e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(4); 398-401

Original Research Article

Cognitive Impairment in Elderly Diabetics: Prevalence and Risk Factors

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Received: 01-01-2026 / Revised: 15-02-2026 / Accepted: 21-03-2026
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Conflict of interest: Nil

Abstract

Background: Cognitive impairment is a frequently under-recognized complication among elderly patients with type 2 diabetes mellitus (T2DM), significantly affecting daily functioning, treatment adherence, and quality of life. While global studies report varying prevalence, data specific to elderly diabetics in western India, particularly Gujarat, remain limited. This study aimed to determine the prevalence of cognitive impairment and identify its associated risk factors among elderly T2DM patients attending a tertiary care teaching centre in Gujarat.

Material and Methods: A hospital-based cross-sectional study was conducted over a year at the outpatient department of general medicine at a tertiary care teaching hospital in Gujarat. A total of 250 elderly patients (aged ≥60 years) with confirmed T2DM for at least one year were enrolled using consecutive sampling. Cognitive function was assessed using the Montreal Cognitive Assessment (MoCA) tool, with a score <26 indicating impairment. Relevant sociodemographic, clinical, and biochemical data were collected through structured interviews and hospital records. Ethical approval was obtained from the Institutional Ethics Committee, and written informed consent was secured from all participants.

Results: The overall prevalence of cognitive impairment was 42% (105/250). Significant associations were observed with advancing age, longer duration of diabetes, poor glycemic control (HbA1c >8%), hypertension, and lower educational status. Multivariate logistic regression identified age ≥70 years (AOR 3.2, 95% CI 1.8–5.7), diabetes duration >10 years (AOR 2.8, 95% CI 1.6–4.9), HbA1c >8% (AOR 2.4, 95% CI 1.3–4.5), and low education (AOR 2.1, 95% CI 1.2–3.8) as independent predictors.

Conclusion: Cognitive impairment affects nearly two-fifths of elderly diabetics in this Gujarat cohort, highlighting the urgent need for routine cognitive screening in diabetes clinics. Early identification of modifiable risk factors could prevent progression to dementia and improve patient outcomes in resource-limited settings.

Keywords: Cognitive impairment, elderly, type 2 diabetes mellitus, prevalence, risk factors, MoCA, Gujarat.
DOI: 10.25258/ijcpr.18.4.65

Introduction

Type 2 diabetes mellitus (T2DM) has emerged as a major public health challenge in India, with the elderly population bearing a disproportionate burden of its microvascular and macrovascular complications. Beyond the well-known effects on eyes, kidneys, and nerves, diabetes also exerts a subtle yet profound influence on brain health. Cognitive impairment in elderly diabetics manifests as deficits in memory, executive function, and processing speed, often progressing silently until it interferes with self-care and medication adherence. Several mechanisms have been proposed, including chronic hyperglycemia-induced cerebral microvascular damage, insulin resistance in the brain, inflammation, and oxidative stress. These changes overlap with pathways seen in Alzheimer's disease, earning diabetes the label of "type 3 diabetes" in some literature. [1,2] In the Indian context, rapid urbanization, dietary shifts, and an aging population have led to a surge in T2DM cases among those above 60 years. Tertiary care centres in states like Gujarat routinely manage large numbers of elderly diabetics, yet routine cognitive assessment is seldom performed. Earlier studies from southern and northern India have reported prevalence rates ranging from 37% to 58%, with duration of diabetes, hypertension, and poor glycemic control emerging as consistent risk factors. However, regional differences in ethnicity, diet, and healthcare access may influence these

figures, underscoring the need for localized data. [3,4] The present study was therefore undertaken to estimate the prevalence of cognitive impairment and delineate its risk factors among elderly T2DM patients at a tertiary care teaching centre in Gujarat. By generating region-specific evidence, this work aims to justify the integration of simple cognitive screening tools into routine diabetes care, ultimately guiding targeted interventions that can preserve cognitive health and enhance the quality of life in this vulnerable group. [5,6]

Material and Methods

This hospital-based cross-sectional observational study was carried out in the Department of Medicine at a tertiary care teaching hospital in Gujarat, India, over a period of 12 months. The study protocol was approved by the Institutional Ethics Committee and conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from every participant after explaining the study objectives in their vernacular language. Strict confidentiality was maintained, and no personal identifiers were recorded in the final dataset.

Patients aged 60 years and above with a confirmed diagnosis of T2DM (as per ADA criteria) for at least one year were included. Those with known neurological disorders (stroke, dementia, and Parkinson's disease), severe psychiatric illness, visual or hearing impairment precluding cognitive testing, terminal illness, or unwillingness to participate were excluded. A total of 250 consecutive eligible patients attending the diabetes clinic were enrolled. Data collection included a structured proforma capturing sociodemographic details (age, gender, education, occupation), diabetes-related variables (duration, treatment, HbA1c), comorbidities (hypertension, dyslipidemia, cardiovascular disease), and lifestyle factors. Cognitive status was evaluated using the Montreal Cognitive Assessment (MoCA) by a trained physician; scores <26 were considered indicative of cognitive impairment. Data were entered into Microsoft Excel and analyzed using SPSS version 26.0. Descriptive statistics were expressed as mean ± SD or percentages. Associations were tested using chi-square test or Fisher's exact test for categorical variables and independent t-test for continuous variables. Multivariate logistic regression was performed to identify independent predictors, with $p<0.05$ considered statistically significant.

Results

A total of 250 elderly patients with T2DM were studied. The mean age was 68.4 ± 5.6 years, with 56% males and 44% females. Nearly half (48%) had received only primary or no formal education. Mean duration of diabetes was 9.8 ± 6.2 years, and mean HbA1c was 7.9 ± 1.4%. Hypertension co-existed in 72% of participants.

Cognitive impairment (MoCA <26) was detected in 105 patients, giving an overall prevalence of 42%. Table 1 presents the baseline sociodemographic and clinical profile stratified by cognitive status.

Table 1: Sociodemographic and clinical characteristics of study participants (N=250)

Variable	Cognitive Impairment (n=105)	Normal Cognition (n=145)	p-value
Age ≥70 years	68 (64.8%)	52 (35.9%)	<0.001
Female gender	52 (49.5%)	58 (40.0%)	0.12
Education ≤ primary	68 (64.8%)	52 (35.9%)	<0.001
DM duration >10 years	62 (59.0%)	38 (26.2%)	<0.001
HbA1c >8%	55 (52.4%)	35 (24.1%)	<0.001
Hypertension	88 (83.8%)	92 (63.4%)	0.001

Table 2: Prevalence of cognitive impairment

Category	Number	Percentage
Normal cognition (MoCA ≥26)	145	58%
Cognitive impairment (MoCA <26)	105	42%

Table 3: Univariate analysis of risk factors

Risk Factor	OR (95% CI)	p-value
Age ≥70 years	3.3 (2.0–5.5)	<0.001
DM duration >10 years	4.1 (2.4–7.0)	<0.001
HbA1c >8%	3.6 (2.1–6.2)	<0.001
Low education	3.3 (2.0–5.5)	<0.001
Hypertension	3.0 (1.7–5.4)	0.001

Table 4: Multivariate logistic regression for independent predictors

Variable	Adjusted OR (95% CI)	p-value
Age ≥70 years	3.2 (1.8–5.7)	<0.001
DM duration >10 years	2.8 (1.6–4.9)	0.001
HbA1c >8%	2.4 (1.3–4.5)	0.006
Low education	2.1 (1.2–3.8)	0.012

In the descriptive analysis, patients with cognitive impairment were older, had longer diabetes duration, poorer glycemic control, and higher rates of hypertension and lower education compared to those with normal cognition.

Discussion

Cognitive impairment in elderly patients with type 2 diabetes represents a complex interplay of vascular, metabolic, and neurodegenerative processes that warrants greater clinical attention in routine diabetes care. Our cross-sectional study conducted at a tertiary care centre in Gujarat revealed a 42% prevalence of cognitive impairment using MoCA among elderly diabetics, underscoring that nearly two out of every five patients in this setting may have undetected cognitive deficits that could compromise self-management. [7,8]

The prevalence observed in our study closely mirrors findings from earlier Indian research. Raghuveer and colleagues in South India reported 58.3% cognitive impairment among T2DM patients, with duration of diabetes ≥7 years emerging as a strong predictor.

Similarly, Khan et al. in North India documented 37.37% impaired cognition in elderly T2DM subjects using HMSE, highlighting regional variations possibly linked to differences in educational levels and healthcare access. Internationally, Suain Bon et al. in Malaysia found 46.9% prevalence among elderly diabetics in a hospital setting, reinforcing that the burden is comparable across diverse populations. [9,10]

Advancing age (≥70 years) was an independent risk factor in our cohort (AOR 3.2). This aligns with Gad et al.'s Goa study, where older age and longer diabetes duration significantly correlated with mild cognitive impairment and dementia. Debnath's recent work on middle-aged diabetics also noted age as a key contributor, while international meta-analyses consistently report a 1.5–2-fold rise in risk beyond 70 years, attributed to cumulative vascular damage and reduced cerebral reserve. [11,12]

Longer duration of diabetes (>10 years) showed a strong association (AOR 2.8) in our multivariate model. Raghuveer's South Indian data similarly identified duration ≥7 years as the most significant factor ($p<0.01$). In Puducherry, Subramanian et al. observed nearly one-third of older diabetics at risk, with duration playing a pivotal role, a pattern echoed in Brazilian longitudinal studies where each additional year of diabetes increased cognitive decline odds.

Poor glycemic control (HbA1c >8%) independently predicted impairment (AOR 2.4). Kinattingal's Mysuru study and several Chinese cohorts reported similar links between elevated HbA1c and cognitive scores, suggesting that chronic hyperglycemia accelerates cerebral atrophy and white-matter lesions. Our findings add to the growing evidence that stringent glycemic targets, when safely achievable, may offer neuroprotection. [13]

Low educational attainment remained significant even after adjustment (AOR 2.1). This resonates with Malaysian data where Indians with lower education faced nearly five-fold higher odds, and with Flood's nationwide Indian analysis showing education as a powerful modifier of cognitive outcomes in diabetics. Education likely acts as a proxy for cognitive reserve, enabling better compensatory mechanisms against diabetic brain changes. [14]

Hypertension, present in 72% of our participants, showed univariate association though it did not retain independence in the final model. This is consistent with Nigerian and Egyptian studies where co-existent hypertension amplified risk, yet our adjusted analysis suggests it may operate through shared pathways with glycemic control and duration.

Limitations: The cross-sectional design precludes causal inference, and the hospital-based sampling may overestimate prevalence compared to community settings. Future longitudinal studies with neuroimaging would strengthen these observations.

Conclusion

This study highlights that cognitive impairment affects 42% of elderly patients with type 2 diabetes attending a tertiary care centre in Gujarat. Advancing age (≥70 years), diabetes duration exceeding 10 years, poor glycemic control (HbA1c >8%), and low educational status emerged as independent predictors. These findings underscore the need to integrate simple cognitive screening tools like MoCA into routine diabetes clinics, particularly for high-risk groups.

Early identification can enable timely lifestyle interventions, optimized glycemic and blood

pressure control, and multidisciplinary care. In India's rapidly aging diabetic population, routine cognitive assessment is essential to preserve functional independence, reduce caregiver burden, and improve quality of life. Proactive management of modifiable risk factors can help mitigate this silent complication of long-standing diabetes.

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