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AUDITORY AND VISUAL REACTION TIMES OF YOUNGER AGE DIABETICS ARE SIGNIFICANTLY LOWER COMPARED TO OLDER AGE DIABETICS

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Abstract

Background: Reaction time is a basic noninvasive test for both the peripheral and central nervous systems. Measurement of response time can detect neurological deficits in diabetic individuals before they become clinically manifest. So, this study was done to compare the Auditory and Visual Reaction Time of diabetics of younger age (20-40 years) with those of older age (41-60 years).

Methodology: 60 subjects having Type II diabetes mellitus were selected of which 30 were of 20-40 yr age group (Group A) and 30 were of 41-60 yr age group (Group B). Auditory and Visual Reaction Time of the subjects were measured using the computerized windows-based Edinburgh University Software in a sound proof room.

Results: Mean duration of Type II diabetes mellitus in the Group A and Group B were 2.83±1.76 yrs and 5.53±5.04 yrs respectively.

Conclusion: Analysis of the data revealed that Group B (older age diabetics) had higher duration of diabetes and had significantly higher Auditory and Visual Reaction Times.

Keywords: Diabetes Mellitus; Auditory Reaction Times; Visual Reaction Times.

Introduction:

Diabetes mellitus (DM) is an endocrine illness characterized by high blood glucose levels caused by insulin insufficiency or resistance, which is one of the primary causes of mortality and morbidity. According to the International Diabetes Federation, our country will have 101.2 million diabetic patients by 2030, making it the world's Diabetic capital. Diabetes is a major source of morbidity and mortality, albeit these consequences are not due to the disorder's immediate impact. They are instead associated with the disorders that arise as a result of long-term diabetes mellitus. Diabetes mellitus can harm the micro and macrovascular systems, as well as the kidneys, eyes, and nervous system. One of the microvascular consequences of diabetes is neuropathy, the severity of which is related to the duration and degree of glycemic control.[1]

Audio-Visual reaction time is the speed, with which a person can respond to an auditory and visual stimulus. The time gap between a stimulus (auditory/visual) to a subject and the subject's response,

which is a sensitive indicator of the sensory motor association, is referred to as reaction time. A reaction time measurement is a reliable indicator of processing of sensory stimulus by central nervous system and its execution in the form of a motor response. Aging slows reflexes and increases the time required to respond to a variety of external stimuli of various types of modalities**.** [2,3] One of the most serious consequences of increased reaction time is the possibility of slips and falls. Falls affect one-third of the senior population and are a leading cause of illness and mortality. Evidence that older participants had a higher rate of slips and falls than healthy young adults has been related to an increase in sway as measured by center-of-pressure or -of-gravity (COP, COG) or head and hip variability.[4] Diabetes affects somatosensory and auditory peripheral nerves, decreases psychomotor responses, and has cognitive impacts, all of which can affect reaction times. Diabetes mellitus can impair balance over time, increasing the likelihood of slips, fractures, and non-healing ulcers, ultimately leading to limb amputation and incapacity. As a result, screening for neuropathy before it presents clinically becomes mandatory. [5,6] So, this study was undertaken to study the comparison of Auditory and Visual Reaction Time of younger age (20-40 years) diabetics with those of older age (41-60 years) diabetics.

Methodology:

A comparative, analytical type of study conducted at the department of physiology, GR Medical college, Gwalior, MP, India. After obtaining an ethical approval from an institutional ethical committee. A total 60 subjects of confirmed cases of Type II diabetes mellitus were enrolled from the Medicine OPD of J A group of Hospitals. The selected subjects were further categorized based on their age, A total 60 of which 30 were in the 20-40 years of age group (Group A) and 30 were 41-60 years of age group (Group B). Subjects with alcohol consumption, smokers, and people with high blood pressure Insulin-dependent patients, complex diabetes cases Subjects with visual and auditory impairments, in light of any recent sickness, as a result of peripheral neuropathy, Muscle wasting, severe anemia, Psychiatric disorders and neurovascular complications were excluded from the study. written and verbal consent was taken from all the participants. The detailed history, general and systemic examination of each subject was done and details of determination procedure were explained clearly.

Recording procedure:

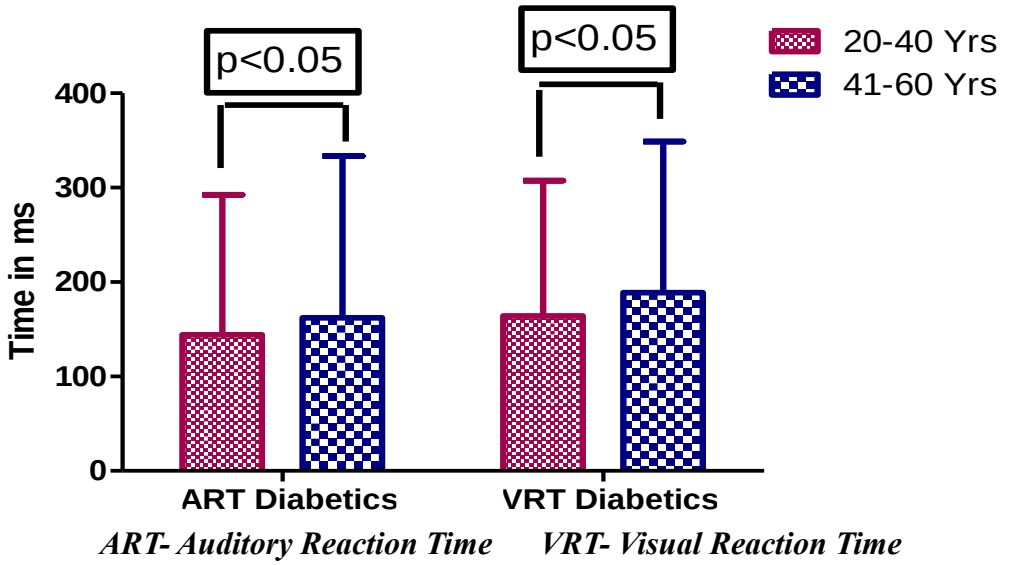
Once the subjects were exposes to red light, he/she was directed to click on a button as rapidly as possible to record visual reaction time, and when he/she hears a click sound, he is asked to record auditory reaction time. Red light was chosen for the experiment because it lasts a long period in the retina. Auditory and Visual Reaction Time of the subjects were measured using the computerized windows-based Edinburgh University Software in a sound proof room. The reaction times were measured in seconds, and the lowest of the three readings was used. Recorded data were presented in the form of mean and SD. P value was determined by using SPPS version 21.00. A p value less than 0.05 was considered as significance.

Results:

Analysis of the data revealed that Group B (older age diabetics) had higher duration of diabetes and had significantly higher Auditory and Visual Reaction Times. Mean duration of Type II diabetes mellitus in the Group A and Group B were 2.83±1.76 years and 5.53±5.04 years respectively.

Table-1: Statistical analysis of ART & VRT in younger and older age diabetes.

Parameters	Group A (20-40 years)	Group B (41-60 years)	p value
Auditory Reaction Times	249.00 ± 39.08	283.33 ± 40.86	<0.05
Visual Reaction Times	265.50 ± 62.54	301.96 ± 75.86	<0.05
Duration Time between ART & VRT	2.83±1.76	5.53±5.04	<0.05



Discussion:

Diabetes Mellitus damages the peripheral nerves, decreases psychomotor reactions, and has cognitive consequences in people who do not have good metabolic control. Slowing of reflexes caused by autonomic dysfunction can be noted in individuals with Type 2 Diabetes Mellitus over time, leading to an increase in the time to react to a variety of external stimuli of different modalities [7,8].

Reaction time is an important component of motor movements. It is one of the important methods to study a person's central information processing speed and fast coordinated peripheral movement response. Audio-visual reaction time is the time taken by an individual to react to an auditory or visual stimulus respectively. Whole body reaction time determines the time taken for moving the whole body in various directions in response to visual stimuli [9]. Diabetes-related central nervous system (CNS) impairments may appear as cognitive abnormalities. Dey et al. discovered no link between diabetes duration and cognitive performance in people under the age of 18 with non-insulin-dependent diabetes [10].

In our study, visual reaction time was prolonged in patients with type 2 diabetes mellitus of younger age (20-40 years) and older age (41-60 years) subjects shown in Table 1. Our study findings were consistent with the studies done by Vinik et al and Aley L et al [11,12].

In our study we have also compared between younger age (20-40 years) and older age (41-60 years) type-II diabetes and found to be prolonged auditory and visual reaction time in older age group of diabetes than that of younger age group. The reason for this is because the occurrence of the visual reaction time involves chemical changes. Furthermore, the visual pathway involves numerous collateral channels to other association areas, resulting in a longer delay in understanding of visual stimuli [13].

A number researchers have shown that the delayed reaction time in type 2 diabetes mellitus patients is caused by axonal degeneration of both myelinated and unmyelinated fibres, axon shrinkage, axonal fragmentation, basement membrane thickening, and microthrombi. Diabetes mellitus is frequently associated with peripheral neuropathy. According to several experts, type 2 diabetes mellitus causes an extra slowdown in signal processing by the central nervous system. This can also cause a delay in whole-body reaction time [14] Measurement of visual and auditory reaction times in type 2 diabetes patients can be used to detect peripheral neuropathy before it becomes clinically obvious, reducing morbidity and death [15].

Conclusion:

- We conclude that diabetes has deteriorating effect on nerves leading to prolonged reaction time in diabetic subjects.
- As older age diabetics had a higher duration of diabetes, they were found to have significantly higher reaction time values of both Auditory and Visual Reaction Times.

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