



## Research Article

## THE ASSOCIATION OF POLYPHARMACY WITH FUNCTIONAL STATUS AND DEPRESSION IN ELDERLY PATIENTS IN KING FAHAD ARMED FORCES HOSPITAL (KFAFH) IN JEDDAH, SAUDI ARABIA

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## ABSTRACT

**Background:** polypharmacy has been recognized as a serious rising issue in healthcare and clinical settings, specifically in geriatric population. With an increasing aging demographic, a global concern for polypharmacy should be addressed. Several studies showed correlation between poly pharmacy and quality of life. **Methods:** This cross-sectional study aimed to determine the relation of polypharmacy in elderly patients in KFAFH in Jeddah, Saudi Arabia functional status and depression. 268 patients had participated in the study and functional status was measured with Euro Qol-5 Dimension-5Levelquestionnaire (EQ-5D-5L) and depression with PHQ-9 questionnaires. Linear regression model was used to assess the correlation. **Results:** it is revealed that the mean medication number of the 268 included patients was  $7.03 \pm 1.8$ , with a minimum number of five and maximum of 14. Statistical analyses also revealed that polypharmacy was significantly correlated to the patient's functional status, as indicated by the mobility, providing one's self-care, and engagement to activity. Moreover, results revealed that polypharmacy was significantly correlated to depressive conditions. **Conclusion:** polypharmacy was determined to be significantly correlated with functional declination and depression, which is affecting the patient's QoL.

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## INTRODUCTION

Polypharmacy is a common phenomenon in geriatric population and it is increasing with aging with multiple comorbidities. Multimorbidity is the coexistence of two or more chronic health conditions among patients and is usually associated with increasing rates of hospitalization and mortality due to a decreasing quality of life (QoL); elderly with coexistence chronic health conditions usually results in polypharmacy (2). Polypharmacy is defined as taking minimally five or more medications regularly (1). Aging has a crucial impact on alteration of Pharmacokinetics processes which include; absorption, metabolism, fat distribution and renal and hepatic clearance (2). These alterations increase the risk of drug adverse reactions.

Multiple undesirable health outcomes are linked with polypharmacy such as no adherence, drug adverse effects, drug to drug interactions, fall, medications cascade, emergency visits and decreased nutritional status (3). All these conditions inflict a substantial health and economic burden on society and the health care system (4). polypharmacy was reported by the US Center for Medicare and Medicaid Services to be practically expensive, with an approximate annual cost amounting to more than US\$50 billion. Some

studies found a considerable number of prescriptions linked with the use of inappropriate medications (5). The prevalence of polypharmacy is growing within all health care settings worldwide; as increasing in life expectancy and advanced medical care. The prevalence is well described in Europe and North America, as recent years data from developing countries is available (6). Furthermore, a recent study in a tertiary hospital in Saudi Arabia revealed that polypharmacy is high in older adults especially in diabetic patients and more noticed in women in comparison to men (7). Recent reports revealed that the demographic aging is rapidly increasing within the next decades (9) and it was estimated that approximately 33% of elderly patients, aged >65 years old, simultaneously take at least five medications (10).

Elderly populations are at higher risk to develop depressive episodes. One major issue in depression in elderly is that it's under-reported especially by house staff (8). A study done in the North West of the Netherlands, they found the major risk indicators for depression in elderly are pain, stroke, visual issues, limits in function, adverse life incidents, being alone, getting inadequate care, and lack of support socially (9). In one study done in Saudi Arabia, the prevalence of depressive symptoms is found to be 39% (10). Therefore, it is crucial to screen for depression in primary health settings.

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Despite the fact that multiple comorbidities are associated with polypharmacy, there are few studies investigating the association with depression and self-health care in older adults (11). Recent study was conducted on Mexican American and African American showed experience more depression and poor self-health care (12). On the contrary, poor compliance in elderly has been associated with several factors such as hearing or visual impairments, complexity of the therapeutic regimen, functional or cognitive impairments and social isolation. Polypharmacy has been linked with decreased functional abilities in elderly; a prospective study of community dwelling of older adults showed a direct proportion between number of prescription and decline in performing daily live activities (13).

**Methodology**

This is a cross-sectional study at King Fahad Armed Force Hospital (KF AFH) in Jeddah, Saudi Arabia using 268 medical records that were collected via random stratified sampling technique between March to August 2022. The total population (n=268) comprised 167 males (62.3%) and 101 females (37.7%), in which all the patients are eligible in the institution and meeting the criteria. All patients are 65 years and above and using 5 or more medications, the population was bracketed into 65-70 years old (61.6%), 71-75 years old (18.7%) and >75 years old (19.8%) see table 1. Moreover, the exclusion criteria were patients diagnosed with depression, active psychiatric conditions, cancer, dementia, palliative and bedridden patients, and patients who were not eligible to the institution. For the data collection, a PHQ-9 questionnaire was used to screen for depression in the last two weeks. The response ranged from 0 (not at all) to 3 (nearly every day) which were then further categorized as minimal symptoms of depression, minor depression, moderate or severe depression. While a European Quality of Life- 5 Dimension (EQ-5D) was used to assess the overall health of the patients during the time of the interview. These included mobility, usual activities, pain/ discomfort, self-care, and anxiety/ depression. Each aspect was quantified from 1 (no problem) to 5 (unable or extreme problem).

Furthermore, the data collection process was based on a structured face-to-face interview and reviewing patients' medication in the OASIS care system which is an electronic patient file and a verbal consent was obtained from all participants which was approved by King Fahad Armed Force Hospital research and ethics committee. This study was analyzed using IBM SPSS version 27 (IBM Corp., Armonk, N.Y., USA). A simple descriptive statistic was used to define the characteristics of the study variables through a form of counts and percentages for the categorical and nominal variables while continuous variables are presented by mean and standard deviations. A Pearson's correlation coefficient was used to correlate variables which were both represented by means. These tests were done with the assumption of normal distribution. Also, a Linear Regression Model was used to estimate the coefficients of the linear equation, involving one or more independent variables that best predict the value of the dependent variable. Lastly, a conventional p-value < 0.05 was the criteria to reject the null hypothesis.

**RESULTS**

The total population of the study was 268, the majority of the patients were male (62.3%) and range 65-70 years of age (61.6%). Among the total population, a mean medication number of 7.03 ± 1.8 was recorded with a minimum number of five and maximum of 14. Furthermore, the total population was classified according to three age groups namely 65-70 years old, 71-75 years old, and > 75 years old. The < 70 age group consists of 165 patients (61.6%), the 71-75 age group consists of 50 patients (18.7%), while the >75 age group consists of 53 patients (19.8%). The mean age was 69.72 ± 7.0 years old with a minimum age of 65 and maximum age of 100. The majority of the population were obese 129 (48.1%) 121 (45%) were overweight and 18 patients had normal BMI, see table 1. 254 patients were living with their partner/family and only 14 patients (5%) were living alone. Among the total population 206 have diabetes (76.9%), 219 have hypertension (81.7%), and 59 (22%) had a cardiac event.

**Table 1** Demographic data of the population

Demographics	Type	Count	Percentage, %
Gender	Male	167	62.3
	Female	101	37.7
Medication number	Mean±SD	7.03±1.8	
	Minimum	5	Maximum
	14		
Age	≤70	165	61.6
	71-75	50	18.7
	>75	53	19.8
	Mean±SD	69.72±7.0	
	Minimum	59	Maximum
	100		
BMI	Normal	18	6.7
	Over weight	121	45.1
	Obese	129	48.1
	Mean±SD	29.59±4.2	
	Minimum	19	Maximum
	56		
Living status	Yes	254	94.8
	No	14	5.2
Smoker	Yes	17	6.3
	Ex-Smoker	10	3.7
Diabetic	No	241	89.9
	Yes	206	76.9
Cardiac event	No	62	23.1
	Yes	59	22.0
Hypertension (HTN)	No	209	78.0
	Yes	219	81.7
	No	49	18.3

The quality of life (QoL) was evaluated based on the patients' mobility, self-care, activity involvement, felt pain, and stress/ depression, see table 2. For the mobility, 125 (46.6%) patients considered that their mobility or walking, was not a problem at all as 25% and 22% had slight to moderate problems in

mobility respectively. Majority of patients had no problem with self-care (82%) or activity (58%); yet, 13 % had slight issues with self-care. 23.5% and 12.3% had slight to moderate problems with daily activity. For the pain being experienced, 112 (41.8%) patients did not consider any problem, on the other hand, 96 (35.8%) and 53 (19.8%) patients had mild to moderate pain and discomfort daily experience respectively. Over half of the patients had no signs of stress or depression; on the contrary, 77(28.7%) patients had as light score of stress/ depression and 40 (14.9%) patients had moderate scores in EQ-5D-5L. The visual analysis gave a mean of  $\pm$  SD of  $76.81 \pm 14.0$ , with minimum and maximum values of 10 and 100.

**Table 2** Assessment of the European quality of life-5dimension

<b>MOBILITY</b>	No problem in walking	125	46.6
	Has slight problem in walking	68	25.4
	Has moderate problem in walking	61	22.8
	Has severe problem in walking	13	4.9
	Unable to walk	1	0.4
	Mean $\pm$ SD	1.87 $\pm$ 1.0	
	Minimum 1		
	Maximum	5	
	<b>SELF-CARE</b>	No problem in self-washing/dressing	220
Has slight problem in self-washing/dressing		35	13.1
Has moderate problem in self-washing/dressing		10	3.7
Has severe problem in self-washing/dressing		2	0.7
Unable to self-wash/dress		1	0.4
Mean $\pm$ SD		1.24 $\pm$ 0.6	
Minimum		1	
Maximum		5	
<b>ACTIVITY</b>		No problem in doing usual activities	156
	Has slight problem in doing usual activities	63	23.5
	Has moderate problem in doing usual activities	33	12.3

	Has severe problem in doing usual activities	15	5.6
	Unable to do usual activities	1	0.4
	Mean $\pm$ SD	1.66 $\pm$ 0.9	
	Minimum 1	1	
	Maximum	5	
<b>PAIN</b>	No pain or discomfort	112	41.8
	Slight pain or discomfort	96	35.8
	Moderate pain or discomfort	53	19.8
	Severe pain or discomfort	7	2.6
	Extreme pain or discomfort	0	0.0
	Mean $\pm$ SD	1.83 $\pm$ 0.8	
	Minimum	1	
	Maximum	4	
<b>STRESS/DEPRESSION</b>	Not anxious or depressed	145	54.1
	Slightly anxious or depressed	77	28.7
	Moderately anxious or depressed	40	14.9
	Severely anxious or depressed	6	2.2
	Extremely anxious or depressed	0	0.0
<b>VISUAL ANALYSIS</b>	Mean $\pm$ SD		76.81 $\pm$ 14.0
	Minimum	100	
	Maximum	100	
<b>PHQ-9</b>	Mean $\pm$ SD		4.44 $\pm$ 3.5
	Minimum	0	
	Maximum	23	

Table 3 shows the key statistical results for the correlation between polypharmacy, as indicated by the medication number, and the QoL of the patients. Results revealed that polypharmacy, in general, has an association with the five determinants of a patient's QOL. At 99% confidence interval, polypharmacy showed a weak positive linear correlation in patient's mobility, determined by their capability to walk ( $r = 0.205$ ,  $P = 0.001$ ), in patient's capacity to perform self-care ( $r = 0.252$ ,  $P < 0.001$ ), in patient's ability to perform usual activities ( $r = 0.261$ ,  $P < 0.001$ ), and in patient's anxiousness or depression ( $r = 0.388$ ,  $P < 0.001$ ). While at 95% confidence interval, polypharmacy also showed a weak positive linear or relation inpatient's pain or discomfort ( $r = 0.131$ ,  $P = 0.032$ ). On the other hand, it was observed that polypharmacy has a weak negative linear correlation with the visual analysis ( $r = -0.345$ ,  $P < 0.001$ ) while a moderate positive linear correlation with PHQ 9scoring, a determinant of depression ( $r = 0.446$ ,  $P < 0.001$ ).

**Table 3.** Linear regressions on the association of polypharmacy with patient's QoL.

<b>MOBILITY</b>	r	0.205**
	p-value	0.001
	N	268
<b>SELF-CARE</b>	r	0.252**
	p-value	<0.001
	N	268
<b>ACTIVITY</b>	r	0.261**
	p-value	<0.001
	N	268
<b>PAIN</b>	r	0.131*
	p-value	0.032
	N	268
<b>STRESS/DEPRESSION</b>	r	0.388**
	p-value	<0.001
	N	268
<b>VISUAL ANALYSIS</b>	r	-0.345**
	p-value	<0.001
	N	268
<b>PHQ-9</b>	r	0.446**
	p-value	<0.001
	N	268

\*\*Correlation is significant (2-tailed).

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To further show the relationship between the means obtained, a statistical test of the mean against a control as the test value was done (Table 4). Results also revealed that the stress/depression ( $P = 0.032$ ) and the corresponding PHQ-9 results ( $P < 0.001$ ) have significant differences at 95% confidence interval.

**Table 4** One sample t-test for the dependent variables

	45	63		18	50	41	001 <sup>a</sup>
	105	42	55	74	384	73	57
	80	16	91	97	145	5	96
	40	56	20	53	268	47	0
	275	47	126	86	564	15	63
	67	70	64	53	31	3	32 <sup>a</sup>

Significant using Linear Regression Model at  $<0.05$  level.  
dependent Variable: Medication Number.

## DISCUSSION

Multi morbidity which is defined co-existence of two or more chronic health conditions has dramatically increasing in the last decades. Multiple commodities increase the management's complexity, drug adverse, hospitalization, multiple medications and decrease functional capacity (16). Multiple medications refers to polypharmacy which is defined by the use of 5 or more medications regularly (17). Polypharmacy has

increased lately in geriatric groups and substantial economic burden and has significant effects on patient quality of life.

In this study 268 candidates were using between 5 and 14 medications with mean medication number  $7.03 \pm 1.8$ . The results of this study showed an association of polypharmacy with the patients QoL, specifically functional declination and depression. For the functional declination, it was observed that the medication number had a significant correlation with the patient's mobility, capacity to provide self-care, and ability to perform usual activities. These findings agreed with previous study in which an increased medication was associated with functional decline among elderly patients with dementia (18). Furthermore, another study have found that patients with high level of medication used to have low health related quality of life and high level of psychological distress compared to patients with low level of medication use (19). Overall, the patients with five or more medication had lower functional

status as they required assistance in performing basic daily activities and cannot live independently (16).

Similar results were also seen among 203 elderly patients in which a significant difference was observed between the groups concerning functional status. It was observed that those patients with five or more medications have significantly lesser physical activity level, more restricted ambulation activities, and lower hand grip strength compared to those with less than five medications (20, 11). While the relationship of polypharmacy and functional status has been widely explored, only few interests have been made with depression. In this study, the association of polypharmacy and depression have been shown to be significantly correlated. Similar to the study conducted involving 457 elderly patients, increased depressive symptoms have been observed among patients with more than four medications. Results further showed that the possible cause of discomfort and stress among patients is the inability to control the results of medication reviews (13). The association of polypharmacy was also evaluated in a study involving 1,512 patients with depression records. Results revealed that depressed patients had a 46% higher rate of chronic disease and higher probabilities for polypharmacy (10). Similar findings were also observed among African American older adults in which polypharmacy was associated with worse depression, especially among female patients (3).

## CONCLUSION

Polypharmacy was determined to be significantly correlated with functional declination and depression in elderly patients affecting the patient's QoL.

## DECLARATIONS

### Ethics approval and consent to participate

The ethical standards formed by the institutional and national research committees, the 1964 Helsinki Declaration and its associated regulations, or comparable ethical principles were followed in this cross-sectional study that involved human subjects. The Human Investigation Committee (IRB) of King Fahad Armed Force Hospital Research and Ethics Committee approved this study, having approval on publication number (2022-62). All study participants provided verbal informed

consent before agreeing to participate which was approved the king Fahad armed force hospital research and ethics committee.

### Consent for publication

Not applicable.

### Availability of data and materials

The data that support the findings of this study are available from king Fahad armed force hospital at family medicine department but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the author Naif Almutairi upon reasonable request.

### Competing interests

The authors declare no conflict of interest.

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### Author's contribution

All authors contributed to the study; conception and design. The materials were prepared, the data was gathered, and the analysis was carried out Naif Ahmed Almutairi, Khaled Saad Alghamdi, Osama Ali Alrashed, Khaled Alqrashi, Naif Alzhrani and Ahmed Alqarni. The first draft of the paper was written by Abdurahee mbayameen and Naif Aljehani, and earlier drafts were reviewed by all authors. Furthermore, all authors examined and approved the final draft.

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