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## Research Article

# A Multifaceted Perspective on Polypharmacy in the Elderly: In the Aspect of Comprehensive Geriatric Assessment and Quality of Life

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## Abstract

**Background and Objective:** Polypharmacy is a common geriatric syndrome in older adults. This study aimed to determine the prevalence of polypharmacy in older adults, its consequences and its relationship with geriatric syndromes, disability and quality of life.

**Materials and Methods:** This cross-sectional study included 408 patients aged 65 and over in the geriatrics clinic. Patients were evaluated for polypharmacy, comprehensive geriatric assessment tests, hand grip strength measurement and SF-36 quality of life test. The IBM SPSS for Windows, version 22.0 (IBM Corp., Armonk, New York, USA), was used for statistical analysis. **Results:** The median number of concomitant drugs was  $4.99 \pm 2.69$  and 233 (57.1%) of the participants had polypharmacy. Female gender and physical inactivity were associated with the presence of polypharmacy. Activities of daily living (ADL), Instrumental Activities of Daily Living (IADL), geriatric depression scale (GDS), Mini Nutritional Assessment (MNA-SF), Tinetti total and timed up and go (TUG) scores were negatively associated with polypharmacy ( $p < 0.05$ ). Polypharmacy was also associated with decreased quality of life in all subscales except for mental health and physical role. Patients with polypharmacy had lower hand grip strength scores and increased risk of depression and falls ( $p < 0.05$ ).

**Conclusion:** The current study suggested that polypharmacy is a risk factor for negative health outcomes in older adults. Therefore, polypharmacy should be considered in the management of older adults to prevent functional impairment and increase treatment adherence.

**Key words:** ADL, depression, IADL, geriatric depression scale (GDS), polypharmacy, quality-of-life

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**Competing Interest:** The authors have declared that no competing interest exists.

**Data Availability:** All relevant data are within the paper and its supporting information files.

## INTRODUCTION

The aging of the population is a significant demographic phenomenon in the 21st century because of parallel factors such as the development of economic and socio-cultural conditions, the reduction in the birth rate and the increased use of modern medicine<sup>1</sup>. As individuals age, their organ functions decline and they become more susceptible to chronic diseases, leading to the need for multiple drugs in the elderly. The incidence of polypharmacy in older adults has been estimated to be between 30 to 60% and the lack of a universal definition is partly responsible for this variation<sup>2</sup>.

Polypharmacy is defined by the World Health Organization (WHO) as the concomitant use of five or more medications by a patient, which may include over-the-counter, prescription, traditional and complementary medicines<sup>3</sup>. The physiological changes associated with aging, the presence of multiple chronic diseases and an increased risk of drug side effects and interactions make treatment management in the elderly more complicated<sup>4</sup>.

Polypharmacy in the elderly is extremely effective in the treatment of multiple diseases (comorbidities) when correct treatment approaches are applied and side effects are monitored and controlled. However, polypharmacy affects the quality of life. Elderly individuals are more sensitive and vulnerable to drug-related side effects<sup>5</sup>.

Compliance with treatment is difficult for individuals who do not know the medications they use, who do not have social security, who live alone and who do not have social support. This situation may cause the quality of life of the elderly to deteriorate<sup>6</sup>.

In our country, drug use without medical supervision and a prescription is a common situation. In a study, 52.6% of the elderly were advised to take medication by their doctor, 16.3% by their own request, 1.3% by the pharmacist and 0.7% by their neighbor<sup>7</sup>. Supplements taken in this way, called non-pharmaceuticals, can interact with existing medications and cause many serious complications, from a simple allergy to death. Therefore, it is important to ask the patient whether he or she uses so-called non-drug supplements<sup>8</sup>.

The physiological age of the individual is more important than the chronological age. Responses to drug treatment and risks may vary depending on the severity of physiological changes. These physiological changes seen in old age affect drug pharmacokinetics and pharmacodynamics<sup>5</sup>.

This study aims to determine the prevalence of polypharmacy in older adults, investigate the consequences of polypharmacy in the elderly and assess its relationship with comprehensive geriatric assessment tests and health-related quality of life scores. By shedding light on the various aspects of polypharmacy in the elderly, this study aims to contribute

to the development of effective strategies and guidelines for the better management of polypharmacy and the improvement of the quality of life of older adults.

## MATERIALS AND METHODS

**Study setting and participants:** This cross-sectional study was conducted over a period of one year, from January, 2019 to January, 2020, at the Dr. Ersin Arslan Education and Trial Hospital in Turkey. Patients aged 65 years and older who presented to the outpatient clinic of geriatrics were eligible to participate in the study. Inclusion criteria were being aged  $\geq 65$ , presenting to the outpatient clinic and providing consent to be included in the study. Exclusion criteria were aphasia, cognitive disorders that significantly impaired cooperation and severe medical comorbidities that could interfere with test applications. Demographic and socioeconomic data, including occupation, education level and marital status, were recorded, along with medical histories, comorbid diseases and medication use. Polypharmacy status was categorized as non-polypharmacy ( $\leq 4$  medications) and polypharmacy ( $\geq 5$  medications), based on WHO's definition.

**Ethics:** The Local Research Ethics Committee approved the study. All participants gave informed consent.

### Measures

**Comprehensive geriatric assessment:** Cognitive function was evaluated using the standardized form of the Mini-Mental State Examination (MMSE), while daily living abilities were assessed using the Katz Index for personal hygiene, continence, dressing, feeding and ambulation<sup>9,10</sup>. The Lawton Brody Index was used to evaluate instrumental activities of daily living, such as cleaning, shopping, managing medications, preparing meals, communicating with others, using transportation and financial management<sup>11</sup>. The Tinetti Balance-Gait Evaluation Scale and timed up and go test (TUG) were used to evaluate the risk of falls, while the Yesavage geriatric depression scale (GDS) was used to assess the psychological status<sup>12-14</sup>. Malnutrition was assessed using the Mini-Nutritional Assessment, Short-Form (MNA-SF). The maximum score for MNA-SF was 14, with a score of 12 or higher indicating acceptable nutritional status and no need for a full MNA evaluation<sup>15</sup>. A score of  $\leq 24$  on the MMSE indicated the presence of dementia, while the Katz index of ADL and Lawton Brody index for IADL evaluated personal independence<sup>9-11</sup>. A score of  $> 24$  on the Tinetti Balance Gait Evaluation Scale indicated a low risk of falls, while a score of  $< 19$  indicated a high risk of falls<sup>12</sup>. Those who took 14 seconds or longer on the TUG test were classified as high-risk for falls<sup>13</sup>. The GDS scores of 5 and higher were considered indicative of

depression<sup>14</sup>. Polypharmacy was classified as severe polypharmacy ( $\geq 10$  medications) and polypharmacy (5-9 medications)<sup>15</sup>.

**Assessment for handgrip strength:** A dynamometer (Camry electronic hand dynamometer) was used to evaluate hand grip strength (HGS) and muscle strength. Elderly individuals were instructed to stand upright with their arms at their sides and squeeze the dynamometer with their dominant hand. After three attempts, the HGS score was calculated by taking the highest<sup>16</sup>.

**Short Form-36 health survey (SF-36):** Medical outcome study (MOS) Short Form 36 (SF-36), a commonly used generic scale for quality of life assessment, was used. The SF-36 was developed by Ware and Sherbourne<sup>17</sup> and its Turkish reliability and validity study was conducted by Soylu and Kütük<sup>18</sup>. The SF-36 is a self-report scale and measures physical functioning, social functioning, role difficulties (physical and emotional), mental health, vitality, pain and general health. It examines 8 dimensions of health, such as perception, with 36 items. The scale provides a score between 0 and 100, with a higher score indicating a better level of health. Community norm values of SF-36 for Turkish society were determined by Demiral *et al.*<sup>19</sup>.

**Statistical analysis:** The normality of variable distribution was evaluated using the Kolmogorov-Smirnov test and all data showed a normal distribution. Numerical variables were presented as Mean  $\pm$  Standard Deviation, while categorical variables were presented as frequencies. An independent sample t-test was used to compare two groups, Pearson correlation analysis was used to evaluate the relationship between variables and a linear regression model was used to assess the relationship between polypharmacy and other variables. The IBM SPSS for Windows, version 22.0 (IBM Corp., Armonk, New York, USA), was used for statistical analysis. A p-value of  $<0.05$  was considered statistically significant.

## RESULTS AND DISCUSSION

The study included 408 patients, of whom 223 were male, with a mean age of  $71.17 \pm 5.35$  years. The median number of concomitant medications used was  $4.99 \pm 2.69$ , with 233 (57.1%) participants having polypharmacy and 22 (5.4%) having severe polypharmacy. Female gender and not exercising were significantly associated with the presence of polypharmacy ( $p < 0.05$ ). Demographic features of study population were summarized in Table 1.

Comprehensive geriatric assessment tests revealed that ADL, IADL, GDS, MNA-SF, Tinetti total and TUG scores were

significantly associated with polypharmacy ( $p < 0.05$ ). Results of comprehensive geriatric assessment tests were summarized in Table 2.

The SF-36 scores showed that higher scores were associated with better health outcomes. Patients with polypharmacy were found to have significantly lower scores in physical functioning, vitality, role limitations due to physical functioning, role limitations due to emotional functioning, social functioning, bodily pain and general health perception sub-scales ( $p < 0.05$ ). Health-related quality of life scores according to polypharmacy status were summarized in Table 3.

Polypharmacy is a common problem among older adults and the present study found a high prevalence of 62.5%, with females being more affected. The findings suggest that physical inactivity, impaired activities of daily living and instrumental activities of daily living, worse nutritional status, low handgrip strength, decreased health-related quality of life scores (excluding mental health and role physical scores) and depression are significantly associated with polypharmacy in the elderly population<sup>20</sup>.

Present study results were consistent with previous studies showing that polypharmacy is related to female gender, impaired physical function and malnutrition<sup>21</sup>. However, current study contributes to the literature by highlighting the potential association between polypharmacy and disability<sup>22</sup>.

Disability refers to any physical or mental impairment that affects a person's ability to perform daily activities. People with disabilities may have difficulty accessing health care, preparing meals or engaging in physical activity, which can increase their risk of malnutrition<sup>23</sup>.

Malnutrition is a condition characterized by a lack of essential nutrients in the body. It can result from inadequate food intake, poor absorption of nutrients or a combination of both. Malnutrition can increase the risk of developing chronic health conditions and can exacerbate existing health conditions, particularly among people with disabilities<sup>24</sup>.

Polypharmacy refers to the use of multiple medications by an individual. For people with disabilities, polypharmacy is often necessary to manage chronic health conditions and alleviate symptoms. However, polypharmacy can also increase the risk of adverse drug interactions, medication errors and other complications.

The relationship between disability, malnutrition and polypharmacy is cyclical. Disability can increase the risk of malnutrition and malnutrition can exacerbate disability. Similarly, polypharmacy can increase the risk of malnutrition and malnutrition can increase the risk of adverse drug interactions<sup>25</sup>.

Table 1: Demographic features of study population

Parameter (N = 408)	
Age (Mean±SD)	71.17±5.35 (65-91)
M/F	45.3/54.7
Frequency of polypharmacy (n = 233)	57.1%
Frequency of severe polypharmacy (n = 22)	5.4%
Mean of use drugs	4.99±2.69 (0-20)
<b>Comorbidities (%)</b>	
Diabetes mellitus	31.4
Hypertension	42.2
Coronary artery disease	57.1
Osteoporosis	29.2
Chronic obstructive lung disease	19.7
Depression	37.3
Thyroid disorders	7.4
GI disorders	27.1
Rheumatismal disorders	22.2
<b>Education (%)</b>	
Illiterate	50.5
Primary school graduate	31.4
Secondary school graduate	3.9
High school graduate	7.4
Graduated from university	6.9
<b>Place of residence (%)</b>	
Lives alone	12.7
Lives with spouse	73.3
Lives with relatives	13.2
Lives with caregiver	0.7
<b>Smoking (%)</b>	
Yes	19.1
No	80.9
<b>Alcohol (%)</b>	
Yes	3.7
No	96.3
<b>Exercise (%)</b>	
Yes	21.8
No	78.2

Table 2: Results of comprehensive geriatric assessment tests

	Polypharmacy (+) (n = 255)	Polypharmacy (-) (n = 153)	p-value
Activities of daily living (ADL) (Mean±SD)	3.85±0.85	4.10±0.96	0.005
Instrumental activities of daily living (IADL) (Mean±SD)	4.80±1.09	5.11±1.21	0.006
Standardized Mini-Mental Test (sMMT) (Mean±SD)	26.88±1.75	27.05±1.78	0.348
Geriatric depression scale (GDS) (Mean±SD)	5.69±4.40	4.31±4.23	0.001
Mini-Nutritional Assessment Short Form (MNA-SF) (Mean±SD)	11.40±1.80	12.01±2.13	0.003
Tinetti (Mean±SD)	22.35±4.92	23.56±4.75	0.007
Time up and go test (TUG) (sec) (Mean±SD)	12.33±5.52	11.22±5.24	0.039
Number of drugs used (Mean±SD)	6.74±2.25	2.54±1.17	0.001
Handgrip strength (kg)	22.32±8.81	25.20±8.69	0.001

Table 3: Health-related quality of life scores according to polypharmacy status

Health-related quality of life (SF-36)	Polypharmacy (+) (n = 255)	Polypharmacy (-) (n = 153)	p-value
Physical functioning (PF)	51.45±15.52	60.33±18.27	0.035
Role-physical (RF)	38.22±21.54	44.34±17.54	0.082
Role-emotional (RE)	43.52±15	52.30±16.52	<0.001
Vitality (VT)	46.75±21.80	54.65±18.25	0.005
Mental health (MH)	55.23±15.2	58.25±16.6	0.835
Social functioning (SF)	52.53±20.5	64.54±17.5	0.004
Bodily pain (BP)	53.42±23.4	67.43±18.2	0.001
General health (GH)	27.16±16.2	40.62±14.3	0.001

To address these issues, healthcare professionals need to develop comprehensive care plans that address all aspects of a person's health, including nutritional status and medication management. This may involve modifications to a person's diet or medication regimen, as well as strategies to improve their overall health and well-being.

The study also revealed that polypharmacy may increase the risk of geriatric syndromes such as depression and falls. The relationship between postural imbalance falls and polypharmacy is complex and multifaceted. Polypharmacy can exacerbate postural imbalance and increase the risk of falls by causing dizziness, drowsiness and confusion. It can also impact muscle strength and balance, making it harder for individuals to maintain proper posture and stability<sup>26</sup>.

On the other hand, postural imbalance and falls can lead to increased medication use, as older adults may require medications to manage pain or treat injuries. They may also require medications to manage any chronic conditions that may have been exacerbated by the fall<sup>27</sup>.

Overall, addressing postural imbalance, falls and polypharmacy in older adults requires a comprehensive approach. This may include regular physical activity and balance training to improve muscle strength and coordination, medication reviews to reduce polypharmacy and potential drug interactions and fall prevention strategies such as installing grab bars and removing tripping hazards. By addressing these issues proactively, older adults can maintain their independence and quality of life<sup>28</sup>.

Depression is often treated with a combination of psychotherapy and medication. Typically, antidepressants are prescribed as the first line of treatment. However, medication alone may not be sufficient to treat depression adequately. Hence, more drugs may be added to the regimen, such as anti-anxiety medications or mood stabilizers<sup>29</sup>.

Unfortunately, the more medication that is added to a patient's treatment, the greater the risk for adverse side effects. Polypharmacy can result in drug interactions, increased toxicity and increased risk of drug-related adverse events. This scenario can make the depression worse, causing negative outcomes for patients<sup>30</sup>.

Moreover, polypharmacy may also make it challenging to diagnose and treat the underlying issues that cause depression. When multiple conditions are treated simultaneously, the origin of depression can become obscured, making it difficult to know which medication or therapy is working and which isn't<sup>31</sup>.

In addition, current study findings demonstrate that comprehensive geriatric assessment tests, such as the ADL, IADL, GDS, MNA-SF, Tinetti total and TUG scores, are valuable

tools for identifying patients at risk of polypharmacy and assessing the impact of polypharmacy on health-related quality of life. Therefore, these assessments should be routinely conducted in clinical practice for this population.

There are some limitations to this study. First, the patients included in the study were represented from a single center which may lead to a potential selection bias. Second, the study was conducted on a cross-sectional design and we could not compare current available data with follow-up results after recovery time.

## CONCLUSION

The current study concluded that there is a high prevalence of polypharmacy. Especially women are more affected. Polypharmacy was associated with physical inactivity, impaired activities of daily living, malnutrition, low hand grip strength, health-related quality of life and depression. Finally, current study highlights the importance of awareness and prevention of polypharmacy in the elderly. Polypharmacy is associated with increased direct and indirect medical costs and therefore its prevention and correction can have a significant impact on healthcare systems. Based on current findings, it was recommended that healthcare providers consider the individual characteristics of each patient when prescribing medications and aim to minimize the use of unnecessary medications to improve health outcomes and quality of life for older adults.

## SIGNIFICANCE STATEMENT

Type 2 diabetes is a very serious public health problem. It affects the daily living activities of elderly individuals by affecting their blood findings and causing a decrease in muscle strength. This study aimed to determine the prevalence of polypharmacy in older adults, its consequences and its relationship with geriatric syndromes, disability and quality of life. Simple handgrip strength tests can be added to a routine physical examination. Polypharmacy increases the risk of depression.

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