Cognition and Quality of Life in Patients with Type-2 Diabetes

Parameshwari Krishna

Assistant Professor, Dept. of Physiology, East Point College of Medical Sciences & Research Centre, Bidarahalli, Bangalore, Karnataka, India

Abstract

The present study was undertaken to observe the cognition and quality of life in type-2 diabetic patients. The study included thirty type 2 diabetic patients and thirty age and gender matched healthy participants. The following criteria were used in the selection of cases. Spatial and verbal memory test was used to assess the cognition functions of the participants. Quality of life was assessed by using WHOQOL-BREF questionnaire which is standardized questionnaire by World Health Organization. There was significant decrease in the spatial memory scores in the diabetic participants when compared with healthy individuals ($P<0.001$). Verbal memory scores in the cases were significantly lower in the diabetic participants when compared with healthy individuals ($P<0.01$). The four domains of the quality of life that is physical health, psychological, social relationships and environmental scores were significantly lower in the diabetic participants when compared with healthy individuals ($P<0.001$).There was a significant decrease in the cognitive functions and quality of lifein the patients with type 2 diabetes when compared with healthy individuals. We recommend further detailed studies in this area to plan and develop better management methods for the benefit of diabetic population.

Key words: *Type-2 diabetes, cognition, quality of life*

Introduction

Diabetes results due to lack of insulin secretion or non-responsiveness of the receptors to insulin. The diabetic cases were increasing day by day and it was reported that India is going to become diabetic capital of the world. The metabolism of carbohydrate, protein and fat was altered in diabetes which results in long-term complications. Cognition is defined as "the mental action or process of acquiring knowledge and understanding through thought, experience, and the senses".[6] There was decrease in the memory, executive functions and decrease in the processing speed of information.[1,2] It was evident that there is increase in the risk of cognitive impairment and dementia in diabetic population.[3-5] The quality of life was lower in diabetic patients when compared with healthy indivisuals.[4] Vascular, metabolic, and psychosocial factors were reported to contribute the impairment of cognition in diabetes population. The prevalence of cognitive impairment is two times greater in diabetic individuals when compared to healthy individuals.[7]It was reported that there was progressive decrease in the cognitive functions in diabetic patients.[8] There was significant decline in the quality of life in diabetic population. All the components of quality of life wereaffected in diabetic patients.[9] The present study was undertaken to observe the cognition and quality of life in type-2 diabetic patients.

Corresponding author:
Parameshwari K
Assistant Professor, Dept. of Physiology, East Point College of Medical Sciences & Research Centre Bidarahalli, Bangalore, Karnataka.

Materials and Methods

Study design: Case control study

Study participants: The study included thirty type 2 diabetic patients and thirty age and gender matched

healthy participants. The following criteria were used in the selection of cases.

Inclusion and exclusion criteria: Type 2 diabetic patients within 30 to 50 years of age and those willing to participate in study were included in the study. Those with any severe complications, those following any stress management methods or techniques and those not willing to not willing to participate were excluded from the study.

Assessment of cognition: Spatial and verbal memory test was used to assess the cognition functions of the participants.[10]

Assessment of quality of life: Quality of life was assessed by using WHOQOL-BREF questionnaire which is standardized questionnaire by World Health Organization.[11]

Ethical Consideration: The study was approved by institutional ethical committee and informed consent was obtained from all the participants after explaining the details of the study and ensuring the confidentiality.

Data Analysis

Data was analyzed by SPSS 20.0. Unpaired t test was used to observe the significance of difference between the groups. P value less than 0.05 was considered as significant.

Results

Results arepresented in table no 1.There was significant decrease in the spatial memory scores in the diabetic participants when compared with healthy individuals (P<0.001). Verbal memory scores in the cases were significantly lower in the diabetic participants when compared with healthy individuals (P<0.01). The four domains of the quality of life that is physical health, psychological, social relationships and environmental scores were significantly lower in the diabetic participants when compared with healthy individuals (P<0.001).

Table no 1: Comparison of cognition and quality of life in cases (diabetic participants) and control (healthy individuals).

Parameter	Cases	Controls	P value
Spatial memory	4±1.25	6±2.48	P=0.0002***
Verbal memory	3.52±2	5.48±3.17	P=0.0058**
Physical health score	45±10.33	64±14.28	P<0.0001***
Psychological score	41±12.72	66±11.44	P<0.0001***
Social relationships score	55±8.32	72±10.31	P<0.0001***
Environmental score	38±4.21	59±8.92	P<0.0001***

(*P<0.05 is significant, **P<0.01 is significant, ***P<0.001 is significant).

Discussion

The present study was aimed to observe the cognition and quality of life in type-2 diabetic patients. There was a significant decline in the spatial and verbal memory scores in the patients with diabetes when compared with the healthy individuals. The overall quality of life also significantly deteriorated in the individuals with diabetes when compared with healthy individuals. Diabetes is a complex metabolic disease which affects almost all the systems of the body.[12] As it is well known that the diabetes affect mainly the memory and executive

functions of the cognition, there may be decrease in the both spatial and verbal memory. The cognitive decline in the diabetic population may be due to the vascular defects and lack of insulin or any defect in the transportation of glucose in the brain.[13]Earlier studies reported that there was existence of cerebral vascular diseases in the patients with diabetes. Further there was clinical and sub-clinical infarctions were present in diabetic patients, which also contributes for impairment of memory.[14] Interestingly, there was negative correlation between the duration of diabetes and memory status.[15,16] Another study reported that the inflammatory cytokines produced in the diabetic patients are the key factors that reduce the memory and other cognitive fuinctions.[17] However, the increased blood glucose levels itself is enough to cause the vascular damage and leads to atrophy of brain and also damage of the neurons.[18,19] It was also reported that the excessive glucose may trigger the formation of amyloid plaques.[20-22] the present study results are in accordance with earlier studies as we have observed significant decrease in the memory scores in the diabetic participants. Assessment of quality of life is a well-accepted measure in the bio-behavioral research. The assessment of quality of life gives information about the effect of illness on the patient. Decreased quality of life was observed in the patients with diabetes irrespective of duration and type.[23]The mean scores of quality of life was lower in diabetic patients when compared with non-diabetic individuals.[24,25] The present study results are in accordance with earlier studies, as we have observed significant decrease in the quality of life in the diabetic patients.

Limitations: the sample size was less in the study and the study was conducted at one center. So the results cannot be generalized.

Conclusion

There was a significant decrease in the cognitive functions and quality of lifein the patients with type 2 diabetes when compared with healthy individuals. We recommend further detailed studies in this area to plan and develop better management methods for the benefit of diabetic population.

Conflicts of Interest: None declared

Source of Funding: Self-funding

References

1. Carla Ruis, Geert Jan Biessels, Kees J. Gorter, Maureen van den Donk, L. JaapKappelle, and Guy E.H.M. Rutten. Cognition in the Early Stage of Type 2 Diabetes. Diabetes Care 2009; 32(7): 1261-1265.
2. Ryan CM, Williams TM, Finegold DN, Orchard TJ. Cognitive dysfunction in adults with type 1 (insulin-dependent) diabetes mellitus of long duration: effects of recurrent hypoglycaemia and other chronic complications. Diabetologia. 1993;36:329–334.
3. Ott A, Stolk RP, van Harskamp F, Pols HA, Hofman A, Breteler MM. Diabetes mellitus and the risk of dementia: The Rotterdam Study. Neurology. 1999;53:1937–1942.
4. Leibson CL, Rocca WA, Hanson VA, Cha R, Kokmen E, O'Brien PC, Palumbo PJ. Risk of dementia among persons with diabetes mellitus: a population-based cohort study. Am J Epidemiol. 1997;145:301–308.
5. Curb JD, Rodriguez BL, Abbott RD, Petrovitch H, Ross GW, Masaki KH, Foley D, Blanchette PL, Harris T, Chen R, et al. Longitudinal association of vascular and Alzheimer's dementias, diabetes, and glucose tolerance. Neurology. 1999;52:971–975.
6. Oxford Dictionaries. Definition of cognition [accessed 2016 Feb 4] Available from: http://www.oxforddictionaries.com/definition/english/cognition.
7. Luchsinger J. Diabetes, Related Conditions, and Dementia. J Neurol Sci. 2010;15; 299(1–2): 35–38.
8. Hewitt, J.; Smeeth, L.; Chaturvedi, N.; Bulpitt, C.J.; Fletcher, A.E. Self-management and patientunderstanding of diabetes in the older person. Diabet. Med.2011;28:117–122.
9. Yki-Järvinen H. Combination therapies with insulin in type II diabetes. Diabetes Care. 2001;24(4):758-67.
10. Naveen KV, Nagarathna R, Nagendra HR, Telles S. Yoga breathing through aparticular nostril

increases spatial memory scores without lateralized effects.Psychol Rep. 1997;81:555–61.

11. WHO QOL BREF- Field Trial Version December 1996. Available from http://www.who.int/mental_health/media/en/76.pdf.
12. Kodi CT, Seaquist ER. Cognitive dysfunction and Diabetes Mellitus. Endocr Rev. 2008;29(4):494-511.
13. Naderali EK, Ratcliffe SH, Dale MC. Obesity and Alzheimer's disease: a link between body weight and cognitive function in old age. Am J Alzheimers Dis Other Demen. 2009;249(6):445-9.
14. Longstreth WT, Bernick C, Monalio TA, Bryan N, Jungreis CA, Price TR. Lacunar infarcts defined by magnetic resonance imaging of 3660 elderly people: the cardiovascular Health Study. Arch Neurol. 1998;55(9):1217-25.
15. Luchsinger JA, Reitz C, Patel B, Tang MX, Manly JJ, Mayeux R. Relation of diabetes to mild cognitive impairment. Arch Neurol. 2007;64(4)570-5.
16. Strachan MW, Frier BM, Deary IJ. Type 2 diabetes and cognitive impairment. Diabet Med. 2003;20(1)1-2.
17. Pelia R, Rodriguez BL, Launer LJ. Type 2 diabetes, APOE gene, and the risk for dementia and related pathologies: the Honolulu-Asia Aging Study. Diabetes. 2002;51(4):1256-62.
18. Alencar RC, Cobas RA, Gomes MB. Assessment of cognitive status in patient with type 2 diabetes through a mini mental state examination: a cross sectional study. Diabetology and Metabolic Syndrome. 2010;2:10.
19. Xu W, Qiu C, Gatz M, Pedersen NL, Johansson B, Fratiglioni L. Mid-and late-life diabetes in relation to the risk of dementia. Diabetes. 2009;58(1):71-7.
20. Van Harten B, Oosterman JM, Potter van Loon BJ, Scheltens P, Weinstein HC. Brain lesions on MRI in elderly patients with type 2 diabetes mellitus. Eur Neurol. 2007;57(2)70-4.
21. Den Heijer T, Vermeer SE, Van Dijk EJ, Prins ND, koudstaal PJ, Hofman A, et al. Type 2 diabetes and atrophy of medial temporal lobe structures on brain MRI. Diabetelogia. 2003;46(12):1604-10.
22. Qiu WQ, Walsh DM, Ye Z, Vekrellis K, Zhang J, Podlisny MB. Insulin degrading enzyme regulates extracellular levels of amyloid beta protein by degradation. J Biol Chem. 1998;273(49)32730-8.
23. Fisher EB Jr, Arfken CL, Heins J, HoustonC, Jeffe D, Sykes R. Acceptance of diabetes in adults. In: Handbook of Health BehaviorResearch, Gochman DS (ed). New York:Plenum Publishing Corp, 1996.
24. Issa B, Baiyewu O. Quality of life of patients with diabetes mellitus in a Nigerian teaching hospital. Hong Kong J Psychiatry. 2007;16:27-33.
25. Thommasen H, Zhang W. Health-related quality of life and type 2 diabetes: A study of people living in the Bella Coola Valley. BC Med J. 2006;48:272-8.