

Original Research Article

POLYPHARMACY AMONG DIABETIC ELDERLY: A CROSS-SECTIONAL STUDY

Solomon Rajkumar¹, Akila. E², Meera.S³, Priyadharshini Dharmalingam⁴

¹Assistant Professor, Department of Community Medicine, Panimalar Medical College Hospital and Research Institute, Chennai, India.

²Assistant Professor, Department of Pharmacology, Government Tiruvallur medical College, Tamilnadu, India.

³Tutor, Department of Community Medicine, Government Tiruvallur medical College, Tamilnadu, India.

⁴Assistant Professor, Department of Community Medicine, Government Tiruvallur medical College, Tamilnadu, India.

Received : 10/05/2026
Received in revised form : 17/06/2026
Accepted : 02/07/2026

Corresponding Author:

Dr. Priyadharshini Dharmalingam
Assistant Professor, Department of
Community Medicine, Government
Tiruvallur medical College, Tamilnadu,
India.
Email: pd@outlook.in

DOI: 10.70034/ijmedph.2026.3.54

Source of Support: Nil,

Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (3); 336-341

ABSTRACT

Population aging and multi-morbidity among elderly diabetic patients lead to polypharmacy, increasing the risk of adverse drug events, non-adherence, and rising healthcare costs. Objectives: To assess the prevalence of polypharmacy and examine its associated demographic and clinical factors among elderly diabetic patients in Tamil Nadu.

Methodology: A cross-sectional study was conducted in 2025 among 300 randomly selected type 2 diabetes mellitus patients aged ≥ 60 years across public and private facilities in Tamil Nadu. Data were collected via face-to-face interviews using pre-tested questionnaires and verified with medical records. Polypharmacy was defined as using five or more concurrent medications. Statistical analysis was performed using SPSS version 26.0.

Results: The mean age of the participants was 65.3 ± 9.33 years, and 73.3% had co-morbidities. The prevalence of polypharmacy (>5 medications) was 47.0%. Polypharmacy was significantly associated with higher age (69.38 ± 4.6 vs. 63.9 ± 3.7 years; $p=0.002$), longer duration of diabetes ($p=0.01$), and presence of co-morbidities ($p<0.001$). Patients with polypharmacy experienced significantly higher adverse effects (65.2% vs. 45.3%; $p=0.001$), greater treatment non-adherence (64.5% vs. 47.2%; $p=0.003$), increased hospitalization rates ($p<0.001$), and higher monthly expenditure ($p=0.004$). Dizziness (28.0%) and gastritis (18.0%) were the most common side effects.

Conclusion: Polypharmacy is highly prevalent among elderly diabetic patients in Tamil Nadu and is tightly linked to poor clinical and economic outcomes. Routine medication reviews, deprescribing strategies, and multi-disciplinary interventions are essential to optimize therapy.

Keywords: Polypharmacy, diabetes, determinants.

INTRODUCTION

Population ageing and increasing burden of non-communicable diseases (NCDs) are emerging as important public health challenges in the world. Diabetes mellitus (DM), one of the most prevalent chronic diseases in old age, contributes a significant share of morbidity, mortality, disability and healthcare expenditure.^[1] According to the International Diabetes Federation, the global prevalence of diabetes is on the rise with the vast majority of the affected being in the age group of elderly.^[2] India, known as the “diabetes capital of the world”, has witnessed a rapid rise in the number of

people living with diabetes due to urbanisation, sedentary lifestyles, dietary transitions and increased life expectancy.^[3] Being one of the most urbanized states in India, Tamil Nadu is known to have a high prevalence of diabetes and its co-morbidities in its aging population.^[4] Elderly with diabetes often present with multiple coexisting chronic conditions like hypertension, dyslipidemia, ischemic heart disease, chronic kidney disease, osteoarthritis and neuropathy.^[5] The concomitant presence of these co-morbidities necessitates the use of multiple medications for disease management leading to polypharmacy. Polypharmacy is commonly defined as the concurrent use of five or more medications and

is increasingly prevalent among older adults with chronic diseases.^[6] While appropriate polypharmacy may be necessary to achieve therapeutic goals, excess or inappropriate medication use may result in adverse clinical outcomes.^[7] Polypharmacy is a major concern in elderly due to age-related physiological changes affecting drug pharmacokinetics and pharmacodynamics leading to increased risk of adverse drug reactions (ADRs), drug-drug interactions, medication non-adherence, and hospitalizations.^[8] The risk is even higher in diabetic elderly patients as diabetes itself often requires multidrug therapy with oral hypoglycemic agents, insulin, antihypertensives, statins, antiplatelet agents, and medications for associated complications.^[9] Consequently, diabetic elderly patients represent a vulnerable population at increased risk of medication-related problems.

Several studies have reported a high prevalence of polypharmacy among elderly diabetic patients across different countries. Research from developed nations has shown that more than half of older adults with diabetes consume five or more medications regularly.^[10] Similar findings have been reported in low and middle income countries where the burden of multimorbidity is increasing rapidly.^[11] Indian studies have also shown high levels of polypharmacy in elderly patients attending outpatient clinics and tertiary care hospitals, with prevalence ranging from 40% to 80% depending on the setting and definitions used.^[12,13] These findings highlight the growing need to monitor medication use among older diabetic patients.

The consequences of polypharmacy are beyond adverse drug reactions. Studies have reported associations between polypharmacy and increased risks of falls, frailty, cognitive impairment, functional decline, poor quality of life, medication errors and increased healthcare utilization.^[14] Furthermore, the financial expenditure involved in purchasing multiple medications may adversely affect treatment compliance, especially among elderly individuals belonging to lower socioeconomic strata.^[15] Non-compliance with medication due to complex drug regimens may hamper glycemic control and increase the risk of diabetes-related complications, thereby creating a vicious cycle of disease progression and increasing health-care costs.^[16]

The National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) has strengthened NCD clinics across India to provide comprehensive management of chronic diseases including diabetes and hypertension.^[17] These clinics cater to a large number of elderly patients who require long-term pharmacotherapy. However, despite the increasing patient load and widespread use of multiple medications, data on the prevalence and determinants of polypharmacy among diabetic elderly patients attending NCD clinics in Tamil Nadu are limited. Most of the available studies have been conducted in

tertiary care hospitals with a lack of evidence from public-sector NCD clinics that serve as the main point of care for chronic disease management.^[18]

Understanding the extent of polypharmacy and identifying associated factors are vital for the development of strategies for rational prescribing, medication adherence, and minimizing medication-related complications among elderly diabetic patients.^[19] Regular medication review, deprescribing of inappropriate medications, patient education, and multidisciplinary approaches involving physicians, pharmacists, and nurses have been recommended to optimize medication use in older adults.^[20]

In this context, the present study was conducted among elderly diabetic patients attending an NCD clinic in Tamil Nadu to assess the prevalence of polypharmacy and examine the factors associated with the occurrence of polypharmacy. The findings of this study are expected to provide valuable evidence for healthcare providers and policymakers to strengthen medication management practices and improve the quality of care delivered to elderly individuals living with diabetes.

MATERIALS AND METHODS

A cross-sectional study was conducted among elderly diabetic patients attending OPD in both government and private facilities in Tamil Nadu for a period of six months in 2025. The study population included individuals aged 60 years and above, diagnosed with Type 2 Diabetes Mellitus and receiving treatment. Elderly diabetic patients who were willing to participate and gave written informed consent were included in the study. Critically ill patients, those having severe cognitive impairment or psychiatric illness affecting communication and those unwilling to participate were excluded from the study. The sample was determined by random sampling method for 300 patients. The sample size was calculated using sharma et al prevalence with 6% absolute precision and 10% non response rate.^[13] Data was collected by face to face interview using pre-tested semi-structured questionnaire. Information regarding socio-demographic characteristics like age, gender, educational status, occupation, marital status and socio-economic status were obtained. Clinical details like duration of diabetes, presence of comorbidities, diabetic complications, history of hospitalization and treatment modalities were also recorded. Medication-related information was collected from patient interviews and verified using prescriptions, treatment records, and available medication strips. The total number of medications consumed regularly by each participant was documented. Polypharmacy was defined as the concurrent use of five or more medications, including antidiabetic drugs and medications prescribed for associated comorbid conditions.

The collected data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) version 26.0. Descriptive statistics such as mean, standard deviation, frequency, and percentage were used to summarize the study variables. The prevalence of polypharmacy was calculated and expressed as a percentage. Associations between polypharmacy and selected sociodemographic and clinical variables were assessed using the Chi-square test or Fisher's exact

test wherever appropriate. A p-value of less than 0.05 was considered statistically significant.

Prior to data collection, the study was approved by the Institutional Ethics Committee, and permission was obtained from the relevant health authorities. Written informed consent was obtained from each participant. The confidentiality and anonymity of the collected information were maintained, and the data was used only for research purposes.

RESULTS

Table 1: Demographic data

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	Mean $\pm$ SD	65.3 $\pm$ 9.33	
Gender	Male	170	56.7
	Female	130	43.3
Duration of Diabetes Mellitus	<5 years	62	20.7
	5–10 years	143	47.7
	11–15 years	60	20
	>15 years	35	11.7
Comorbidities	Present	220	73.3
	Absent	80	26.7

The study population consisted of 300 elderly patients with diabetes mellitus with the mean age of 65.3 $\pm$ 9.33 years; this implies that the majority of the patients were in the older age group, and males comprised 56.7% of the study group and females 43.3%. Almost half of the study population (47.7%) had diabetes for 5–10 years followed by 20.7% with a duration of diabetes for less than 5 years, and a large percentage (31.7%) had diabetes for more than 10 years. Comorbidities were very high, affecting 73.3% of the study population. These results showed a predominantly elderly diabetic population with a long duration of disease and a high burden of associated chronic illnesses.

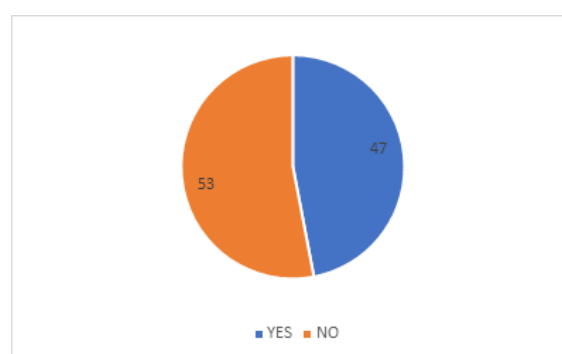


Figure 1: Polypharmacy prevalence

Table 2: Variables related to medication

Variable	Category	Frequency (n)	Percentage (%)
No. of medications involved in polypharmacy	<3	73	24.3
	3–5	86	28.7
	>5	141	47.0
Poor or Non-adherence	Yes	166	55.3
	No	134	44.7
Side Effects	Yes	164	54.7
	No	136	45.3
Details of Side Effects	Dizziness	84	28.0
	Hypoglycemia	26	8.7
	Gastritis	54	18.0
	Falls	32	10.7
Amount of Money Spent (□ PER MONTH)	Mean $\pm$ SD	□1072 $\pm$ 103.81	
Hospitalisation in Past 6 Months	Yes	74	24.7
	No	226	75.3

Around 141 patients (47%) were found to be following polypharmacy. Variables Related to Medication ($\approx$ 100 words) Characteristics related to medication revealed that 47.0% of participants were exposed to polypharmacy with the use of more than five medications concomitantly. Poor or non-adherence to treatment was present in 55.3% of patients, which indicates major problems with

medication compliance. Adverse drug effects were reported by 54.7% of participants, with dizziness being the most common complaint (28.0%), followed by gastritis (18.0%), falls (10.7%), and hypoglycemia (8.7%). The mean monthly expenditure on medications was □1072 $\pm$ 103.81, which signifies a considerable financial burden. Additionally, 24.7% of patients had been hospitalized in the previous six

months, which underscores the clinical impact of diabetes and its treatment-related complications. Polypharmacy was significantly associated with several demographic and clinical factors. Patients with polypharmacy were older than those without polypharmacy (69.38 ± 4.6 vs. 63.9 ± 3.7 years; $p=0.002$). Duration of diabetes was significantly associated with polypharmacy ($p=0.01$). Presence of comorbid conditions was more common in patients with polypharmacy (84.4% vs. 63.5%; $p<0.001$).

Adverse drug effects (65.2% vs. 45.3%; $p=0.001$), non-adherence to treatment (64.5% vs. 47.2%; $p=0.003$), hospitalization (40.4% vs. 10.7% increased risk of hospitalization ($p<0.001$) and higher treatment costs ($p=0.004$). Gender was not significantly associated with polypharmacy ($p=0.61$). These findings demonstrate that polypharmacy has a significant impact on adverse health and economic outcomes in elderly diabetic patients.

Table 3: Bivariate analysis of polypharmacy with other variables

Variable	Category	Polypharmacy Yes (n=141)	Polypharmacy No (n=159)	P value
Age (years)	Mean $\pm$ SD	69.38 $\pm$ 4.6	63.9 $\pm$ 3.7	0.002*
Gender	Male	82 (58.2%)	88 (55.3%)	0.61
	Female	59 (41.8%)	71 (44.7%)	
Duration of DM	<5 years	18 (12.8%)	44 (27.7%)	0.01*
	5–10 years	56 (39.7%)	87 (54.7%)	
	11–15 years	47 (33.3%)	13 (8.2%)	
	>15 years	20 (14.2%)	15 (9.4%)	
Comorbidities	Yes	119 (84.4%)	101 (63.5%)	<0.001*
	No	22 (15.6%)	58 (36.5%)	
Adverse Effects	Yes	92 (65.2%)	72 (45.3%)	0.001*
	No	49 (34.8%)	87 (54.7%)	
Non-adherence	Yes	91 (64.5%)	75 (47.2%)	0.003*
	No	50 (35.5%)	84 (52.8%)	
Hospitalized (past 6months)	Yes	57 (40.4%)	17 (10.7%)	<0.001*
	No	84 (59.6%)	142 (89.3%)	
Cost of Treatment (INR)	Mean $\pm$ SD	1612.11 $\pm$ 194.30	431.03 $\pm$ 67.30	0.004*

DISCUSSION

This cross-sectional study assessed the prevalence of polypharmacy and its associated factors among elderly diabetic patients attending an NCD clinic in Tamil Nadu. The findings revealed that nearly half of the participants (47.0%) were exposed to polypharmacy, defined as the concurrent use of more than five medications. The study also demonstrated significant associations between polypharmacy and increasing age, longer duration of diabetes, presence of comorbidities, adverse drug effects, medication non-adherence, hospitalization, and higher treatment costs.

The mean age of participants was 65.3 ± 9.33 years, indicating that the study population largely consisted of older adults. Similar age distributions have been reported in studies conducted among elderly diabetic populations in India and other countries.^[4,5] The predominance of males (56.7%) observed in the present study is consistent with findings from several Indian studies where men constituted a higher proportion of patients attending diabetes clinics.^[12,13] However, gender was not significantly associated with polypharmacy in the present study ($p=0.61$), which is in agreement with the findings of Wastesson et al,^[10] who reported that medication burden in older adults is more strongly influenced by multimorbidity than by gender.

The prevalence of polypharmacy in the present study was 47.0%, which is comparable to the prevalence reported in elderly populations by Jhaveri et al,^[12] and Sharma et al,^[13] who found prevalence rates ranging from 50% to 60%. Although some

international studies have reported higher prevalence estimates of 60–70% among elderly diabetic patients,^[10,11] the slightly lower prevalence observed in the present study may reflect differences in healthcare settings, prescribing practices, and accessibility to medications in public-sector NCD clinics. Nevertheless, the finding indicates that almost one in every two elderly diabetic patients is exposed to multiple medications, highlighting polypharmacy as an important clinical issue.

Duration of diabetes showed a significant association with polypharmacy ($p=0.01$). Patients with diabetes duration exceeding ten years were more likely to experience polypharmacy than those with shorter disease duration. This finding is biologically plausible because prolonged diabetes is associated with the development of microvascular and macrovascular complications, requiring additional medications for glycemic control and management of associated conditions. Similar observations have been reported by Sinclair et al,^[5] who noted that longer disease duration increases the complexity of therapeutic regimens among older diabetic adults.

A notable finding of the present study was the high prevalence of comorbidities (73.3%). Furthermore, comorbid conditions were significantly more common among patients with polypharmacy than among those without polypharmacy (84.4% versus 63.5%; $p<0.001$). This finding supports the concept that multimorbidity is one of the primary drivers of polypharmacy in older adults. Studies by Maher et al,^[7] and Midão et al,^[11] similarly reported that elderly patients with multiple chronic diseases require complex medication regimens, thereby

increasing the risk of polypharmacy. Hypertension, cardiovascular disease, dyslipidemia, and chronic kidney disease frequently coexist with diabetes and contribute substantially to medication burden.

The study also found that adverse drug effects were reported by 54.7% of participants, with dizziness being the most common complaint, followed by gastritis, falls, and hypoglycemia. Importantly, adverse effects were significantly more common among patients with polypharmacy (65.2%) than among those without polypharmacy (45.3%) ($p=0.001$). This observation is consistent with previous studies indicating that the likelihood of adverse drug reactions increases with the number of medications prescribed.^[7,8] Age-related physiological changes affecting drug metabolism and elimination further increase susceptibility to medication-related complications among elderly individuals.^[8] The occurrence of dizziness and falls observed in the present study is particularly concerning because falls contribute significantly to disability, fractures, and loss of independence among older adults.

Medication adherence remains a critical challenge in diabetes management. In the present study, 55.3% of participants exhibited poor or non-adherence to treatment, and non-adherence was significantly associated with polypharmacy (64.5% vs. 47.2%; $p=0.003$). This finding aligns with the work of Kardas et al,^[16] who reported that increasing medication complexity negatively influences adherence behavior. Elderly patients often face difficulties in remembering multiple medications, understanding dosing schedules, and managing treatment costs. Consequently, complex medication regimens may reduce compliance and compromise glycemic control, thereby increasing the risk of diabetes-related complications.

Hospitalization was another important outcome associated with polypharmacy. Nearly one-fourth (24.7%) of participants reported hospitalization within the previous six months. Among patients with polypharmacy, hospitalization rates were significantly higher compared with those without polypharmacy (40.4% versus 10.7%; $p<0.001$). These findings are consistent with those reported by Fried et al,^[14] who demonstrated that polypharmacy is associated with increased healthcare utilization, including emergency visits and hospital admissions. Medication-related adverse events, poor adherence, and worsening comorbid conditions may contribute to this increased hospitalization risk. The findings underscore the importance of routine medication review and monitoring among elderly diabetic patients.

The economic implications of polypharmacy were also evident in this study. The mean monthly expenditure on medications was $\text{₹}1072 \pm 103.81$, and patients with polypharmacy incurred substantially higher treatment costs than those without polypharmacy ($\text{₹}1612.11 \pm 194.30$ versus $\text{₹}431.03 \pm 67.30$; $p=0.004$). Similar findings have been documented by Khezrian et al,^[15] who reported

that polypharmacy contributes significantly to healthcare expenditures among older adults. Increased medication costs may create financial barriers to adherence, particularly among elderly individuals who depend on fixed incomes or family support. Therefore, the economic burden associated with polypharmacy deserves attention alongside its clinical consequences.

The findings of the present study reinforce recommendations made by Rankin et al,^[19] and Scott et al,^[20] who emphasized the importance of medication review, deprescribing of inappropriate medications, and multidisciplinary approaches to optimize pharmacotherapy in older adults. Regular assessment of medication necessity, screening for drug-drug interactions, and patient counseling can help reduce unnecessary medication use and improve treatment outcomes.

CONCLUSION

Overall, the present study demonstrates that polypharmacy is a common and clinically significant problem among elderly diabetic patients attending NCD clinics in Tamil Nadu. Nearly half of the study population experienced polypharmacy, which was strongly associated with older age, longer duration of diabetes, comorbidities, adverse drug effects, poor adherence, increased hospitalization, and higher treatment costs. These findings highlight the need for targeted interventions aimed at rational prescribing and comprehensive medication management to improve the quality of care and health outcomes among elderly diabetic patients.

Acknowledgement: Author would like to thank participants for their active participation

Conflict of interest: Nil

Funding: Nil

REFERENCES

1. World Health Organization. Ageing and health. Geneva: WHO; 2024.
2. International Diabetes Federation. IDF Diabetes Atlas, 10th ed. Brussels: IDF; 2021.
3. Anjana RM, Deepa M, Pradeepa R, et al. Prevalence of diabetes and prediabetes in India. *Diabetologia*. 2017;60(11):2245-2253.
4. Mohan V, Pradeepa R. Epidemiology of diabetes in Tamil Nadu. *Indian J Endocrinol Metab*. 2020;24(4):301-308.
5. Sinclair AJ, Abdelhafiz AH, Rodríguez-Mañas L. Diabetes and global ageing among older people. *Diabetes Res Clin Pract*. 2015;108(2):123-135.
6. Masnoon N, Shakib S, Kalisch-Ellett L, Caughey GE. What is polypharmacy? A systematic review. *BMC Geriatr*. 2017;17:230.
7. Maher RL, Hanlon J, Hajjar ER. Clinical consequences of polypharmacy in elderly. *Expert Opin Drug Saf*. 2014;13(1):57-65.
8. Mangoni AA, Jackson SHD. Age-related changes in pharmacokinetics and pharmacodynamics. *Br J Clin Pharmacol*. 2004;57(1):6-14.
9. American Diabetes Association. Standards of Care in Diabetes 2025. *Diabetes Care*. 2025;48(Suppl 1):S1-S350.
10. Wastesson JW, Morin L, Tan ECK, Johnell K. Polypharmacy in older adults. *Clin Geriatr Med*. 2018;34(2):255-265.

11. Midão L, Giardini A, Menditto E, et al. Polypharmacy prevalence among older adults. *Int J Environ Res Public Health*. 2018;15(12):2799.
12. Jhaveri BN, Patel TK, Barvaliya MJ, et al. Utilization pattern of medicines among elderly patients. *J Pharmacol Pharmacother*. 2014;5(1):15-20.
13. Sharma M, Lohiya A, Gupta VK. Polypharmacy and prescribing patterns in elderly Indian patients. *J Family Med Prim Care*. 2021;10(3):1245-1251.
14. Fried TR, O'Leary J, Towle V, et al. Health outcomes associated with polypharmacy. *J Am Geriatr Soc*. 2014;62(12):2261-2272.
15. Khezrian M, McNeil CJ, Murray AD, Myint PK. Polypharmacy and healthcare costs. *Ther Adv Drug Saf*. 2020;11:1-12.
16. Kardas P, Lewek P, Matyjaszczyk M. Determinants of patient adherence. *Front Pharmacol*. 2013;4:91.
17. Ministry of Health and Family Welfare, Government of India. Operational Guidelines: NPCDCS. New Delhi; 2023.
18. Pradeepa R, Mohan V. Diabetes care in India: Challenges and opportunities. *J Assoc Physicians India*. 2021;69(5):11-13.
19. Rankin A, Cadogan CA, Patterson SM, et al. Interventions to improve appropriate polypharmacy. *Cochrane Database Syst Rev*. 2018;9:CD008165.
20. Scott IA, Hilmer SN, Reeve E, et al. Reducing inappropriate polypharmacy: The process of deprescribing. *JAMA Intern Med*. 2015;175(5):827-834.