Acta Scientific MEDICAL SCIENCES (ISSN: 2582-0931)

Volume 10 Issue 7 July 2026

Research Article

Montreal Cognitive Assessment Based Screening for Mild Cognitive Impairment in Indian Type 2 Diabetic Population: A Comprehensive Review of Current Evidence

Arul Priya M[1]*, Manoj Abrahmam Manoharlal[2] and MK Franklin Shaju[3]

[1]MPT-Research Scholar, KG College of Physiotherapy, Coimbatore-641035, Affiliated to The Tamil Nadu Dr. M.G.R Medical University, Chennai-600032, India

[2]Principal, KG College of Physiotherapy, Coimbatore-641035, Affiliated to The Tamil Nadu Dr. M.G.R Medical University, Chennai-600032, India

[3]Principal, R.V.S. College of Physiotherapy, Coimbatore-641402, Affiliated to The Tamil Nadu Dr. M.G.R Medical University, Chennai-600032, India

***Corresponding Author:** Arul Priya M, MPT-Research Scholar, KG College of Physiotherapy, Coimbatore-641035, Affiliated to The Tamil Nadu Dr. M.G.R Medical University, Chennai-600032, India.

DOI: 10.31080/ASMS.2026.10.2259

Received: May 19, 2026

Published: July 02, 2026

Abstract

Background: In India the prevalence of diabetes is high and continues to increase at an alarming rate. Mild cognitive impairment is a common complication of Type 2 Diabetes Mellitus (T2DM), which might have a threatening effect on the functional ability of patients if left unnoticed and untreated. In India there are diverse cultural practices and different languages spoken across the region. It is very essential to have a screening test that is easy, practical, valid and also subtle to identify the sensitive cognitive domains that are affected in type 2 diabetes and that has different versions (Languages) more suitable for various language speaking population in India. Montreal cognitive assessment is one of the available screening tools that is widely used to detect cognitive impairment. This systematic review explores how Montreal cognitive assessment (MoCA)can help in identifying Mild cognitive impairment (MCI) and how sensitive it is to identify the key domains of cognition that may be affected in T2DM in Indian population.

Method: A thorough search was carried out using the electronic databases of PubMed, Embase and google scholar for studies published between 2016 and 2026 to identify the studies that used Montreal cognitive assessment (MoCA) alone or with other tool to identify MCI in T2DM patients in India. After careful reading and reviewing; about 14 articles were included for the review process. A systematic approach was utilized to summarize the key findings from the selected 14 studies by identifying common themes like region of the study, mean age of the sample, mean MoCA score, common domains of cognition affected, version of MoCA used and gender differences in the prevalence of MCI in type 2 diabetes.

Conclusion: The reviewed literature showed Montreal cognitive assessment (MoCA) can be used as a screening tool in the Indian hospitals with regional version to detect mild cognitive impairment and that can have a positive impact on the health outcomes of type 2 diabetics if cognitive impairment is diagnosed at an early stage.

Keywords: Type 2 Diabetes Mellitus; Mild Cognitive Impairment; Montreal Cognitive Assessment Tool; Indian Population

Abbreviations

T2DM: Type 2 Diabetes Mellitus; MoCA: Montreal Cognitive Assessment; MCI: Mild Cognitive Impairment.

Introduction

Diabetes affects people of all ages in almost all the countries of the world emerging as an international health epidemic in the recent years [1]. Rapid urbanization is one important factor that causes an increase in the prevalence especially in the low to middle income countries [2]. It is a major escalating problem making it a public health issue both in India and across worldwide. Reports indicate that 1 in 10 adults worldwide is affected with type 2 diabetes and most of them are undiagnosed [3]. In the Asian region China and India account for the largest population that are affected [4] and India emerging as the Diabetic capital of the world [5]. Individuals with elevated HbA1C levels experience increased cognitive impairment and from epidemiological studies one can understand that there is a strong association between type 2 diabetes mellitus and dementia [6]. This indicates that maintaining glycemic control is very important in the subjects with type 2 diabetes mellitus.

Cognitive impairment has now been widely acknowledged as a common chronic complication of diabetes [7]. Imaging of brain in type 2 diabetic subjects shows that it is adversely affected which causes disturbances in higher mental function of cognition [8]. Although the exact reasons are unknown factors like insulin resistance, persistent hyperglycemia, oxidative stress, vascular damage are thought to accelerate the neurodegenerative process and thereby increasing the risk of MCI particularly in older subjects [9].

Mild cognitive impairment serves as a transitional stage between normal aging and dementia marked by noticeable memory and cognitive difficulties that do not compromise independent living [10]. According to various cross-sectional studies, prevalence of mild cognitive impairment in type 2 diabetes is in the range between 19% t0 54% in India [11-13]. Mild cognitive impairment can be explained as a cognitive dysfunction beyond natural aging process but does not meet the criteria for dementia. Often a mild change in memory, learning and attention that is greater than one's normal age is seen and also difficulty to follow conversations is noted but their ability to perform daily activities is unaffected and not that severe enough to interfere with normal daily life unlike patients with Alzheimer's disease [14,15]. Many community studies have concluded that diabetes mellitus is an independent risk factor for dementia which also states that the number of people with dementia will surpass 80 million in the year 2040 [16]. Hence Mild cognitive impairment is often seen as a gateway that bridges the gap between normal cognitive aging and severe neurogenerative disorders.

In the clinical perspective, diabetes affects the domains of cognition in specific ways; the affected individuals present with memory lapse, reduced concentration, slowed processing speed and difficulty in problem-solving [17]. Most commonly affected domain is memory which exhibit as short term memory lapses, decreased working memory and difficulty in recalling information especially during episode of hypoglycemia which makes the patient forget instruction regarding of dosage of insulin or to recall appointments. The domain of attention when impaired leads to problems in concentration and sustaining focus when performing any activity. When there is sustained insulin resistance and neuroinflammation it affects frontal region of the brain that is responsible for the domain of executive function which helps in planning, decision making and problem solving. This is exhibited as difficulty in organizing daily routines or adapting to changes in treatment plans. Language is a domain that is less severely affected but a few patients may show reduced verbal fluency like slower word retrieval during conversation. Visuospatial skills may be affected making them difficult during navigation or during interpretation of visual patterns due to retinal changes and vascular damage. Lastly, processing speed is one domain that is slowed due to chronic hyperglycemia and white matter changes due to which delayed responses and slower mental calculation occurs [18]. This multidimensional decline of cognitive domains complicates not only daily functioning but also self-management of the disease like glucose monitoring, medication adherence or planning of diet and exercise which is more challenging for the patients if the diagnosis and management of MCI is overlooked or undiagnosed. The consequence leads to heightened demands for personal care, elevated health care costs, increased hospitalization rates which ultimately results in increased economic burden and depression [19]. Identification of MCI through screening tools offers an early opportunity to identify the decline in a much earlier stage and may greatly affect the patient's health outcome by early intervention so

that progression to the next severe stage is prevented. There are many screening tools available to detect cognitive decrements. One such tool is Montreal Cognitive assessment (M0CA) which is comprehensive and easy to administer. This review mainly focuses on the studies used MoCA; in T2DM to identify the prevalence of Mild cognitive impairment in the Indian context.

Methodology and study selection

Inclusion and exclusion criteria

Inclusion criteria were type 2 diabetes mellitus subjects who are clearly defined (self-report or clinical diagnosis). Age above 18 years, duration of the studies :2016 to 2026. type of study-. cross sectional case control or retrospective studies conducted in India, use of MoCA as screening tool to find the prevalence of MCI, it can also be used with other tools. The studies were excluded if they and if necessary information was not obtained after contacting the author.

Screening process

A thorough search was performed to identify the studies that utilized MoCA as a tool to identify the presence of mild cognitive impairment in type 2 Diabetes subjects in the electronic databases of PubMed, web of science and Embase. The MeSH search terms included "type 2 diabetes mellitus" OR "diabetes mellitus type 2"AND "mild cognitive impairment" OR "cognitive decline" OR "MCI" AND "Montreal cognitive assessment "OR "MoCA" AND OR "epidemiologic" AND "India" OR "Indian". Two independent reviewers independently reviewed the articles on screen by reading through the abstracts. The studies which were relevant to the review were selected for further exploration. Finally, about 14 articles were selected and reviewed in the final stage of selection.

Data extraction

The data was extracted from all the studies and pooled together under the following categories: author and year, study design and setting, sample size, mean age of T2DM subjects, prevalence of MCI, gender difference, MoCA version, cutoff score and mean MoCA data if available and the most affected domains of cognition.

Systematic review

A systematic approach was utilized to summarize the key findings in the literature and also to critically analyze the common trends, differences, gaps and possible future research prospects. The prevalence of Mild cognitive impairment in diabetic population across different regions of the country, common age groups affected, to identify the difference in male and female prevalence and the common domains of cognition affected were primarily noted in the review.

Results and Discussion

Mild cognitive impairment is an overlooked complication of type 2 diabetes. The primary objective of this review was to evaluate the use of Montreal cognitive assessment tool to identify cognitive decline in type 2 diabetics in the Indian context. The Montreal Cognitive Assessment tool developed by Dr. Ziad Nasreddine in the year 1996 in Montreal, Canada is a brief tool with a cut off score <26 for normal cognitive function. It has a sensitivity of 90% when compared to 18% of Mini Mental State Examination (MMSE). There are 30 items in the test and requires 10 to 12 minutes to administer and analyze the following domains: short term memory, visuospatial skills -the patient is asked to draw a clock and copy a cube. Executive function that is Checked by alternating tasks and verbal fluency is checked by asking the patient to say as many words as possible that begins with the specific letter with in a time frame. The domain of attention is checked by digit span checking, serial subtraction. Naming and repetition exercises check the language domain and abstraction is checked by identifying the similarity of tasks. This gives a total score of 30 which is a comprehensive measure of cognitive function [20]. Hence this serves as a valuable tool to identify mild cognitive impairment in type 2 diabetic subjects. From the pooled data it is understood that majority of the studies were conducted in Southern part of India (9 out of 14 studies) and the remaining were from the other regions. Most of the studies were cross sectional and few were case control studies which included age and sex matched nondiabetic case controls. Collectively these studies demonstrated a high prevalence of cognitive decline identified by MoCA. One study from Pune reported a prevalence of 72% [21] whereas in Chennai it was only 10% [22]. But most of the studies reported prevalence rates between 41% and 58% indicating the silent rise in MCI in type 2 diabetes subjects in India. It is also noted that one study from Kolkata mentioned that the MCI prevalence of 41.7% was noted in type 2 diabetics where in their mean age was 44.2. This indicates that cognitive decline is not only limited to middle and old age but

also common in younger diabetic subjects [23]. Gender variations of MCI was also analyzed in this review which interpreted that females had a higher prevalence than males ;the reasons could be could be biological clinical psychosocial and socioeconomic factors like lower educational attainment and the status of a homemaker [24] who is not engaged in outside jobs. MoCA is very effective in detecting impairments in executive function, abstraction and delayed recall. The reviewed studies identified memory especially delayed recall, attention, executive function and visuospatial skills as the most affected domains. Language, fluency. abstraction and naming were moderately affected and the domain of orientation was largely preserved. Importantly, MoCA is available in various regional languages that makes it accessible for varied cultural and linguistic groups. Consistent use of MoCA across regions prove that it can be used to detect early cognitive impairment and prevents further progression to dementia in India. The strength of MoCA lies in its practicality, brevity and adaptability for both community and clinical settings. In other words, it can act as a lens through which cognitive impairment is revealed [25]. The adoption of MoCA as a screening tool across Indian Studies reveals its robustness in its methodology and clinical relevance making it as the most preferred tool for early identification of mild cognitive impairment in type 2 diabetes even among young adults.

Challenges during administration of MoCA

Even though Montreal Cognitive Assessment is the most sought-after tool to detect cognitive impairment in type 2 diabetes patients there are few challenges encountered during administration of the test. One of which is that though it is valid tool there is a need for trained experts to administer and another is its dependency on the patient's literacy and mood. There is a lack of fully trained healthcare professionals who can consistently administer and interpret the results actively. This necessitates the training of healthcare providers being important to ensure proper administration of MoCA and false positives can be avoided in the busy diabetic clinics.

Strength and limitation of the review

It is important to mention certain limitations that might have influenced the scope of the review. The most important one is the time factor; older studies might have been published after the review that would have added the findings to this review. Notable strength is the commitment to conduct a detailed search of the literature which was done systematically by two reviewers.

Future directions and research prospects

A study conducted by Gupta A., *et al*. [26] showed that at <26 cut off score the following was observed: Sensitivity 94.2%, specificity 29.5%, accuracy 54.7%. At a Cutoff <23: Sensitivity was 69.2%, specificity was 71.8 and an accuracy of 70.8% and at a Cutoff of <21: Sensitivity of 49.0%, specificity of 91.4% and an accuracy of 74.9% was noted. Hence in a country like India, where different languages are spoken and varied cultural practices exist more studies are required to validate the cutoff score of MoCA reference to different regional languages. It is essential to have normative data with respect to age, gender, education and occupation so that the validity of MoCA will be greater when compared to other scales or tests.

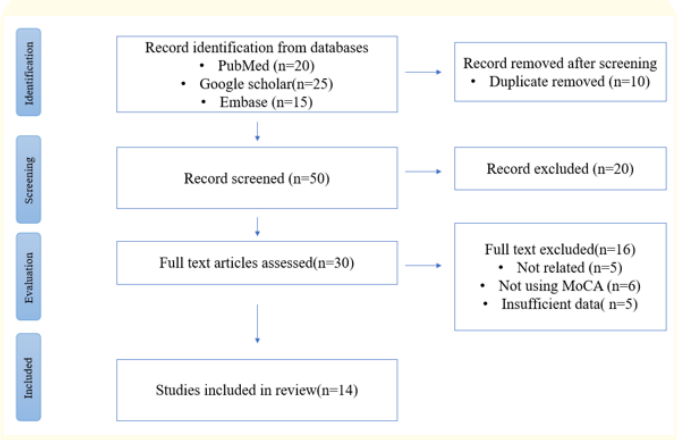

Figure 1: Flowchart to describe the steps in article selection from 2016–2026.

Step	Stage	Procedure Description
1	Database Selection	Three databases—PubMed, Google Scholar, and Embase—were selected for the literature search.
2	Literature Search	A detailed search was conducted using relevant keywords and MeSH terms. Studies published between 2016 and 2026 were included.
3	Inclusion Criteria	Observational studies (cross-sectional, case-control, and cohort) involving patients with Type 2 Diabetes Mellitus (T2DM), aged >18 years, assessed using MoCA or other cognitive tools were included.
4	Exclusion Criteria	Studies not published in English and those lacking relevance to diabetes and cognitive impairment were excluded.

5	Initial Screening	Titles and abstracts of identified studies were reviewed to assess their relevance to the research topic.
6	Full Text Evaluation	Full-text articles that passed initial screening were evaluated according to predefined study criteria.
7	Data Extraction	Data on author, year, study setting, sample size, mean age, gender distribution, mean MoCA score, and affected cognitive domains were extracted and tabulated.
8	Systematic Review	A comprehensive review was employed to identify common themes, trends, and to summarize findings.

Table 1: Description of steps and stages of narrative review.

Author/year study design setting	Sample size	Mean Age of T2DM in Years	Prevalence of MCI	Gender difference in MCI	Moca cut off language, mean moca	Domains Affected
Ray., *et al*. (2025) Cross sectional West Bengal	110	55.71 ± 5.02.	55%	44% Males, 19% Females	MoCA<26 25.41 ± 2.62	Memory (delayed recall ↓), Attention (reduced focus), Executive (visuospatial impairment)
Raguveera., *et al*. (2025) Cross sectional Karnataka	108	52.94 ± 12.2	58.30%	57.5% Males, 60% Females	MoCA<26	Memory (recall deficits), Attention (reduced focus), Executive (planning difficulty), Visuospatial (spatial errors)
Ramani., *et al*. (2025) Case control Kerala	300 (150 T2DM, 150 non-Diabetic)	62.4 ± 8.1	Percentage not given majority if them affected	No difference noted in gender	MoCA (<26), MMSE (<24), 22.3 ± 8.8	Memory (recall ↓), Attention (↓), Executive (↓), Processing speed (↓), Language (↓)
Bhosale., *et al*. (2025) Cross sectional Maharashtra	150	54 ± 8.7	72%	34% Males, 30% Females	MoCA (<26 = Cognitive Impairment) 21.9 ± 4.0	Executive/Visuospatial (most affected), Memory (delayed recall ↓), Language (↓), Attention (least affected)
Chatterjee., *et al*. (2025) Cross sectional study, West Bengal	120	44.2 ± 6.8	41.70%	38% Males, 46% Females	MoCA (<26), MMSE (<24), ACE-III (<88 for MCI) 24.1 ± 2.9	Memory (most affected), Fluency (↓), Visuospatial (↓), Attention (no major change)
Suvvari., *et al*. (2024) Cross sectional Andhra Pradesh	96	50.37 ± 10.27	56%	Similarly affected	MoCA (<26 = Cognitive Impairment), Telugu version 25.14 ± 1.63	Attention (most affected), Memory (delayed recall ↓), Language (↓), Executive (↓)

Vijayanand., *et al*. (2023) Cross Sectional Tamil Nadu	170	82.4% (Above 40 years)	10%	Males (9.7%), Females (10.4) There is no significant association of gender	MMSE<24, MoCA:<26	Memory (learning difficulty), Attention (poor concentration), Executive (decision-making issues)
Kinnatingal., *et al*. (2023) Case control Karnataka	200 (100 T2DM, 100 non-Diabetic)	51 ± 9	71.42%	Females are more affected	MoCA<26 18.99 ± 0.48	Memory (delayed recall ↓), Attention (focus ↓), Executive/Visuospatial (planning and spatial ↓), Abstraction ↓
Godhasara., *et al*. (2021) Cross sectional Ahmedabad	50	45.12 ± 9.25	48%	41.7% Males, 58.3% Females	MoCA<26	Attention (most affected), Memory (recall ↓), Visuospatial (moderate), Naming (least affected)
Chakaraborthy. *et al*(2021),Cross sectional study Karnataka	1278	58.4	35.80%	28.1 Males, 49.6 Females	MoCA (<26), MMSE (<24), ACE-III (<88 for MCI)	Memory (most affected), Fluency (↓), Visuospatial (↓), Attention (no major change)
Lalithambika., *et al*. (2019) Cross sectional Kerala	70	53.3 ± 7.69	54.29%	Percentage not given females more affected	MoCA(<26 = Mild Cognitive Impairment)	Executive (↓), Memory (↓), Attention (↓), Language (↓), Naming (↓)
Yerrapragada., *et al*. (2019) Cross sectional Karnataka	194	56.2% (Above 65 years),83.5%(Above 55%)	50.50%	40% Males, 59% Females	MoCA (<26 = Cognitive Impairment) (Kannada version) (Mean appraxation 1.78)	Memory (↓), Attention (↓), Executive/Visuospatial (↓), Abstraction (least affected)
Mishra., *et al*. (2019) Case control Karnataka	100 (50+50)	age group (40-65 years)	44%	62% Males and 38% Females.	MMSE (<24), MoCA (<26)	Memory (↓), Attention and Calculation (↓), Language (↓), Executive function (↓)
Kant., *et al*. (2018), Retrospective cohort Uttar Pradesh	678	57.45 ± 8.264	43.21%	37.7% Males, 63.3% Females	17.21 ± 4.78	Visuospatial/executive, attention, language, abstraction, orientation; memory

Table 2: A summary of the key finding of the reviewed articles.

Conclusion

From being just a clinical illness, diabetic mellitus has become a major public health issue leading to a high medical expense, reduces the quality of life and has a greater impact on the lives of vulnerable population. With prevalence projected to reach nearly 80 million cases in India by 2030 and the country being known as the "diabetic capital of the world" is justified. Even though many people are developing diabetes, mild cognitive decline is often unnoticed or undiagnosed in routine care. Certain symptoms like problem with thinking, decision making, memory and difficulty in planning daily tasks are often missed in type 2 diabetes patients. This may disturb the everyday activities in later stages which ultimately affects the management of the disease by increasing the chances of both hypoglycemia and hyperglycemia most cases diabetes management does not include the cognitive evaluation/assessment as a part of the routine examination unlike the importance given to the other organs like heart, kidneys and eyes. Simple assessment tool like MoCA can be used not only to identify the early screening but also to evaluate the improvement in cognitive domains after cognitive intervention. This review highlights the need to indicate the importance of cognitive impairment as a hidden complication in diabetic patients that must be identified in early screening and subsequent intervention and patient education. A Holistic management of diabetes should include tight glycaemia control, treatment of hypertension and addressing comorbidities such as neuropathy, nephropathy, retinopathy, foot ulcer, thyroid dysfunction and cognitive health as well. Early screening of MCI can help patients understand their condition and work for better improvement with proper planning and the management. It can also decelerate further progression of mild cognitive impairment to dementia. Routine screening should be initiated in the early stages of diabetes a part of standard diabetic management to improve overall patient's physical and mental health both in India and worldwide.

Acknowledgement

We would like to sincerely thank our mentors and institution for their guidance and support throughout this work. We are also grateful to all the researchers whose studies contributed to this review. A Special mention of gratitude to Sakthi Aiswarya. M MPT(Neurology) who has been a constant support throughout the process.

Conflict of Interest

We don't have any conflict of interest.

Bibliography

1. International Diabetes Federation. "IDF Diabetes Atlas". 11th ed., International Diabetes Federation (2025).
2. Saeedi P., *et al*. "Global and Regional Diabetes Prevalence Estimates for 2019 and Projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th Edition". *Diabetes Research and Clinical Practice* 157 (2019): 107843.
3. Teufel F., *et al*. "Global, Regional, and National Estimates of Undiagnosed Diabetes in Adults: Findings from the 2025 IDF Diabetes Atlas". *Diabetes Care* 49.3 (2026): 490-496.
4. Mohan V and M Tiwaskar. "The Unrelenting Epidemic of Diabetes in India: Do the Numbers Matter?" *Journal of the Association of Physicians of India* 73.5 (2025): 12-13.
5. Newtonraj A and K S Kannan. "Time Series Forecasting and Projection of Diabetes Prevalence in India from 2023 to 2035: A Cross-Sectional Study". *Journal of Clinical and Diagnostic Research* 18.10 (2024): LC01-LC05.
6. Lalithambika CV., *et al*. "Prevalence of Mild Cognitive Impairment in Type 2 Diabetes Mellitus and Its Correlation with Glycemic Control". *Journal of Clinical and Diagnostic Research* 19.3 (2025): OC01-OC05.
7. Beckman J A and MA Creager. "Vascular Complications of Diabetes". *Circulation Research* 118.11 (2016): 1771-1785.
8. Aderinto N., *et al*. "The Impact of Diabetes in Cognitive Imppairment: A Review of Current Evidence and Prospects for Future Investigations". *Medicine* 102.43 (2023): e35557.
9. Biessels G J and R A Whitmer. "Cognitive Dysfunction in Diabetes: How to Implement Emerging Guidelines". *Diabetologia* 63.1 (2020): 3-9.
10. Koekkoek PS., *et al*. "Cognitive Function in Patients with Diabetes Mellitus: Guidance for Daily Care". *The Lancet Neurology* 14.3 (2015): 329-340.
11. Chakraborty S., *et al*. "Prevalence and Risk Factors of Mild Cognitive Impairment in Type 2 Diabetes Mellitus Patients: A Cross-Sectional Study from South India". *International Journal of Diabetes in Developing Countries* 41.3 (2021): 421-428.

12. Raghuveer Pracheth., *et al*. "Prevalence and Factors Associated with Cognitive Impairment among Persons with Type 2 Diabetes Mellitus: A Cross-Sectional Study in Medical College Hospitals of South India". *Clinical Epidemiology and Global Health* 15 (2025): 101-107.

13. Bhosale A., *et al*. "Mild Cognitive Impairment in Type 2 Diabetes Mellitus: Prevalence and Associated Factors in a Tertiary Care Hospital". *Indian Journal of Psychological Medicine* 47.1 (2025): 45-52.

14. Cao F., *et al*. "The Relationship Between Diabetes and Dementia Risk: A Meta-Analysis". *Diabetology and Metabolic Syndrome* 16 (2024): 101.

15. Stanciu GD., *et al*. "Link Between Diabetes and Alzheimer's Disease Due to the Shared Amyloid Aggregation and Deposition". *Journal of Clinical Medicine* 9 (2020): 1713.

16. Liao X., *et al*. "Cognitive Impairment in Type 2 Diabetes: Global Trends and Diagnostic Approaches". *Biomedicines* 13.2 (2025): 473.

17. Saedi E., *et al*. "Diabetes Mellitus and Cognitive Impairments". *World Journal of Diabetes* 7 (2016): 412-422.

18. Aderinto N., *et al*. "The Impact of Diabetes in Cognitive Impairment". *Medicine* 102.43 (2023): e35557.

19. Pinto T C C., *et al*. "Is the Montreal Cognitive Assessment (MoCA) Screening Superior to the Mini-Mental State Examination (MMSE)?" *International Psychogeriatrics* 31.4 (2019): 491-504.

20. Nasreddine Z S., *et al*. "The Montreal Cognitive Assessment (MoCA): A Brief Screening Tool for Mild Cognitive Impairment". *Journal of the American Geriatrics Society* 53.4 (2005): 695-699.

21. Bhosale U., *et al*. "Association Between Cognitive Impairment and Glycemic Control in Type 2 Diabetes". *International Journal of Current Pharmaceutical Research* 17.3 (2025): 45-48.

22. Vijay Anand R., *et al*. "Incidence of Cognitive Impairment Among Adults with Type II Diabetes Mellitus". *International Journal of Academic Medicine and Pharmacy* 5.2 (2023): 1646-1657.

23. Chatterjee, S., *et al*. "Prevalence and Pattern of Cognitive Dysfunction in Type-2 Diabetes". *Journal of Family Medicine and Primary Care* 14.2 (2025.

24. Chakraborty A., *et al*. "Age-Related Prevalence of Mild Cognitive Impairment in Type 2 Diabetes Mellitus". *Frontiers in Endocrinology* 12 (2021): 798652.

25. Thomas P E., *et al*. "Validity and Reliability of Montreal Cognitive Assessment". *Indian Journal of Public Health Research and Development* 9.3 (2018): 173-177.

26. Gupta A., *et al*. "Validity of Montreal Cognitive Assessment to Detect Cognitive Impairment". *Diabetes Therapy* 15.5 (2024): 1155-1168.

27. Mishra R and S G Rajesh. "Association of Cognitive Impairment and Type 2 Diabetes Mellitus". *International Journal of Contemporary Medical Research* 6.12 (2019): L32-L36.

28. Pednekar S., *et al*. "Study of Mild Cognitive Impairment in Type 2 Diabetes Mellitus Patients". *International Journal of Research in Medical Sciences* 4.7 (2016): 2615-2618.

29. Ray S., *et al*. "Relationship Between Cognitive Impairment and Glycemic Management Using MoCA Score". *Medical Research Archives* 13.3 (2025).

30. Suvvari T K and C S Kali. "Association Between Type 2 Diabetes Mellitus and Cognitive Impairment". *Annals of Neurosciences* 33.1 (2026): 59-64.

31. Yerrapragada DB., *et al*. "Cognitive Dysfunction Among Adults with Type 2 Diabetes Mellitus". *Ochsner Journal* 19.3 (2019): 227-234.

32. Khullar S., *et al*. "Prevalence and Predictors of Cognitive Impairment in Type 2 Diabetes". *Journal of Social Health and Diabetes* 5.1 (2017): 47-53.

33. Ramani P N., *et al*. "Assessing Cognitive Impairment in Type 2 Diabetes Mellitus". *International Journal of Medicine and Public Health* 15.1 (2025): 1627-1633.

34. Perabathula SC., *et al*. "Cognitive Impairment in Type 2 Diabetes Mellitus". *Journal of YSR University of Health Sciences* 13.4 (2024): 317-322.

35. Kant S., *et al*. "Assessment of Cognitive Impairment Using ACE and MoCA". *IP Indian Journal of Neurosciences* 4.4 (2018): 185-190.

36. Kinattingal N., *et al*. "Prevalence of Cognitive Decline in Type 2 Diabetes Mellitus Patients". *Journal of Personalized Medicine* 13.3 (2023): 524.

37. Mishra R and S G Rajesh. "Association of Cognitive Impairment and Type 2 Diabetes Mellitus". *International Journal of Contemporary Medical Research* 6.12 (2019): L32-L36.

38. Panse R., *et al*. "Cognitive Impairments and Associated Risk Factors Among Diabetes Patients". *Indian Journal of Public Health Research and Development* 11.1 (2020): 193-198.

39. Godhasara SD and V Suthar. "Prevalence of Cognitive Impairment in Type II Diabetes Mellitus". *International Journal of Health Sciences and Research* 11.11 (2021): 136-142.

40. Varghese S M., *et al*. "Sweet Memories or Not? A Comparative Study on Cognitive Impairment in Diabetes Mellitus". *Frontiers in Public Health* 10 (2022): 822062.