



Original Research Article

Drug Utilization Study and Prevalence of Cognitive Dysfunction in Diabetes Mellitus

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Name of Author:

Sharma A., Arora S., Gil T.K., Mengi A., Sodhi A., Baldi A., Sharma D.K.

Corresponding Author:

Sharma A

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Abstract: Diabetes mellitus (DM) is a global public health concern, not only for its classic metabolic complications but also for its profound impact on cognitive function. This article explores the drug utilization patterns in diabetic populations and provides a contemporary review of the prevalence and determinants of cognitive dysfunction among individuals with diabetes. The interplay of comorbid conditions, polypharmacy, drug selection, and neurocognitive health is discussed, supported by data tables and summary graphs.

Keywords: Diabetes mellitus, cognitive dysfunction, drug utilization, polypharmacy, comorbidities.

INTRODUCTION

The dual burden of diabetes mellitus and cognitive dysfunction represents a growing challenge for clinicians and healthcare systems. While tight glycemic control is sustained through tailored pharmacotherapy, emerging literature highlights that both the disease and its treatment may influence cognition. Understanding drug utilization patterns alongside the high prevalence and risk factors of cognitive impairment in diabetes is necessary for optimal patient care.

Drug Utilization Patterns in Diabetes Mellitus

Demographics and Polypharmacy

- The majority of patients with type 2 diabetes mellitus are treated with more than one antidiabetic agent.
- Polypharmacy is common due to the need for comorbidity management (hypertension, dyslipidemia, etc.), with average drug counts per prescription ranging from 4–5 drugs in several studies^{[1][2]}.
- Male predominance is often observed in Indian and global cohorts^[1].

Classes of Antidiabetic Drugs Prescribed

Drug Class	Example Drugs	Utilization in T2DM (%)
Biguanides	Metformin	79.6 - 97.5
Sulfonylureas	Glimepiride, Glyburide	44 - 67

DPP-4 Inhibitors	Sitagliptin, Vildagliptin	1.5 - 15
Alpha-Glucosidase Inhibitors	Voglibose	7
Thiazolidinediones (TZDs)	Pioglitazone	4.5
Insulin	Basal, Premixed types	7 - 17.7

- Fixed drug combinations (e.g., glimepiride + metformin) are preferred for convenience and better glycemic control^{[3][11]}.
- Injectable insulins are usually reserved for advanced or uncontrolled cases or during hospitalization^{[3][11]}.
- Use of DPP-4 inhibitors and GLP-1 agonists is increasing in tertiary settings^[4].

Drug Utilization Trends

- Metformin remains the foundational agent unless contraindicated.
- Combination therapies and newer classes (DPP-4, SGLT-2 inhibitors, GLP-1 agonists) are increasingly prescribed for improved glycemic and cardiovascular outcomes^{[4][5]}.
- Concomitant use of antihypertensives, statins, antiplatelets, and PPI is frequent.

Prevalence of Cognitive Dysfunction in Diabetes Mellitus

Overview

- Diabetic patients show a significantly higher prevalence of cognitive dysfunction compared to non-diabetics. Impairments range from mild cognitive impairment (MCI) to established dementia.
- Cognitive domains commonly affected include attention, memory, executive function, language, and visuospatial ability^{[6][7]}.

Prevalence Rates

Study / Population	Diagnostic Tool	Prevalence (%)	Noted Risk Factors
Fiche Hospital, Ethiopia (2024)	MMSE	56.3	Type II DM, low education, poor control, alcohol use ^[8]
China, multicentric (2024)	Various/MoCA	40.6	Female, duration >13.5 yrs, low education, high Na ⁺ ^[9]
Kerala, India (2022)	ACE/III, MoCA	54–63.8	Age, hypertension, vascular events ^[7]
Mysuru, India (2023)	MoCA	High (mean MoCA 18.99)	Age, glycemic variability ^[6]
Indonesia (2024)	MoCA	48	Poor HbA1c, lower adherence ^[10]

- Overall, between 40% and 64% of diabetes patients have measurable cognitive impairment, with rates higher for those with longer diabetes duration, uncontrolled glycemia, and comorbid conditions^{[8][6][7][10]}.

Major Associated Risk Factors

- **Duration of diabetes:** Risk increases sharply beyond 10–14 years of disease^{[9][7]}.
- **Glycemic control:** Uncontrolled blood sugar and high HbA1c are strongly linked^{[8][11]}.
- **Educational status:** Lower education correlates with higher prevalence^{[8][9]}.
- **Age and sex:** Older age and female sex have higher risk in some studies^[9].
- **Comorbidities:** Hypertension, cardiovascular disease, and previous cerebrovascular events contribute independently^[7].

Graph: Prevalence of Cognitive Impairment by Study

Study	Location	Prevalence (%)
Ethiopia (2024)		56.3
China (2024)		40.6

	Kerala,	India	(2022)		54.3	-	63.8	
	Indonesia	(2024)				48		

Impact on Patient Outcomes
Cognitive impairment adversely affects diabetes self-management, medication adherence, and increases the risk for poor outcomes such as severe hypoglycemia, falls, and rehospitalization^[11].

Relationship Between Drug Utilization and Cognitive Outcomes
Influence of Specific Antidiabetic Medications

- **Metformin:** Multiple studies suggest metformin may have a beneficial or neutral effect on cognitive decline and may improve MCI when compared to insulin alone^{[2][5]}.
- **GLP-1 receptor agonists, DPP-4 inhibitors, SGLT-2 inhibitors:** Emerging evidence shows these agents may reduce the incidence or severity of cognitive impairment versus other antidiabetics, particularly insulin.
- **Insulin:** Monotherapy with insulin is linked to a higher incidence of dementia and cognitive dysfunction, potentially due to hypoglycemia risk and more advanced disease status^{[5][9]}.

Table: Cognitive Outcomes Associated with Antidiabetic Medications

Antidiabetic Regimen	Association with Cognitive Dysfunction
Metformin alone/improved glycemic agents	Protective or neutral effect
GLP-1, DPP-4, SGLT-2 inhibitor-based combinations	Most protective effect
Insulin <i>alone</i>	Increased risk of cognitive impairment
Metformin + insulin	Comparable benefit to metformin alone

Medication Adherence and Cognition

- Studies have found a significant association between cognitive impairment and poor medication adherence in diabetics. Poor cognitive function leads to lower capacity for self-care, identifying a population at higher risk for complications^[11].

DISCUSSION

Both drug utilization patterns and the prevalence of cognitive dysfunction in diabetics reveal critical opportunities for patient-centered care in diabetes management:

- Polypharmacy remains high, including for non-antidiabetic drugs, underscoring a need for rational prescribing and review for drug–drug interactions.
- Cognitive impairment is prevalent and multifactorial in diabetes populations; routine screening is warranted, especially for those with long-standing diabetes and high-risk profiles.
- Choice of antidiabetic regimen may impact cognitive outcomes, with growing support for metformin-based and incretin-based agents conferring protective benefits.

Clinical Recommendations

- Employ metformin as first-line and prefer combination regimens with GLP-1/DPP-4/SGLT-2 inhibitors where feasible to optimize metabolic and cognitive health^{[5][9]}.
- Implement regular cognitive screening protocols for diabetics, particularly those over 60, with long disease duration, or existing comorbidities.
- Educate patients and caregivers on the importance of medication adherence and cognition, and consider simplifying regimens in those who develop impairment.

CONCLUSION

Drug utilization in diabetes is characterized by frequent polypharmacy and reliance on metformin-based regimens, with a trend toward novel incretin-based therapies. Cognitive dysfunction is highly prevalent, affecting at least 40–60% of diabetics depending on population and assessment method. Proactive medication optimization, screening, and individualized care strategies are vital to mitigate risks, improve outcomes, and preserve quality of life in this vulnerable group.

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