



Correlation of cognition with fast walking speed in diabetic patients

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Abstract

India is known as the Diabetes capital of the world. It is considered as one of the most common chronic diseases. The objective of this study is to identify correlation of cognition with fast walking speed in diabetic patients. It is a cross-sectional study performed on community-living middle aged diabetic individuals (age-45-59 years) and normal individual who could walk 7 m at self-selected normal speed (N=30). Walking performance was assessed in fast walking test. Patients were asked to walk as fast as possible and speed is calculated. Cognition was assessed by PGI memory Scale. The results of data analysis demonstrated that poor cognition lead to decline in fast walking speed in individual with diabetes. The results suggested that cognition is significantly correlated with inability in fast walking in diabetic individual.

Keywords: fast walking; cognition, PGI memory scale

Introduction

India is known as the Diabetes capital of the world. It involves people of all ages and races. It is considered as one of the most common chronic diseases in approximately all countries, and its prevalence continues to increase mainly due to changes in lifestyle resulting in physical inactivity and increased obesity [1]. In 2000, India (31.7 million) topped the world with the highest number of people with diabetes mellitus [2]. Prevalence of diabetes is predicted to double globally from 171 million in 2000 to 366 million in 2030 with a maximum increase in India [2]. The prevalence rate of diabetes mellitus above 40 year of age in India, was 5 per cent in urban and 2.8 percent in rural areas [3].

Cognition is "the mental action or process of acquiring knowledge and understanding through thought, experience, and the senses". It encompasses processes such as knowledge, attention, memory and working memory, judgment and evaluation, reasoning and "computation", problem solving and decision making, comprehension and production of language [4].

Type 2 diabetes is associated with accelerated cognitive decline and an increased risk of dementia. Studies have shown decrements in memory function, executive function, and information-processing speed. Individuals with baseline type 2 diabetes shows accelerated cognitive decline, particularly in information-processing speed and executive function, compared with individual without diabetes [5].

Walking from one place to another is a fundamental component of everyday activities [6]. Mobility is defined as the ability to walk safely and independently in one's natural environment and thus, is a prerequisite for one's independence in activities of daily living (ADLs and IADLs), preserving social interactions and for maintaining overall quality of life. It is not surprising that improving mobility is a major goal in rehabilitation. The natural environment commonly imposes varied challenges while walking; for example, increasing

walking speed when necessary, etc. Therefore, adaptive locomotion is the mainstay of mobility [7].

The aim of the research is to study the effect cognition on fast walking speed in diabetic patient with age group 45-59. This research will highlight the trend of this variable in population suffering from diabetes.

Material and Methods

Sample

Total 30 subjects were selected for the study on the basis of inclusion and exclusion criteria

Source of subjects

The subjects were selected from Rehabilitation center, Jamia Hamdard and HAHC hospital after signing the informed consent according to the following criteria

Method of selecting subjects

Random sampling was done

Inclusion Criteria

Inclusion criteria includes gender-both male and female with age group 45-59 years [8], having 5-10 years of duration of diabetes, Literate patients having normal BMI (18.50-24.99 kg/m²) [9] and who can walk at least 7m distance at self-selected places.

Exclusion Criteria

Exclusion criteria includes patients having neurological disorder like multiple sclerosis, stroke etc., fracture, trauma or disease affecting the lower extremity and low back, any conditions interfering with motor function such as RA, OA, GOUT, any amputation, cancer or any surgery, any systemic, metabolic, endocrinal, infectious, gastrointestinal diseases except diabetes mellitus, nutritional deficiency, Pregnancy, psychiatric disorders, mental retardation, communication

problem, hearing loss and Participants who need manual assistance and walking aids like crutches for walking

Procedure

Participants were made to do fast walking tests. Starting location was marked with a colour tape. The end of 7 m walking pathway was not marked to prevent slowing in anticipation. The Time to complete the walking test was measured using stopwatch. The Time data was then converted into walking speed (m/s). Participant were asked to walk as fast as possible. If the participant could not increase the speed by at least 0.1 m/s, a failure was recorded.

Time to cover the 7 m distance was recorded in seconds, then these values were converted into speeds by using formula (speed=distance/time). A zero value was assigned for gait speed for in case of failure. Cognitive function was evaluated by the PGI memory scale. It is a short simple, objective, valid test for cognition and memory. It contain 10 sub tests-remote and recent memory, mental balance, attention concentration, delayed recall, immediate recall, retention for similar and dissimilar pair, visual retention, recognition. Each sub tests has different scoring method

Data Analysis

Statistical analysis was done by using SPSS software. ANOVA (one-way analysis of variance followed by Dunnett’s ‘t’ test was used to find out the correlation of cognition with fast walking test. A statistically significant difference was defined as p value less than 0.05.

Result

The mean value of correlation of Fast Walking Speed (FWS) (0.93±0.07) with cognition was (74.16±2.93/115). A statistically significant difference exists between FWS and Cognition within the group (p-value<0.01) as shown in table.

Table 1: Shows correlation and level of significance between FWS and cognition in diabetic individual

Walking speed	Cognition		P- value
	Mean	SD	
FWS (0.93±0.07)	74.16	2.93	0.01

Discussion

This study investigated that cognition is associated with inability or poor performance in the fast walking in diabetes. Data analysis show positive correlation between cognition and fast walking at p-value<0.01 in diabetic individual. In our study results show that poor cognition is associated with inability in fast walking in diabetic individual. Diabetes is associated with decline in cognition, and its components that includes memory, executive function and information processing speed [10]. Cognitive impairment leads to poor motor function and gait alternation in diabetes as motor function depend upon integrity of motor system through brain which regulate planning and execution of motor activity. The cognitive impairment when present in type 2 diabetes mainly produces mental slowing, reduced mental flexibility and impaired learning and memory [11]. During information processing, speed is critical to complete the task rapidly and efficiently. Executive function is defined

as a set of cognitive skills that are necessary to plan, monitor and execute a sequence of goal-directed complex actions. Executive function are necessary for effective, goal-directed actions and for the control of attentional resources, which are at the basis of the ability to manage independent activities of daily living (ADL). Executive Function increases as the locomotor task becomes more difficult and challenging. Impairment in executive function lead to reduced inner drive to move, increased risk of falling, deficits in decision making during walking in complex environment [12].

Conclusion

This study shows that cognition is significantly correlated with inability in fast walking performance in diabetic individual. Thus it can be concluded that timely intervention can be suggested to minimize the challenges faced by them in adaptive locomotor performance. This might provide a window of opportunity for prevention and early treatment of diabetes-related locomotor deficits to design proper exercise regimen for the patient with the proper guidelines in the management of diabetes so as to maintain the mobility, functional independence and preventing further deterioration thus improving quality of life of the patient.

References

1. Quality of Life in People with Diabetes: Systemic Study in Iran by Baharak Najafi, Aliasghar A Kiadaliei, in Journal of Diabetic and Metabolic Disorder, 2013, 12.
2. Current state of Diabetes Mellitus in India by Seema Abhijeet Kaveeshwar, Jon Cornwall, in Australian Medical Journal. 2014; 7:45-48.
3. Epidemiology of Type-2 Diabetes: Indian Scenario by Mohan *et al*, in Indian Journal of Medical Research. 2007, 217-230
4. Cognition - definition of cognition in English from the Oxford dictionary. www.oxforddictionaries.com. Retrieved, 2016.
5. Gait pattern alternation in Older Adults associated with Type-2 in the absence of Peripheral Neuropathy-result from Baltimore longitudinal study of Ageing, by lemg-uk ko, Sari Stenholm, in Journal of Gait and Posture. 2011; 34:548-552
6. Mobility disability in the Middle Aged: Cross-sectional associations in the English longitudinal study of Ageing by David Melzer, Elizabeth Gardener, in Journal of Age and Ageing. 2005; 34:594-602.
7. Sensory-motor and Psychosocial correlates in Adaptive locomotor performance in Older Adults by Nandini Despande, E. Jeffrey Miter, Luigi Ferrucci, in Journal of Physical Medicine Rehabilitation. 2011; 92(7):1074-1079.
8. Diabetes in Identical Twins: A study of 200 pairs.by Barnett, A.H., Eff C., Leslie, R. D., *et al*, in Diabetologia. 1981; 20:87-93.
9. Executive function and Type-2 Diabetes: putting the pieces together by Jason L Rucker, Joan. M. Madowd, in Journal of American Physical Therapy Association, in 2012; 92:454-462.
10. Cognition in the Early Stage of Type 2 Diabetes, by Carla Ruis, Geert Jan Biessels, Kees J. Gorter, Maureen Van

- Den Donk, I. Jaap Kappelle, Guy E.H.M. Rutten, in Diabetes Care. 2009; 32:1261-1265
11. Cognition in type-2 Diabetes: Association with vascular risk factors, complication of Diabetes and Depression by Thomas Iype, Sivaraman K. Shaji, Deepak Charles in Annals of Indian Academy of Neurology. 2009; 12(1):25-27.
 12. Association of Executive Function and Performance of Dual task physical tests among Older Adults: Analysis from the Inchianti study, by Antonia K. Coppin, Anne Shumway cook in Age and Ageing. 2006; 35:619-624.