impaired colour vision [10]. Unlike other characteristics, this one is unique: Type of diabetes did not seem to be associated with colour vision; however, type of diabetes did appear to be associated with how well individuals could see in the dark [11]. However, questions have been raised concerning the diagnostic and prognostic utility of a single HbA1c test. This reveals how much sugar is in your blood. It is recommended that diabetics with stable blood sugar levels have their Hb1ac levels tested at least twice a year [12]. It was determined that the dominant eye's typical sensitivity to contrast was determined using the Pelli Robson chart. CSs of at least 1.08 log units were common among both young and elderly participants [13].

There's a 2.85-degree angle in your eyes when you see this chart from one meter. Using the logarithmic contrast scale, you may determine how well you perceive contrast. Tones and colours are less noticeable to those with a lower score. If you have a contrast sensitivity score of 2.0, you're in the typical. A score of less than or equal to 1.5 indicates that the subject has issues with their eyesight (moderate loss). There is an issue with the person's eyesight if their score falls below one (severe loss). There are now 352 million

individuals with diabetes worldwide, and this figure is expected to rise to 417 million by 2030 and to 486 million by 2030 in adults aged 20 to 64. Difficulty focusing due to fluctuating vision, foreign body feelings, and photophobia are among the most common side effects [14].

Problem statement

Type 2 diabetics with high levels of contrast sensitivity are the focus of this investigation. Vascular and metabolic variables play an important role in diabetes mellitus (DM), which has a profound effect on retinal neurophysiology. According to the World Health Organization (WHO), there are several reasons why individuals are unable to see well [15]. Eye diseases that induce color blindness are referred to be "acquired" in this scenario. Approximately 8% of males and 5% of females worldwide have lost their capacity to distinguish between color and contrast sensitivity [16] so far similar studies have not been conducted in Pakistan Lahore.

Research objective

The study was guided by the following research objective:

- Contrast sensitivity in type 2 diabetes patients has to be assessed.
- In addition, researchers looked for a link between contrast sensitivity and diabetes duration, and HbA1c levels.

Significance of the study

Type 2 diabetics with high levels of contrast sensitivity are the focus of this investigation. The primary aim of this research is to find out how persons with hyperglycemia are influenced by contrast since hyperglycemia might make it difficult to notice the contrast. Patient well-being deteriorates consequently.

Methodology

The study was cross-sectional descriptive research. Data collection procedure undergone at Treetops eye and medical Centre most of the data is selected from the University of Lahore Teaching Hospital Lahore. The study was carried out from January 2022 to April 2022. The population of the study was

- Type 2 diabetic patients were assessed only
- Age group between 25-50 years
- Patients that are diabetes for more than 3-5 years Age (no limit)

A convenient sampling method was used for this study.

A modified questionnaire was used to collect data from the patients with the help of the following equipment

- Snellen charts/logMAR
- Pelli Robson chart

In the data-gathering procedure, there was unanimous consent from the University of Lahore’s IRB (Institutional review board). On the day of data collection, subjects fulfilling the inclusion criteria were selected for convenient random sampling after obtaining informed consent. To begin, a questionnaire was given to the patient. Medical history, ophthalmological history, insulin usage, and a recent HbA1c report were among the items on the questionnaire (within one week of recruitment).

A total of 100 patients took part in the research, with a gender split of 54 men and 46 women, ranging in age from 25 to 60. Type 2 diabetes has been present in each patient for an average of more than five years for those who took part in the research. HbA1c is further classified as Normal (4-5.6 mmol) Mild (5.7-6.4mmol) Moderate (6.5-9mmol) Severe (greater than 9mmol).

An investigation on the methods used to gauge the contrast sensitivity of people with type 2 diabetes was conducted at a medical facility. In this descriptive hospital-based study, people with diabetes who visited the diabetic clinic had their visual acuity and contrast sensitivity assessed using a Snellen chart and a Pelli Robson chart. Respondents’ responses, but some answers required the assessment due to which the equipment is used for the filling of the questionnaire.

In ethical consideration, the rules and regulations set by the ethical committee of the university of Lahore were followed while conducting the research and the rights of the research participants were respected. Permission for data collection was taken from all the participants on the attached consent form. All the data and information taken from participants were kept confidential. Throughout the study, participants remained anonymous.

Results

The results are based on the primary data collected for the research. A total of 100 patients took part in the research, with

a gender split of 54 men and 46 women, ranging in age from 25 to 60. Section 1 contains the frequencies of HbA1c as shown in table 1 categories of HbA1c that patients with a value of 5.7-6.4 with a percentage of 61.0% are higher than both less than 9 with a percentage of 8.0% and more than 6.5-9 with a percentage of 28.0% is shown in table 2.

Level of diabetes	Value of HbA1c	Frequency	Percent
Normal	Below 5.7 mmol	3	3.0
Mild	5.7-6.4 mmol	61	61.0
Moderate	6.5-9 mmol	28	28.0
Severe	Greater than 9 mmol	8	8.0
Total		100	100

Table 1: Frequency of HbA1c.

Contrast sensitivity	Frequency	Percentage
Normal	46	46.0
Moderate	29	29.0
Severe	25	25.0
Total	100	100

Table 2: Frequency of contrast sensitivity in right eye.

Section 2 elaborates contrast sensitivity frequency of the right eye as shown in table number 3 that the Patients with normal contrast sensitivity (≥ 2 log units) with a percentage of 46% are higher than both less than severe (< 1 log unit) with a percentage of 25% and more than moderate (< 1.5 log unit) with a percentage of 29.0% shown in table 2.

Section 3 elaborates on the frequency of contrast sensitivity in the left eye as shown in table 3 that the Patients with normal contrast sensitivity in the left eye (≥ 2 log units) with a percentage of 52% are higher than both less than moderate (< 1.5 log unit) with percentage of 22% and more than severe (< 1 log unit) with percentage of 26%.

Contrast sensitivity	Frequency	Percentage
Normal	52	52.0
Moderate	22	22.0
Severe	26	26.0
Total	100	100.0

Table 3: Frequency of contrast sensitivity in the left eye.

Discussion

In the current study, we found that age, gender, length of diabetes, and type of diabetes all influenced how well people controlled their diabetes. Our interpretation of the study was in line with previous research findings. All these factors did not influence this diabetic condition. They were not important for this diabetic person.

Our research shows that there is a statistical link between diabetes type and contrast sensitivity. Contrast sensitivity was found to be less. In another study, 24 people with type 2 diabetes were found to have colour blindness. Even though, our research found that type 2 diabetes was found 60% of the time. Contrast vision is rarer [17].

In the present research, we found that there was a very strong (P-value 0.00) connection between contrast sensitivity and diabetes duration. My findings backed up previous research that found a strong link between diabetes management (controlled vs. uncontrolled) and contrast sensitivity (P value less than 0.05). As a result, it was found that the contrast sensitivity function changed as the blood sugar level changed. Dr. Rashmi and his colleagues did the same thing. They looked at contrast sensitivity and how it was linked to how long people had diabetes and how well they controlled their blood sugar. They found that diabetics who didn't have retinopathy had significantly less contrast sensitivity than diabetics who had retinopathy (P-value 0.03) [18]. Another study looked at the contrast sensitivity, colour vision, and visual acuity of people with diabetes. When compared to the control group, diabetic eyes without retinopathy had less contrast sensitivity than the control group [19].

In the current study, we looked at people with type 2 diabetes. Type 2 diabetes was found to be more common than type 1 diabetes, a study found. Colour vision and contrast sensitivity tests, on the other hand, may be able to tell us more about people with diabetes who have trouble seeing than a simple test of their eyesight [20].

Conclusion and Recommendations

Contrast sensitivity problems are more common in those with type II diabetes who've had high blood sugar levels. There is a substantial correlation between contrast sensitivity with glycosylated hemoglobin (HbA1c).

There is a statistical link between diabetes type and contrast sensitivity. Contrast sensitivity was found to be less in type II diabetics.

This study revealed no indication of gender disparities in contrast sensitivity a significant correlation was established between contrast sensitivity and glycated hemoglobin for further studies.

Patients with diabetes should get a check after every six months, they should use Anti-reflective coating, colored lenses, and polarized lenses for enhancing their contrast sensitivity.

Limitations

This study has the following limitation.

- The results are based on self-reported data from participants, which limits the validity of the data.
- Study was carried out only in a specific center and the sample size was limited.
- The impact could be more effective if the sample size was bigger, and the data was collected from multiple centers and areas.

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