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Original Research Article

A Study of Polypharmacy in Elderly Diabetics

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Abstract:

Background: Polypharmacy is increasingly common among elderly individuals with type 2 diabetes mellitus (T2DM) due to multiple comorbidities requiring complex pharmacotherapy. It poses risks such as adverse drug reactions, drug interactions, and functional decline.

Objective: To assess the prevalence, patterns, and associated factors of polypharmacy in elderly patients with T2DM.

Methods: This prospective observational study was conducted over one year in a tertiary care hospital and included 180 elderly diabetic patients (aged ≥60 years). Data on demographics, comorbidities, medications, and functional status were collected and analyzed using descriptive and inferential statistics.

Results: Polypharmacy (≥5 medications) was observed in 70% of patients, and excessive polypharmacy (≥10 medications) in 15.6%. Common drug classes included oral hypoglycemics, antihypertensives, and statins. Significant associations were found between polypharmacy and older age, ≥2 comorbidities, chronic kidney disease, and low ADL scores ($p < 0.05$). Potentially inappropriate medications were noted in 23.3% of cases.

Conclusion: Polypharmacy is highly prevalent among elderly diabetics and is associated with clinical and functional burden. Regular medication reviews and individualized treatment plans are crucial to reduce associated risks.

Keywords: Polypharmacy, Elderly, Type 2 Diabetes, Comorbidities

Introduction

The global rise in life expectancy has led to an increasing proportion of elderly individuals, many of whom live with chronic conditions such as type 2 diabetes mellitus (T2DM) [1]. Managing diabetes in older adults often requires a multifaceted approach due to the frequent coexistence of multiple comorbidities, including hypertension, cardiovascular disease, and renal dysfunction. Consequently, these individuals are commonly prescribed several medications simultaneously—a practice termed polypharmacy [2,3].

While polypharmacy can be clinically justified to manage complex health needs, it also brings about a range of challenges [4]. Elderly patients are particularly vulnerable to adverse drug reactions, drug-drug interactions, medication non-adherence, and functional decline due to age-related physiological changes, altered

pharmacokinetics, and cognitive impairment. These risks may lead to increased hospitalizations, diminished quality of life, and higher healthcare costs [5,6].

Furthermore, the presence of potentially inappropriate medications and the lack of regular medication reviews exacerbate the risk of polypharmacy-related complications in this demographic [7,8]. As healthcare systems strive to provide patient-centered care, understanding the prevalence and patterns of polypharmacy in elderly diabetics has become essential. This knowledge is crucial for developing safer prescribing practices, optimizing therapeutic outcomes, and minimizing avoidable medication-related harm in the geriatric population [9,10].

This study aims to assess the prevalence, patterns, and associated clinical factors of polypharmacy among elderly patients with type 2 diabetes mellitus. It also seeks to identify potential risks linked to medication burden, including inappropriate prescriptions and functional impairment.

Materials and Methods

1. Study Design

This research was conducted as a prospective observational study. The primary objective was to evaluate the prevalence, patterns, and associated factors of polypharmacy among elderly patients diagnosed with type 2 diabetes mellitus (T2DM). The study was categorized as an original research article.

2. Study Setting and Duration

The study was carried out in the outpatient and inpatient departments of the Internal Medicine and Geriatrics units of a tertiary care hospital. Data collection spanned 12 months.

3. Study Population

Inclusion Criteria:

- Patients aged ≥ 60 years
- Diagnosed with Type 2 Diabetes Mellitus
- Willing to provide informed consent

Exclusion Criteria:

- Patients with Type 1 Diabetes Mellitus
- Terminally ill or on palliative care
- Cognitive impairment impeding informed consent

4. Sample Size and Sampling Method

A total of 150 to 200 elderly diabetic patients were enrolled using a consecutive sampling technique, wherein every eligible patient visiting during the study period was included until the desired sample size was reached.

5. Data Collection Tool

A structured case record form was used to gather the following data:

- Sociodemographic details (age, gender, education, socioeconomic status)
- Clinical history (duration of diabetes, comorbidities, complications)
- Medication history (all prescribed drugs, over-the-counter medications, herbal supplements)
- Functional assessment using ADL (Activities of Daily Living) and MMSE (Mini-Mental State Examination) scales

Polypharmacy was defined as the use of five or more concurrent medications. Potentially inappropriate medications (PIMs) were evaluated using the Beers Criteria (2023 update).

6. Data Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version [Insert Version]. Descriptive statistics (mean, standard deviation, frequency, percentage) were used for baseline characteristics. Associations between polypharmacy and clinical variables were assessed using:

1. Chi-square test for categorical variables
2. Independent t-test or Mann–Whitney U test for continuous variables

A p-value < 0.05 was considered statistically significant.

Results

A total of 180 elderly patients with type 2 diabetes mellitus were enrolled in the study. The mean age of participants was 68.4 ± 6.2 years, with a slight male predominance (54.4% male and 45.6% female). The majority of the participants (62.2%) were aged between 60 and 69 years, while 30% were aged 70–79 years, and 7.8% were aged 80 years or older. About 60% of the study population resided in urban areas, with the remainder from rural settings.

The mean duration of diabetes among participants was 11.3 ± 5.8 years. The most common comorbid conditions were hypertension (77.2%), dyslipidemia (53.3%), osteoarthritis (26.7%), coronary artery disease (18.9%), and chronic kidney disease (15.6%). Polypharmacy, defined as the concurrent use of five or more medications, was present in 126 patients (70%). Among these, 28 patients (15.6%) were found to have excessive polypharmacy, using 10 or more medications daily. The remaining 54 patients (30%) were on fewer than five medications.

Regarding drug usage, oral hypoglycemic agents were prescribed to 93.3% of the patients, while 25.6% were on insulin therapy. Antihypertensives were commonly used (78.9%), followed by statins (52.2%), proton pump inhibitors (37.8%), and NSAIDs (21.7%). Notably, 42 patients (23.3%) were prescribed at least one potentially inappropriate medication (PIM) as per the 2023 Beers Criteria. Common PIMs included long-acting sulfonylureas such as glibenclamide, benzodiazepines, and first-generation antihistamines.

A significant association was found between polypharmacy and increasing age (≥70 years) (p = 0.032), presence of more than two comorbidities (p < 0.001), and presence of chronic kidney disease (p = 0.011). Additionally, polypharmacy was significantly associated with reduced functional independence, as measured by an Activities of Daily Living (ADL) score of less than 5 (p = 0.029). However, there was no significant association observed between polypharmacy and gender (p = 0.412).

1. **Demographic Characteristics**

A total of **180 elderly patients with Type 2 Diabetes Mellitus** were enrolled. The mean age was **68.4 ± 6.2 years**, with a slight male predominance (**54.4% male**, 45.6% female).

Variable	**n (%)**
Age group (years)	
- 60–69	112 (62.2%)
- 70–79	54 (30%)
- ≥80	14 (7.8%)
Gender	
- Male	98 (54.4%)
- Female	82 (45.6%)
Residence	
- Urban	108 (60%)
- Rural	72 (40%)

2. **Clinical Profile**

The **mean duration of diabetes** was **11.3 ± 5.8 years**. The most common comorbidities included:

Comorbidity	n (%)
Hypertension	139 (77.2%)
Dyslipidemia	96 (53.3%)
Coronary artery disease	34 (18.9%)
Chronic kidney disease	28 (15.6%)
Osteoarthritis	48 (26.7%)

3. **Prevalence of Polypharmacy**

- **Polypharmacy** (≥5 medications) was present in **126 patients (70%)**
- **Excessive polypharmacy** (≥10 medications) was observed in **28 patients (15.6%)**

Number of Medications	n (%)
<5 (No polypharmacy)	54 (30%)
5–9 (Polypharmacy)	98 (54.4%)
≥10 (Excessive polypharmacy)	28 (15.6%)

4. **Medication Profile**

The most frequently prescribed drug classes were:

Drug Class	Patients Receiving n (%)
Oral hypoglycemics	168 (93.3%)
Insulin	46 (25.6%)
Antihypertensives	142 (78.9%)
Statins	94 (52.2%)
Proton-pump inhibitors	68 (37.8%)
NSAIDs	39 (21.7%)

5. **Potentially Inappropriate Medications (PIMs)**
    1. PIMs (as per Beers Criteria) were identified in **42 patients (23.3%)**
    2. The most common PIMs included long-acting sulfonylureas (e.g., glibenclamide), benzodiazepines, and first-generation antihistamines.
6. **Association Between Polypharmacy and Clinical Factors**

Statistically significant associations were found between polypharmacy and:

- **Age ≥70 years** ($p = 0.032$)
- **>2 comorbidities** ($p < 0.001$)
- **CKD presence** ($p = 0.011$)
- **Functional impairment (ADL score <5)** ($p = 0.029$)

No significant association was found with gender ($p = 0.412$).

Discussion

This study investigated the prevalence and patterns of polypharmacy among elderly patients with type 2 diabetes mellitus (T2DM) and explored the associated clinical and demographic factors. Our findings revealed that 70% of elderly diabetics were exposed to polypharmacy, and 15.6% were under excessive polypharmacy (≥10 medications). These results highlight a growing public health concern given the aging diabetic population and rising multimorbidity rates.

The observed prevalence aligns closely with recent international literature. Salh et al. (2025) conducted a similar study in Sulaimani City and found that 67.4% of elderly diabetic patients were exposed to polypharmacy, which was associated with potentially inappropriate medications (PIMs) and diminished quality of life [11].

Bayrak et al. (2025) further supported this association, reporting that polypharmacy significantly increased the risk of falls in elderly diabetics due to the additive effects of hypoglycemia and sedative medications [12].

In the current study, the most frequently prescribed medications were oral hypoglycemic agents, antihypertensives, and statins, consistent with the findings of Dwivedi et al. (2025), who used data mining techniques to evaluate the common drug patterns among elderly diabetics and found similar drug combinations to be prominent contributors to drug–drug interactions (DDIs) [13].

Our study also found a significant association between polypharmacy and comorbidities, especially chronic kidney disease and functional dependence. This is corroborated by Tian et al. (2025), who emphasized that polypharmacy in T2DM elderly patients was significantly correlated with frailty, decreased oral function, and the presence of CKD [14]. Moreover, Lisni et al. (2025) identified a high rate of clinically relevant potential DDIs in elderly diabetic patients enrolled in Indonesia's PROLANIS program [15], emphasizing the global relevance of the issue.

Interestingly, our study showed no significant association between gender and polypharmacy, which aligns with findings from Cl3h9ObPJAUJ et al. (2025), who also reported no sex-based differences in polypharmacy patterns among older adults in a primary care setting [16].

Despite its relevance, our study had several limitations:

1. Single-center design limits the generalizability of results.
2. The assessment of medication appropriateness relied on available clinical records and self-reporting, which might introduce recall bias.
3. We did not assess medication adherence or pharmacoeconomic factors, which are critical in elderly populations.
4. Cross-sectional data limit the causal interpretation of associations.

Future studies should focus on:

1. Longitudinal assessments to track medication burden and outcomes over time.
2. Interventional trials assessing the effectiveness of deprescribing protocols in elderly diabetics.
3. The integration of clinical decision support systems (CDSS) for safer prescribing.
4. Incorporating pharmacogenomics to tailor polypharmacy regimens for the elderly [17-19].

Overall, our findings underscore the importance of regular medication reviews and individualized treatment strategies in elderly diabetics. Collaboration among physicians, pharmacists, and caregivers is essential to mitigate the risks of polypharmacy while maintaining glycemic control and treating comorbidities.

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