DOI: 10.21088/ijmhs.2347.9981.13126.1

Indian Journal of Medical and Health Sciences
Volume 13 Number 1, January - June 2026

ORIGINAL ARTICLE

Role of the Mini-Cog in Early Detection of Cognitive Impairment in Diabetes Mellitus: A Cross-sectional Study

Suman Kumar Kotwal,[1], Shalija Kotwal[2], Monika Jaithal[3]

HOW TO CITE THIS ARTICLE:

Suman Kumar Kotwal, Shalija Kotwal, Monika Jaithal. Role of the Mini-Cog in Early Detection of Cognitive Impairment in Diabetes Mellitus. A Cross-Sectional Study. Jr. Med. & Health Sci. 2026; 13(1): 07–10.

ABSTRACT

Objective: Chronic hyperglycemia will result in many complications and patients living with diabetes are at increased risk of mild cognitive impairment (MCI) and dementia. There are basket of tests available for diagnosis of cognitive impairment, but all of them are time consuming. Minicog is simple and easy to perform and can be completed in three minutes. Early detection of MCI in patients with diabetes mellitus will help in delaying progression of cognitive decline.

Methods: we enrolled 150 patients living with diabetes in our study. Minicog test was used for screening of MCI. Those having score of 3or 4 were considered to have MCI.

Results: a total of 36.7% of patients had mild cognitive impairment. MCI was seen in 19% of women and 17.3% of men. Hba1c was negatively correlated with MCI.

Conclusion: Minicog is a brief, simple and less time-consuming screening tool and is immensely helpful for quick screening of cognitive impairment.

KEYWORDS

• Cognitive impairment • Dementia • Screening • Minicog

INTRODUCTION

Diabetes mellitus is a public health problem. It has reached pandemic proportions. One in ten adults has type 2 diabetes mellitus (T2DM). Diabetes mellitus is a state of chronic hyperglycemia, and it results in damage to all organs of the body, it affects blood vessels, nerves, brain etc.[1]

Chronic hyperglycemia will result in many complications and patients living with diabetes are at increased risk of mild cognitive impairment (MCI) and dementia. While the

AUTHOR'S AFFILIATION:

[1] Associate Professor, Department of Endocrinology, Super-Speciality Hospital, Bakshi Nagar, Jammu, India.

[2] Assistant Professor, Department of Pathology, ASCOMS, Sidhra, Jammu, India.

[3] Scholar, Department of Biotechnology, University of Jammu, Jammu, India.

CORRESPONDING AUTHOR:

Suman Kumar Kotwal, Associate Professor, Department of Endocrinology, Super-speciality Hospital, Jammu, India.

E-mail: sumankotwal@yahoo.com

➢ **Received:** 10-07-2025 ➢ **Accepted:** 22-10-2025

exact mechanisms are still unknown, several causes have been postulated. Vascular factors, oxidative stress, inflammation, and insulin resistance are some of factors believed to be responsible for MCI and dementia in diabetes mellitus.[2-4]

Diabetes has been identified as a key risk factor for dementia and MCI. Dementia is a global epidemic. In several studies and meta-analyses, diabetes was estimated to increase the risk of dementia by approximately 50%. Less severe forms of cognitive dysfunction that precede the development of dementia affect many more people, with mild cognitive impairment (MCI) affecting 6% of the population. It is defined as objective cognitive impairment relative to the person's age, with concern about the cognitive symptoms, in a person with essentially normal functional activities who does not have dementia.[5,6] People with MCI are at a high risk for developing dementia with around 46% developing dementia within 3 years, compared to 3% of an age-matched population.[7,8]

It has been seen in studies that 22-36% of patients with diabetes mellitus have MCI. Many screening tests have been validated for early detection of cognitive function problems in patients with diabetes, but most are time consuming and difficult to perform, especially with immense rush of patients in outdoor department (OPD) in developing countries. Early detection of MCI in patients with diabetes mellitus will help in delaying progression of cognitive decline. We used minicog test for screening of MCI in our patients. Minicog test can be completed in three minutes only while others screening tests will take 15-30 minutes. Minicog test is a brief, simple and less time-consuming screening tool and is immensely helpful for quick screening of cognitive impairment.

MATERIAL AND METHODS

Selection of subjects: This was a cross sectional study carried out at Super speciality Hospital Jammu which is a tertiary care hospital in north India from June 2022 to May 2023. T2DM patients having age between 20–60years presenting endocrinology OPD were enrolled.

Inclusion and exclusion criteria: Patients having frank hypothyroidism, those on antipsychotic drugs, pregnant women, those with vitamin B12 deficiency and those having history of recent head trauma and radiation exposure to head and neck area were excluded from the study.

Sample size calculation: The sample size was calculated using the formula: Sample size= Z X2 P- Q/d2 Where X=constant value (1.96) at 95% confidence, P=prevalence of diabetes mellitus in north India, Q=1-Prevalence and d=tolerated error=0.05. Accordingly, one hundred fifty consecutive patients were included.

Ethical clearance was obtained from institutional ethical committee vide registration number IEC/GMCH/2022/1101. The proper consent of all enrolled patients was obtained. A thorough history was obtained, and physical examination of all enrolled patients was performed. All selected patients were subjected to baseline investigations. HbA1c, thyroid function tests, vitamin B12 were obtained in all patients.

Cognitive Impairment Assessment: The Mini-Cog (Washington, USA) was used for cognitive evaluation; it is a two-part assessment tool with a total score of five, including three points for three recalls and two points for clock drawing. The clock numbers must be completely drawn in the right direction with the arms at ten past eleven. A score of two indicates the correct numbers and arms. The length of the arms is not assessed. A score of zero indicates that the clock is drawn incorrectly. The Mini-Cog has been previously validated for use among elderly patients, with a score of 0-2 indicating high sensitivity in both primary care and hospital settings. After proper explaining screening test to all patients, minicog test was carried out in all studied population. Data was entered on excel sheets for all parameters and statistical analysis was done by SPSS version.[20]

RESULTS

A total of 150 patients were enrolled, of 84 were women and 64 men. The mean age of patients was 50.13±9.37, mean BMI 27.37±4.39 and mean HBa1c was 8.71±2.11.

36.7% of our patients had mild cognitive impairment i.e. had a score of 3 or 4 on minicog screening. Gender wise 19% of women and around 17.3% of men with diabetes mellitus had cognitive impairment.

Spearman rho correlation was calculated for relationship between minicog score and HbA1c. A negative correlation was found; rho 148 = -0.163 with p-value <0.005. No significant correlation was found between BGF, BMI, hypertension, dyslipidemia and duration of diabetes.

DISCUSSION

Dementia commonest being Alzheimer and vascular affects 50 million people worldwide. Cognitive dysfunction that predates the development of dementia affects many more people and is known as mild cognitive impairment (MCI). It affects around 6% of the population (9-11). People with MCI are at an increased risk for developing dementia with around 46% developing dementia within 3 years, compared to 3% of an age-matched population. Diabetes mellitus is associated with a 50% increase in the risk of dementia risk and type 2 diabetes mellitus increases the risk of dementia by 19% over 20 years.[12-14]

In our study 36.7% of patients had mild cognitive impairment. Studies from different parts of world have shown varied prevalence of MCI among T2DM patients, but what is common in all studies is high prevalence of MCI among diabetes patients as compared to non-diabetics.

Early detection of cognitive function problems in patients with diabetes during the development of dementia will help in focusing on measures to delay cognitive decline, as well as the self-management of diabetes. The importance of identifying this population with MCI is to focus on slowing progression.[15]

Several studies reported that the duration of diabetes is a key predictor of cognitive outcomes, and that longstanding diabetes is associated with more significant cognitive impairment. We could not find significant correlation with the duration of diabetes. The relationship between the cognitive decline and the duration of diabetes may be due to the accumulating harmful effects which diabetes causes.[18]

Our study has shown an inverse statistically significant relationship between HbA1c and minicog score, i.e. lower the minicog score, higher the HbA1c. Studies that found that HbA1c of 6.5% or above was associated with lower cognitive performance (19-21). Another study showed a weak negative relationship between the HbA1c level and the cognitive.[23] This difference in studies may be attributable to a variety of factors like; study design, study participants, duration of diabetes, and the tools used to assess the degree of cognitive impairment.

In our study we found an inverse correlation between blood glucose and MCI, but it was not statistically significant, while we have not observed any correlation between hypertension, dyslipidemia and BMI.

LIMITATIONS

Ours is a cross-sectional study, so causation cannot be inferred. Secondly, we only have one reading of HbA1c for each participant, so we cannot assess trends in HbA1c levels.

CONCLUSION

To conclude, more than 36.7% of individuals with diabetes interviewed in our study had mild cognitive impairment while severe degree of cognitive impairment was seen in greater proportions of patients. The level of HbA1c was significantly higher in patients with severe cognitive impairment, and the probability of MCI and severe cognitive impairment increased as the level of HbA1c increased.

Conflict of interest: None

Funding: Nil

REFERENCES

1. D., Shaw J.E., Magliano D.J. The burden and risks of emerging complications of diabetes mellitus. Nat Rev Endocrinol. 2022; 18:525–39.
2. Banday M.Z., Sameer A.S., Nissar S. Pathophysiology of diabetes: an overview. Avicenna J Med. 2020; 10: 174–88.
3. Verdile G., Keane K.N., Cruzat V.F., *et al.* Inflammation and oxidative stress: the molecular connectivity between insulin resistance, obesity, and Alzheimer's disease. Mediators Inflamm. 2015; 2015: 105828.
4. Zilliox L.A., Chadrasekaran K., Kwan J.Y., *et al*. Diabetes and cognitive impairment. Curr Diab Rep. 2016; 16:87.
5. Petersen R.C. (2004) Mild cognitive impairment as a diagnostic entity. J Intern Med 256: 183–194.

6. Tschanz J.T., Welsh-Bohmer K.A., Lyketsos C.G., Corcoran C., Green R.C., Hayden K., *et al*. Conversion to dementia from mild cognitive disorder: the Cache County Study. Neurology. 2006 Jul 25; 67(2): 229-34.

7. Davis W.A., Zilkens R.R., Starkstein S.E., Davis T.M., Bruce D.G. Dementia onset, incidence and risk in type 2 diabetes: a matched cohort study with the Fremantle Diabetes Study Phase I. Diabetologia. 2017 Jan; 60(1): 89-97.

8. Biessels G.J., Strachan M.W., Visseren F.L., Kappelle L.J., Whitmer R.A. Dementia and cognitive decline in type 2 diabetes and prediabetic stages: towards targeted interventions. Lancet Diabetes Endocrinol. 2014 Mar; 2(3): 246-55.

9. Sachdev P.S., Lipnicki D.M., Kochan N.A., Crawford J.D., Thalamuthu A., Andrews G, *et al*. The Prevalence of Mild Cognitive Impairment in Diverse Geographical and Ethnocultural Regions: The COSMIC Collaboration. PLoS One. 2015; 10(11): e0142388.

10. Lopez O.L, Kuller L.H., Becker J.T., Dulberg C., Sweet R.A., Gach H.M., *et al*. Incidence of dementia in mild cognitive impairment in the cardiovascular health study cognition study. Arch Neurol. 2007 Mar; 64(3): 416-20.

11. Cooper C., Sommerlad A., Lyketsos C.G., Livingston G. Modifiable predictors of dementia in mild cognitive impairment: a systematic review and meta-analysis. Am J Psychiatry. 2015 Apr; 172(4): 323-34.

12. Albert M.S., DeKosky S.T., Dickson D., Dubois B., Feldman H.H., Fox N.C., *et al*. The diagnosis of mild cognitive impairment due to Alzheimer's disease: recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease. Alzheimers Dement. 2011 May; 7(3): 270-9.

13. Livingston G., Sommerlad A., Orgeta V., Costafreda S.G., Huntley J., Ames D., *et al*. Dementia prevention, intervention, and care. Lancet. 2017 Dec 16; 390(10113): 2673-734.

14. Lalithambika C.V., Arun C.S., Saraswathy L.A., Bhaskaran R. Cognitive Impairment and its Association with Glycemic Control in Type 2 Diabetes Mellitus Patients. Indian J Endocrinol Metab. 2019; 23(3): 353-6.

15. Varghese S.M., Joy N., John A.M., George G., Chandy G.M., Benjamin A.I. Sweet Memories or Not? A Comparative Study on Cognitive Impairment in Diabetes Mellitus. Front Public Health. 2022; 10: 822062.

16. Liu S., Lu Y., Cai X., Cong R., Li J., Jiang H., *et al*. Glycemic Control is Related to Cognitive Dysfunction in Elderly People with Type 2 Diabetes Mellitus in a Rural Chinese Population. Curr Alzheimer Res. 2019; 16(10): 950-62.

17. Palta P., Carlson M.C., Crum R.M., Colantuoni E., Sharrett A.R., Yasar S, *et al*. Diabetes and Cognitive Decline in Older Adults: The Ginkgo Evaluation of Memory Study. J Gerontol A Biol Sci Med Sci. 2017 Dec 12; 73(1): 123-30.

18. West R.K., Ravona-Springer R., Schmeidler J., Leroith D., Koifman K., Guerrero Berroa E. *et al* (2014) The association of duration of type 2 diabetes with cognitive performance is modulated by long-term glycemic control. Am J Geriatr Psychiatry 22(10): 1055–1059.

19. Rawlings A.M., Sharrett A.R., Schneider A.L., Coresh J., Albert M., Couper D, *et al*. Diabetes in midlife and cognitive change over 20 years: a cohort study. Ann Intern Med. 2014 Dec 2; 161(11): 785-93.

20. Biessels G.J., Staekenborg S., Brunner E., Brayne C., Scheltens P. Risk of dementia in diabetes mellitus: a systematic review. Lancet Neurol. 2006 Jan; 5(1): 64-74.

21. Cukierman-Yaffe T., Gerstein H.C., Williamson J.D., Lazar R.M., Lovato L., Miller M.E., *et al*. Relationship between baseline glycemic control and cognitive function in individuals with type 2 diabetes and other cardiovascular risk factors: the action to control cardiovascular risk in diabetes-memory in diabetes (ACCORD-MIND) trial. Diabetes Care. 2009 Feb; 32(2): 221-6.

22. Avadhani R., Fowler K., Barbato C., Thomas S., Wong W., Paul C., *et al*. Glycemia and cognitive function in metabolic syndrome and coronary heart disease. Am J Med. 2015 Jan; 128(1): 46-55.

23. Wium-Andersen I.K., Rungby J., Jørgensen M.B., Sandbæk A., Osler M., Wium-Andersen M.K. Risk of dementia and cognitive dysfunction in individuals with diabetes or elevated blood glucose. Epidemiol Psychiatr Sci. 2019 Aug 28; 29: e43.