

Original Article

Polypharmacy in elderly patients with dementia and its effect on recurrent hospital admission

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Abstract

Background: Dementia is an irreversible neurodegenerative disease characterized by a group of symptoms and signs, including memory impairment, language disturbance, and psychiatric changes, and impairments in activities of daily living. People with dementia had higher levels of comorbidities and may receive more medications (polypharmacy) than their cognitively intact counterparts. Polypharmacy has been linked to an increased risk of negative health outcomes in elderly; including adverse effects, hospitalizations, frailty, and even mortality.

Objective: To detect the prevalence of polypharmacy use in demented elderly patients and its effect on recurrent hospital admission from February 2022 to December 2022 at Ain Shams university hospitals.

Methods: A cross-sectional study was conducted to detect the prevalence of polypharmacy use in demented elderly patients and its effect on recurrent hospital admission in outpatient clinics of Ain Shams university hospital from February 2022 to December 2022. The current study included 90 demented elderly patients who were interviewed to know their personal history, degree of dementia, drug history, medical history, and number of hospital admission in the last year.

Results: Prevalence of polypharmacy in our study was 54.4%. Most of them had minor polypharmacy (38.9%) who received 4–6 medications, and 15.6% of them had severe polypharmacy who received ≥ 7 medications. Our study also showed that 81.1% of elderly demented patients was admitted to the hospital in the last year, but there was no significant relationship between polypharmacy and recurrent hospital admission.

Conclusion: The prevalence of polypharmacy is high among elderly demented patients. Interventions aimed at reducing the prevalence of polypharmacy should be considered. 81.1% of elderly demented patients was admitted to the hospital in the last year, but there was no significant relationship between polypharmacy and recurrent hospital admission.

Key words: Polypharmacy, dementia.

Introduction:

Dementia is a syndrome that is manifested by decline in cognitive functions that are severe enough to impair social and occupational functioning [1].

In United States (US), 5.8 million Americans aged 65 and older have Alzheimer's dementia. Eighty percent are age 75 or older [2]. In Egypt, the prevalence of dementia ranged from 2.01% to 5.07% in community dwelling [3].

Demented patients experience more comorbidities and may receive more medications than their cognitively intact counterparts [4].

The word polypharmacy is derived from the ancient Greek 'polús' meaning 'many', and 'pharmakeía' meaning 'the use of drugs' [5]. There is no single agreed definition of polypharmacy [6]. For example, should the term refer to only simultaneous opposed to consecutive drugs, include short-term as well as long-term therapy, be restricted to prescription-only drugs, or include non-pharmacological products? [5].

Bushardt et al., (2008) defined polypharmacy as the use of multiple medications or the use of a medication that is not indicated [7].

(Veronese et al.,2017) used the categorization used in the development of multidimensional prognostic index (i.e., 4–6 medications are considered minor polypharmacy, and ≥ 7 medications

are considered severe polypharmacy) [8].

Polypharmacy is associated with negative health outcomes including death, falls, adverse drug reactions, increased hospital stay length, and readmission to hospital after discharge [9].

However, the association between polypharmacy and dementia in previous studies is controversial.

According to **Clague et al., (2017)** demented patients have more comorbidities and consequently receive more medications than those without dementia [10].

Gupta et al., (2013) showed a case study that reported reversible dementia because of polypharmacy [11].

However, **Gnjidic et al.,2012** had found no association between number of medications and dementia [12].

Some studies even showed that patients with dementia use a lesser number of medications [12] **and** were at lower risk for potentially inappropriate medications [13]. This controversy is not surprising because the effects of medications on dementia are diverse [1].

The aim of current study was to detect the prevalence of polypharmacy use in demented elderly patients as a primary outcome, and its effect on recurrent hospital admission as a

secondary outcome at Ain Shams University hospitals.

Methods:

- **Study Design:** A cross-sectional study was conducted to detect the prevalence of polypharmacy use in demented elderly patients and its effect on recurrent hospital admission.
- **Study Setting:** Outpatient clinics of Ain shams university hospital from February 2022 to December 2022.
- **Study population:** The study included 90 demented elderly patients who were interviewed to know their personal history, degree of dementia, drug history, medical history, and number of hospital admission in the last year.
 - **Inclusion criteria:**
 - Elderly above sixty years old.
 - Both males and females.
 - Those who have dementia (mild, moderate, moderately severe, and severe dementia) according to Global Deterioration Scale [14].
 - **Exclusion criteria:**
 - patients who have mild cognitive impairment according to "Global Deterioration Scale" [14].
 - Patients who have subjective cognitive decline (stage 1-2).

● **Study tools:**

- ✓ **Mini mental status examination (MMSE)** for assessment of cognitive function, using the Arabic version [15].

The MMSE consists of 30 questions with 10 devoted to orientation, three questions requiring registration of new information, five questions assessing attention and calculation, three recall items, eight items devoted to language skills, and one construction question. Scoring is according to age and education.

- ✓ **Global deterioration scale:**

- a 7-point scale used to determine the severity of dementia, based on observations of behaviors in the individual.

- The scale ranges from no cognitive decline (1) to very severe cognitive decline (7).

Stages 1-3 are the pre-dementia stages & Stages 4-7 are the dementia stages.

- **Stage 1 and 2:** subjective complaints of mild memory loss. Testing is normal, and no functional affection.

- **Stage 3**(mild cognitive impairment): The function is normal, but co-workers may be aware of declining work performance. They have objective deficits on testing.

- **Stage 4** (mild dementia):

Difficulty performing complex tasks, e.g., handling finances.

- **Stage 5** (moderate dementia):

can no longer survive without some assistance. Unable to recall major events in their current lives. Some disorientation to date. They require no assistance with toileting, eating, or dressing.

- **Stage 6** (moderately severe dementia): Unaware of recent events in their current lives. They will need assistance with basic ADL. And may have urinary incontinence. May be associated with behavioral and psychological symptoms.

- **Stage 7** (severe dementia):

Verbal abilities are lost. Urinary incontinence is present and need assistance with eating. Motor skills may be lost [14].

- Stages from 1 to 3 are being excluded from our study.

- ✓ Polypharmacy was determined by categorization used in the development of multidimensional prognostic index (i.e., 4–6 medications are considered minor polypharmacy, and ≥ 7 medications are considered severe polypharmacy) [16].

- ✓ Effect of polypharmacy on recurrent hospital admissions will

be determined by asking about number of hospital admissions in the last year and what is the cause.

• **Ethical Considerations:**

An informed consent was obtained from family member who lives with the patient and knows detailed history about the patient. The study methodology was reviewed and approved by the Research Review Board of the Geriatrics and Gerontology Department, Faculty of Medicine, Ain Shams University. Confidentiality and anonymity of participants was be ensured.

Data entry and statistical analysis were on a personal computer using excel sheets. Quantitative variables were presented in the form of means and standard deviation. Qualitative variables were presented in the form of frequency tables (number and percent). A comparison between quantitative variables was carried out using One Way ANOVA test. A comparison between qualitative variables was carried out using Chi square test (FE: Fisher Exact).

The statistical difference was accepted when $P < 0.05$ and $P < 0.001$ is considered highly significant.

• **Results:**

- A sample of 90 demented patients were recruited at Ain Shams University hospitals at outpatient clinics from February 2022 to December 2022. Among these patients, the mean age was 74.60 ± 7.83 years, 64.4% of the study patients were females, and 35.6% were males, 62.2% were widow/widower, 37.8% were highly educated, and 54.4% reported having an unsatisfactory income as shown in **Table (1)**.
- The study showed that the most prevalent medical comorbidity among our subjects was cardiac diseases (33.3% of them had hypertension), followed by neurological diseases (26.7% of them had stroke or transient ischemic attacks), endocrine diseases (28.9% of them had diabetes mellitus), renal diseases, cancer, chest diseases, anemia, and finally hepatic diseases as shown in **Table (2)**.
- Also, showed that the mean number of medications Was 4.39 ± 2.43 , while the most prevalent drug used among our patients were antihypertensive drugs, followed by antiplatelets, hypoglycemics, NMDA receptors antagonists,

- anti-depressants, antipsychotics, and finally cholinesterase inhibitors as shown in **Table (3)**.
- The current study showed that 51.1% of the study patients had severe dementia (stage 7), and 24.4% of the study patients had moderately severe dementia (stage 6), and 15.6% of the study patients had moderate dementia (stage 5), and 8.9% of the study patients had mild dementia (stage 4) according to Global deterioration scale as shown in **Figure (1)**.
- The study showed that Prevalence of polypharmacy in demented patients was 54.4 %. Most of them had minor polypharmacy (38.9 %) who received 4–6 medications, and 15.6% of them had severe polypharmacy who received ≥ 7 medications as shown in **Figure (2)**.
- The study shows that the mean age of demented patients that had polypharmacy was 75.27 ± 7.44 , also shows that there was no significant relationship between gender, marital state, education, and income and polypharmacy as shown in **Table (4)**.
- There was no significant relationship between stages of dementia and polypharmacy as shown in **Table (5)**.
- The study shows that 55% of the patients was admitted at hospital once in the last year as shown in **Figure (3)**.
- There was no significant relationship between polypharmacy and recurrent hospital admission as shown in **Table (6)**.

Table (1): Socio-demographic data of selected patients:

		Min.	Max.	Mean	SD
Age		62.00	93.00	74.60	7.83
Data		N		%	
Sex	Male	32		35.6%	
	Female	58		64.4%	
Marital status	Single	2		2.2%	
	Married	31		34.4%	
	Widow	56		62.2%	
	Divorced	1		1.1%	
Education	Illiterate	33		36.7%	
	Primary education	11		12.2%	
	Secondary education	12		13.3%	
	High education	34		37.8%	
Income	Satisfactory	41		45.6%	
	Unsatisfactory	49		54.4%	

Table (2): Past medical history of selected patients:

		N	%
Cardiac diseases	IHD	21	23.3%
	HTN	51	56.7 %
	HF	4	4.4 %
	AF	8	8.9 %
	No	34	37.7%
Chest disease	Yes	14	15.6%
	Bronchial Asthma	8	8.9 %
	COPD	6	6.7 %
	No	76	84.4%
Hepatic disease	Yes	9	10 %
	HCV	8	8.9%
	Liver cirrhosis	1	1.1 %
	No	81	90%
Renal disease	Yes	33	36.7 %
	Renal stones	2	2.2%
	CKD	22	24.4%
	UTI	16	17.8 %
	No	57	63.3%
Endocrine disease	Yes	34	37.8 %
	DM	29	32.2%
	DM with end organ damage	1	1.1%
	Thyroid disease	7	7.8 %
	No	56	62.2%
Neuropsychological diseases	Yes	54	60 %
	Depression	13	14.4 %
	Cerebrovascular stroke / TIA	33	36.7 %
	Parkinson disease	14	15.6%
	No	36	40.0%
Anemia	Yes	12	13.3%
	No	78	86.7%
Cancer	Yes	19	21.1%
	No	71	78.9%

Other diseases (DVT-Post covid- osteoarthritis-gastritis- constipation)	Yes	29	32.2 %
	No	61	67.8%

IHD (ischemic heart disease) – HTN (Hypertension) –HF (Heart failure) -AF (Atrial flutter) – COPD (chronic obstructive lung disease) – HCV (hepatitis c virus) – CKD (chronic kidney disease) -UTI (urinary tract infection) – DM (diabetes mellitus) -TIA (transient ischemic attack) -DVT (deep venous thrombosis).

		Min.	Max.	Mean	SD
Number of medications		0.00	13.00	4.39	2.43
Class of medications		N	%		
Anti HTN	No	39	43.3%		
	Yes, and appropriate	35	38.9%		
	Yes, and inappropriate	16	17.8%		
Hypoglycemics (OHG-Insulin)	No	59	65.6%		
	Yes, and appropriate	14	15.6%		
	Yes, and inappropriate	17	18.9%		
Anti-depressants	No	76	84.4%		
	Yes, and appropriate	11	12.2%		
	Yes, and inappropriate	3	3.3%		
Antipsychotics	No	81	90.0%		
	Yes, and appropriate	2	2.2%		
	Yes, and inappropriate	7	7.8%		
Cholinesterase inhibitor	No	86	95.6%		
	Yes, and appropriate	2	2.2%		
	Yes, and inappropriate	2	2.2%		
NMDA Antagonist	No	71	78.9%		
	Yes, and appropriate	13	14.4%		
	Yes, and inappropriate	6	6.7%		
Anti-platelets	No	54	60.0%		
	Yes, and appropriate	32	35.6%		
	Yes, and inappropriate	4	4.4%		
Other drugs (Statins-paracetamol- laxatives-inhalers)	No	11	12.2%		
	Yes, and appropriate	59	65.6%		
	Yes, and inappropriate	20	22.2%		

Table (3): Drug history of selected patients:

Figure (1) prevalence of dementia stages of selected patients:

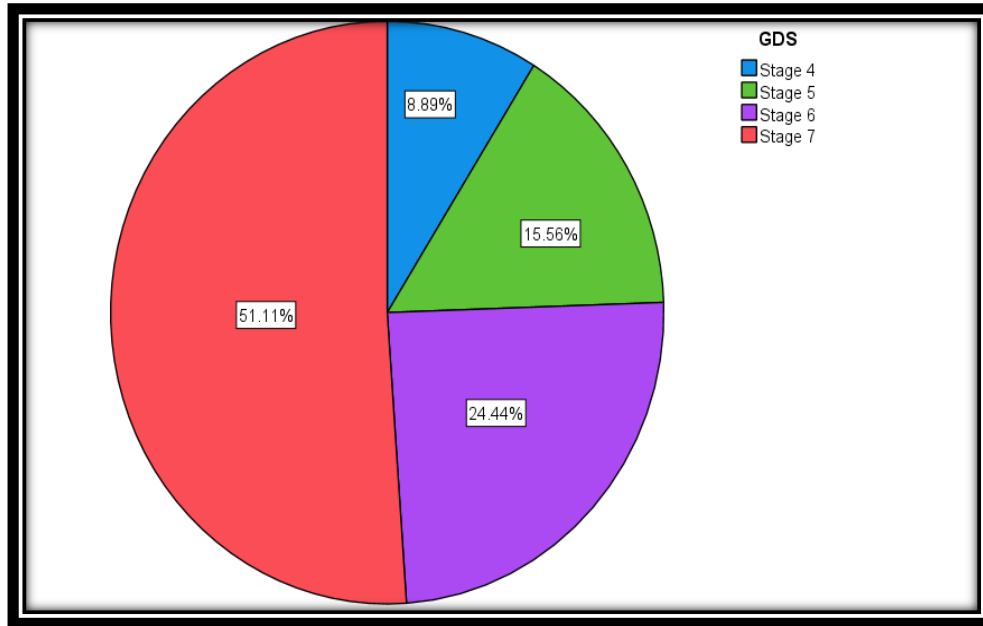


Figure (2) Prevalence of polypharmacy and its grades in selected patients:

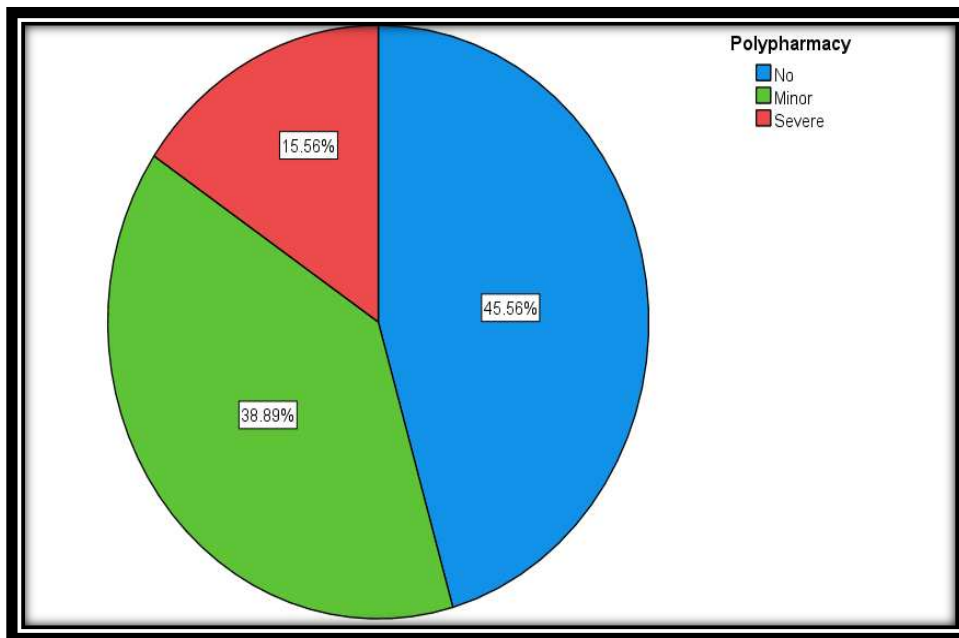


Table (4) Relationship between demographic variables and polypharmacy:

		Polypharmacy				t*	P value
		Yes (N=49)		No (N=41)			
		Mean	SD	Mean	SD		
Age		75.27	7.44	73.80	8.30	0.88	0.38
		N	%	N	%	X ^{2**}	P value
Sex	Male	18	36.7%	14	34.1%	0.07	0.80
	Female	31	63.3%	27	65.9%		
Marital status	Single	0	0.0%	2	4.9%	4.18 FE	0.08
	Married	14	28.6%	17	41.5%		
	Widow/divorced	35	71.4%	22	53.7%		
Educatio n	Illiterate	15	30.6%	18	43.9%	4.99	0.17
	Primary education	4	8.2%	7	17.1%		
	Secondary education	7	14.3%	5	12.2%		
	High education	23	46.9%	11	26.8%		
Income	Satisfactory	25	51.0%	16	39.0%	1.30	0.26
	Unsatisfactory	24	49.0%	25	61.0%		

*Student t test **Chi square test (FE: Fisher Exact)

Table (5) Relationship between polypharmacy and grades of dementia according to Global Deterioration Scale:

		Polypharmacy				t*	P value
		N	%	N	%	X ² **	P value
GDS	Stage 4	3	6.1%	5	12.2%	1.75 FE	1.00
	Stage 5	9	18.4%	5	12.2%		
	Stage 6	13	26.5%	9	22.0%		
	Stage 7	24	49.0%	22	53.7%		

*Student t test **Chi square test (FE: Fisher Exact)

Figure (3) Distribution of number of hospital admissions among admitted patients:

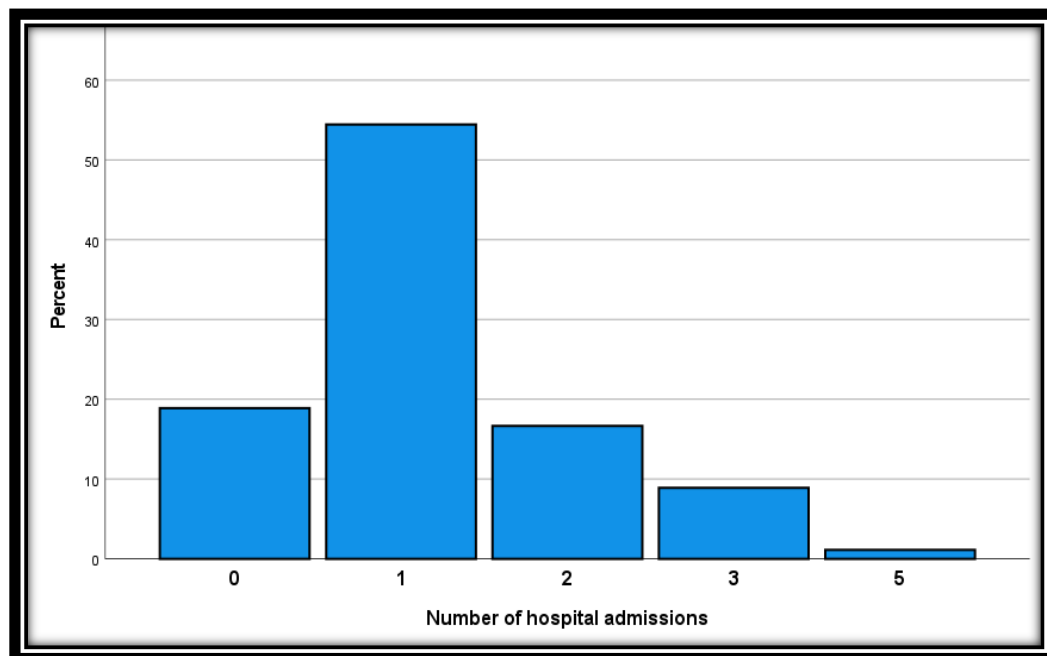


Table (6) Relationship between polypharmacy and recurrent hospital

		Polypharmacy				X2*	P value
		Yes (N=49)		No (N=41)			
		N	%	N	%		
Number of hospital admissions in the last year	0	9	18.4%	8	19.5%	0.99 FE	0.46
	1	25	51.0%	24	58.5%		
	2	9	18.4%	6	14.6%		
	> 2	6	12.2%	3	7.3%		

admission:

*Chi square test (FE: Fisher Exact)

Discussion:

There is increase in the number of elderlies worldwide and this is associated with increase in age-related diseases, one of them is dementia.

In people with dementia, prescribing is further complicated by difficulties in communication, changing goals of care, and a high prevalence of multiple comorbidities.

This study was A cross-sectional study involving 90 demented elderly patients attending outpatient clinics of Ain shams university hospital. Demographic data, degree of dementia, drug history, medical history, and number of hospital admission in the last year of patients were collected.

Dementia is associated with decline in cognition and function as well as psychological and behavioral symptoms that may be a risk factor for polypharmacy.

The study showed that the mean number of medications was 4.39 ± 2.43 , prevalence of polypharmacy in demented patients was 54.4 %. Most of them had minor polypharmacy (38.9 %) who received 4–6 medications, and 15.6% of them had severe polypharmacy who received ≥ 7 medications.

This agree with *Kristensen et al. (2019)* who had a cross-sectional study about prevalence of polypharmacy in People with and without dementia, the prevalence of polypharmacy in demented patients was 69.4%, but in

people without dementia, polypharmacy was 36.1%, So polypharmacy was significantly more marked in people with dementia [17]. By agreement with our study *Morin et al. (2018)* reported that the prevalence and incidence of polypharmacy are high among older adults (55.7%) in a prospective cohort study to measure the prevalence and incidence of polypharmacy in elderly patients in Sweden [18].

Explanation may be as people with dementia experience higher levels of comorbidities as cardiovascular diseases such as coronary heart disease, stroke, diabetes mellitus, and hypertension and may receive on average more medications than their cognitively intact counterparts [19].

Dementia is also commonly associated with other multiple comorbidities such as diabetes mellitus, hypertension, and heart failure, and high rates of physical and psychiatric co-morbidity, often resulting in polypharmacy simultaneously [20].

However, another study found no association between number of medications and dementia [12]. And that may be as the study which aimed to find association between number of concomitant medications and geriatric syndromes, functional

outcomes, and mortality in community-dwelling, included only males above 70 years old. This controversy is not surprising because the effects of medications on dementia are diverse [1].

The study also showed that the most prevalent drug with dementia patients were antihypertensive drugs, followed by antiplatelets, hypoglycemics, NMDA receptors antagonists, anti-depressants, antipsychotics, and finally cholinesterase inhibitors.

Rasu et al., 2021 conducted a cross-sectional study in three counties of Texas about polypharmacy in elderly and what are the most common medications used, the study showed that anti-hypertensive agents were the most common medications used (15%) [21].

In the current study, there was no significant relationship between gender, marital state, education, income, and polypharmacy, however *Balkhi et al. (2021)* study which was a retrospective cross-sectional study to investigate the prevalence of polypharmacy among adult patients in a tertiary teaching hospital and to determine patients' characteristics that are associated with polypharmacy, showed that polypharmacy in adult

patients was significantly influenced by gender (more in females) [22].

We found that there was no significant relationship between grading of dementia according to Global Deterioration Scale and polypharmacy.

The current study also showed that 81.1 % of elderly demented patients was admitted at the hospital in the last year, 55% of the patients were admitted at hospital once, 16.7% was admitted twice in the last year. There was no significant relationship between polypharmacy and recurrent hospital admission.

While *Vetrano et al.,2013* reported that polypharmacy was associated directly with recurrent hospitalization in his study which was a cross-sectional analysis of 1449 nursing home residents with advanced cognitive impairment to assess prevalence and factors related to polypharmacy in nursing home residents with advanced cognitive impairment. That difference may be as our study had small sample size unlike *Vetrano et al.,2013* who had

larger sample size, also he reported polypharmacy in nursing home residents and his study subject was severely demented patients only [23].

Conclusion:

The prevalence of polypharmacy is high among elderly demented patients. Interventions aimed at reducing the prevalence of polypharmacy should be considered.

The prevalence of hospital admission is high among elderly demented patients, but there was no significant relationship between polypharmacy and recurrent hospital admission.

Limitation of the study:

In the current study, we excluded mild cognitive impairment, so we need more research about polypharmacy and mild cognitive impairment.

Polypharmacy in demented patients may be influenced by cultures, percentage of elderly in population, and care giver goals, so we need more research about that.

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