

Polypharmacy among the Elderly

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ABSTRACT

Introduction: Older people are at risk for polypharmacy due to multiple chronic diseases. Considering the lack of information in this regard, the aim of this study was to investigate the state of polypharmacy among the elderly in the city of Amirkola in northern part of Iran. **Materials and Methods:** This descriptive/analytical cross-sectional study is a part of Amirkola Health and Aging Project that was conducted on 1616 individuals aged 60 years and over. The data about medications were gathered through interviews and observation of prescriptions and medications consumed by patients. The data were analyzed by SPSS software version 18, and $P \leq 0.05$ was regarded significant. **Results:** In this study, 1616 individuals including 883 men (54.6%) and 733 women (45.3%) were investigated. The average age of individuals was 69.37 ± 7.42 . Among the investigated individuals, 526 including 368 men (41.7%) and 158 women (21.6%) consumed no medications. The prevalence of polypharmacy in this study was 23.1%, which was 32.7% in women and 15.2% in men (odds ratio = 1.51, 95% confidence interval: 1.10–1.93). The most prevalent group of medications used in both genders was cardiovascular drugs. **Conclusions:** Regarding the considerable prevalence of polypharmacy among the elderly, especially in aged women, serious efforts are required to manage polypharmacy. Provision of educational programs for physicians, personnel of pharmacies, and the staff of health-care centers in order for appropriate and safe consumption of medications in aged people is absolutely necessary.

KEYWORDS: Chronic disease, medication consumption, polypharmacy, the elderly

INTRODUCTION

Occurrence and concurrency of chronic diseases increase with age, and therefore, the amount of medication use increases correspondingly.^[1,2] A serious problem in pharmacotherapy in elderly patients is the concurrency of consumption of several medications. Polypharmacy is a state in which five medications or more are consumed concurrently (regardless of dosage form and duration of consumption)^[3-5] which leads to decreased quality of life, physical problems, increased drug interactions, side effects, and medical problems^[6,7] and also increases the cost of treatment.^[8] Moreover, polypharmacy increases the incidence of fall, number and rate of hospital stay, length of stay, frequent hospitalizations, and the death rate in elderly population.^[9]

The proper medications for aged people are prescribed according to the history of disease, drug resistance, physical and mental health, physical ability, memory, and family support.^[10] It seems that the risk of drug complications and interactions is more due to pharmacokinetic or pharmacodynamic changes caused by age-related physiological changes in elderly people. Inattention to different metabolic changes of medications such as their absorption, distribution, and excretion in elderly people's body compared to middle-aged people is regarded as an important factor in incidence of unwanted side effects in elderly people.^[11]

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Different factors affect polypharmacy in elderly people including age, gender, level of education, frequent visit to doctors, and types and number of diseases.^[12] Aging and undergoing different diseases increase the need to consume medications in a way that in diabetic patients and patients with coronary artery, the number of medications consumed may reach up to 6–9. Visiting different physicians and hospitalization increases the risk of polypharmacy because new medications may be prescribed for the patient. Low levels of literacy and information in patients are one of the most common causes of polypharmacy.^[13,14] Moreover, in most of the studies, polypharmacy in women was more than in men.^[15,16]

Comorbidities require consumption of more medications.^[17] The results of a study showed that elderly people with several comorbidities are more exposed to the risk of polypharmacy. The average number of diseases in aged people was 7.7, and the average number of medications consumed was 4.9, inasmuch as the number of medications consumed and prevalence of polypharmacy was 5.2 (51%) in hypertension, 5.6 (58%) in hyperlipidemia, 5.8 (61%) in myocardial infarction, 5.6 (54%) in diabetes, 5.1 (52%) in dementia, and 7 (73%) in depression.^[18] Regarding the high prevalence of polypharmacy, its importance, and its adverse effects on the elderly's health and considering the fact that there has not been a comprehensive study on polypharmacy in the elderly in Iran, the present study aims at investigating the state of polypharmacy among the elderly in the city of Amirkola.

MATERIALS AND METHODS

The present study is a part of Amirkola Health and Aging Project (registry number: 892917)^[19] that is being conducted as a cohort study on all people aged 60 years and older in the city of Amirkola in north of Iran since 2011. Amirkola's population is 26,232 and about 2200 of them are over 60 years old. The city of Amirkola has two health care centers in which the list of all elderly people can be found. Elderly people are invited to participate in and are given the required information about the project through phone calls and home visits. The required information are gathered by a trained person using standard questionnaires. Pharmaceutical information including number, type, and duration of consumption are gathered through self-report as well as observing the patient's consumed medications and prescriptions. The concurrent use of five or more medications at least for 1 day is regarded as polypharmacy. Dosage form and duration of consumption are not considered in counting the numbers.^[3-5] Medications that have been consumed periodically are also added to the number of

medications. The type of drug category has no effect in assessing polypharmacy. The prevalence of consumption of different drug categories is also investigated.

The presence or absence of chronic diseases in an aged person was determined by asking him/her if he/she has ever been told by a doctor that he/she has a certain disease. If the aged person reported that if he/she had a specific health problem, his/her medical records were investigated and if he/she had no medical records, the answer to the question was considered negative. Moreover, in this study, the presence of some diseases and disorders such as cognitive impairment, depression, thyroid disorders, hypertension, and diabetes was determined through questionnaire, examination, and laboratory tests. Osteoporosis was also diagnosed through bone densitometry.

The Mini-Mental State Examination (MMSE) was used to investigate the cognitive state. Maximum and minimum MMSE score is 30 and 0, respectively. If a person obtains a score of 25 or more, he or she is considered normal. Scores of 21–24, 10–20, and <9, respectively, indicate a mild, moderate, and severe cognitive impairment.^[20,21] In a study in Iran, a cutting point of 22 gave a sensitivity of 90% and specificity of 93.5%.^[22] The same cutting point was used in the present study.

To assess depression, 15-item version of Geriatric Depression Scale which is a yes/no questionnaire was used. The clinical validity of the scale is proved. In this scale, the patients are divided into several groups based on their obtained scores. A score of 0–4 was considered as normal, 5–8 as mild depression, 9–11 as moderate depression, and 12–15 as severe depression.^[23] The psychometric properties of the Persian version are verified.^[24]

The collected data were statistically analyzed after they were entered into SPSS Statistics version 18 and after running different tests including Chi-square test, independent samples *t*-test, and logistic regression. Logistic regression model is used to investigate affective variables on polypharmacy. $P \leq 0.05$ was considered statistically significant.

RESULTS

In the present study, 1616 individuals including 883 men (54.6%) and 733 women were investigated. The average age of participants was 69.37 ± 7.42 (70 ± 7.7 in men and 69.7 ± 7.00 in women). Among all participants, 1377 individuals (85.2%) were married, 65.8% were illiterate, 82.2% possessed insurance, 6.6% lived alone, 6.6% were unemployed, 39.7% were

homemakers, 21.7% were retired, and 31.1% were employed. A number of 1434 individuals (88.8%) had comorbidities. Moreover, MMSE was normal in 1103 participants (68.4%), and 700 individuals had symptoms of depression.

In this investigation, 526 individuals (32.54%) were consuming no medications, while 23.1% of the participants had polypharmacy which was significantly more prevalent in women (32.7%) than in men (15.2%) ($P = 0.007$) [Figure 1]. The average age of people without polypharmacy was 69.92 ± 7.54 and the average age of people with polypharmacy was 69.66 ± 7.00 , which had no significant difference. The average number of medications consumed in people without polypharmacy was 1.38 ± 1.45 and in people with polypharmacy was 6.63 ± 1.60 . The percentage of people with comorbidities was 88.8. The average number of comorbidities in people with polypharmacy (4.23 ± 1.89) was significantly more than in people Without it (2.26 ± 1.79) ($P = 0.000$). The average MMSE score in the group with polypharmacy was 24.74 ± 4.21 and in the group without polypharmacy was 25.57 ± 9.55 , which means that there was no significant difference between the two groups.

The most prevalently consumed group of medications in both genders was cardiovascular-hypertension group, inasmuch as 35.4% of men and 50.05% of women used it. The second most prevalently consumed medications were analgesic, anti-inflammatory, and rheumatic medications, inasmuch as 32.7% of men and 46.1% of women used this group of medications. The third most prevalently consumed group of medications was antilipid medications in men (13.6%) and gastrointestinal medications in women (27.1%) [Figure 2].

Among the chronic comorbidities, depression, hypertension, and heart diseases (angina, myocardial infarction, and heart failure) were the most prevalent diseases among the participants. Moreover, polypharmacy increases significantly with the presence

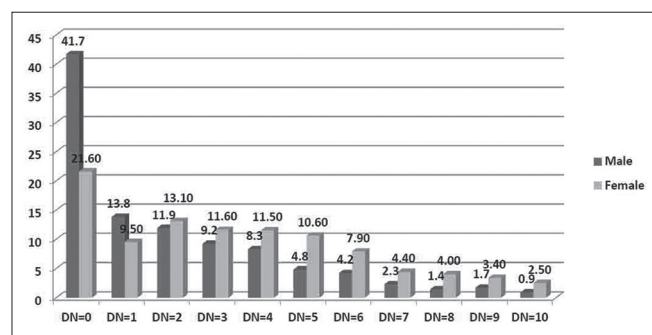


Figure 1: Percentage of drug users in terms of drug number (DN: Drug number) and sex in the elderly of Amirkola

of comorbidity. Heart diseases, diabetes, and pulmonary diseases, respectively, had the most number of polypharmacy ($P = 0.000$) [Table 1].

Among the investigated variables, being married, being in the age group of 60–69 years and 75–79 years, having comorbidity, being female, being retired, and being employed apart from homemakers had a significant role in increasing polypharmacy [Table 2].

DISCUSSION

Results of the present study indicate the relatively high prevalence of polypharmacy (23.1%) in people aged 60 years and older. Other cross-sectional studies showed that this amount was 39.4 in Italy,^[25] 32.5 in Taiwan,^[26] and 29.5 in New Zealand.^[27] Moreover, another study in Italy indicated that the prevalence of polypharmacy was 46% in the elderly aged 65 years and older.^[28] The results of Blozik *et al.*'s study also showed that, like in our study, the incidence of polypharmacy (17%) and consumption of potentially inappropriate medicines (21%) were high in the elderly of Switzerland and were followed by consequences such as hospitalization, decreased performance, and

Table 1: Distribution of comorbidities and the percentage of polypharmacy associated with each disease

Comorbidity	n (%)	Polypharmacy, n (%)	P
Diabetes			
Yes	378 (23.4)	68 (44.4)	0.000
No	1237 (76.5)	206 (16.7)	
Hypertension			
Yes	667 (41.3)	258 (38.7)	0.000
No	948 (58.6)	116 (12.2)	
Hypothyroidism			
Yes	67 (4.1)	28 (41.8)	0.000
No	1548 (95.8)	346 (22.4)	
Myocardial infarction			
Yes	91 (5.6)	49 (53.8)	0.000
No	1524 (94.3)	325 (21.3)	
Angina			
Yes	285 (17.6)	145 (50.9)	0.000
No	1330 (82.4)	229 (17.2)	
Heart failure			
Yes	38 (2.3)	23 (60.5)	0.000
No	1577 (97.6)	351 (22.3)	
Arthritis			
Yes	316 (19.5)	107 (33.9)	0.000
No	1299 (80.4)	267 (20.6)	
Depression			
Yes	700 (43.3)	224 (32.0)	0.000
No	912 (56.4)	150 (16.4)	
Pulmonary disease			
Yes	121 (7.4)	49 (40.5)	0.000
No	1494 (92.5)	325 (21.8)	

death.^[4] The higher prevalence of polypharmacy in most of other studies might be because the age of seniority was considered over 65 years. On the other hand, the incidence of polypharmacy has obviously increased in the population, especially the elderly, during recent decades. Factors that caused this increase might be enhanced life expectancy, presence of chronic diseases that require long-term treatment, greater use of health services, and production of new medications.

In the present study, polypharmacy was significantly more prevalent in elderly women (32.7%) than in elderly men (15.2%) ($P = 0.007$). In most of other studies, likewise, the risk of polypharmacy in elderly

women was more than in elderly men.^[27-31] Only in Slabaugh *et al.*'s study, polypharmacy in men was more than in women^[25] which was due to higher prevalence of chronic diseases in men. In the present study, the percentage of men and women who consumed no medications was, respectively, 41.7% and 21.6%. In Nobili *et al.*'s study, too, 13.3% of men and 11.1% of women consumed no medications.^[28] In the present study, the average number of consumed medications in people without polypharmacy was 1.38 ± 1.45 and in people with polypharmacy was 6.63 ± 1.60 . In a similar study, the average number of consumed medications in the elderly without polypharmacy was 2.6 ± 1.2 and in the elderly with polypharmacy was (7.1 ± 2.1) .^[32] Therefore, it is important to educate about the correct use of medications by health professionals and nurses in the families of the elderly, especially elderly women.

In the present study, the average age of participants without polypharmacy was 69.92 ± 7.54 and the average age of participants with polypharmacy was 69.66 ± 7.00 , which had no significant difference. However, the age group of 65–69 years and 75–79 years was significantly associated with increase of polypharmacy ($P = 0.005$ and $P = 0.011$). In other studies, polypharmacy consumption pattern was associated with increase of age.^[25,28,33] In a study in New Zealand, the risk of polypharmacy and hyperpolypharmacy was more in the age group of 80–84 years.^[27] Moreover, in a study in Taiwan, patients with

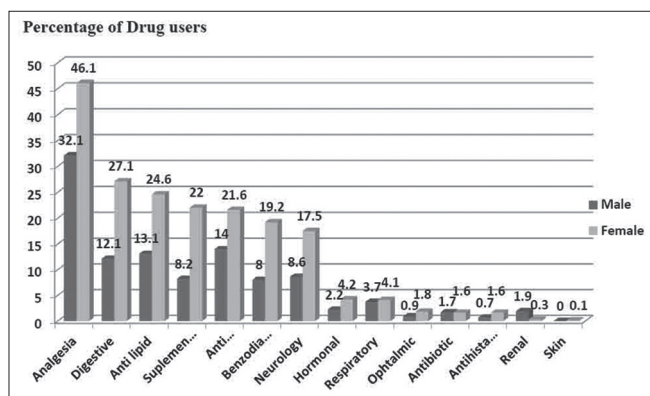


Figure 2: Percentage of drug users in terms of drug and gender in the elderly of Amirkola

Table 2: Odds ratio and 95% confidence interval of variables effective on polypharmacy in the elderly of the city of Amirkola

Investigated variables	Polypharmacy, n (%)	OR	OR 95% CI		P
			Lower	Upper	
Marital status					
Married	21.2	Reference			
Single	34.5	0.596	0.444	0.903	0.015
Age					
60-64	20.2	1.480	1.027	2.124	0.036
65-69	24.4	1.650	1.119	2.427	0.012
70-74	37.6	1.254	0.812	1.931	0.309
75-79	22.8	2.052	1.208	3.486	0.008
≥80	40.5	0.588	0.222	1.555	0.285
Gender					
Male	15.2	Reference			
Female	32.7	1.515	1.100	1.937	0.007
Comorbidity					
Yes	26.00	1.668	1.547	1.800	0.000
No	0.6	Reference			
Occupational status					
Unemployed	38.9	Reference			
Housewife	31.9	1.461	0.421	1.089	0.039
Retired	19.6	1.638	0.324	0.959	0.011
Employed apart from homemakers	10.9	1.216	0.203	0.603	0.362
Unemployed	30	1.947	0.188	5.117	0.011

OR: Odds ratio, CI: Confidence interval

the highest percentage of polypharmacy were in the age group of 75–84 years.^[26] According to studies that were mentioned, polypharmacy in the elderly has increased with age and it can be said that since the number of chronic comorbidities and other problems of the elderly increases with age, the incidence of polypharmacy will increase consequently.

As reported by studies conducted so far, polypharmacy in the elderly is related to the presence of chronic diseases.^[17,29,34] Comorbidities require consumption of more medications. Polypharmacy causes drug interactions, adverse drug reactions, decreased patient compliance, and personal and social costs and it affects the quality of life as well.^[17] In our study, too, it was shown that comorbidities increase with age, and consequently, the chance of occurrence of polypharmacy increases.

In a study, 61.1% of aged patients suffered from more than three chronic diseases, inasmuch as the average number of chronic diseases was 2.8 and was related to polypharmacy.^[35] The most prevalent diseases in this study were hypertension (75.3%), depression (45.5%), and dementia (39.4%). Moreover, in Sabzwari *et al.*'s study, the most prevalent chronic diseases among the elderly included diabetes, hypertension, heart disease, and depression.^[36] In another cross-sectional study by Vyas *et al.* in the United States, the amount of polypharmacy was variable from 7.2% in patients with pulmonary disease to 64.1% in those who had three concurrent diseases.^[37] In the present study, too, chronic comorbidities including depression (43.2%), hypertension (41.3%), and heart diseases (25.5%) were the most prevalent diseases in the elderly. Moreover, polypharmacy increased significantly with the presence of comorbidities, and the highest incidence of polypharmacy was, respectively, in patients with heart disease, diabetes, and pulmonary disease ($P = 0.000$). Furthermore, in the present study, polypharmacy had no significant relation with some chronic diseases such as liver and kidney diseases, peptic ulcer, and hyperthyroid.

In our study, the most widely consumed group of medications in both genders was the cardiovascular-hypertension group, inasmuch as 35.4% of men and 50.05% of women consumed it. The second most prevalently consumed medications were analgesics, anti-inflammatory, and rheumatic medications, inasmuch as 32.7% of men and 46.1% of women consumed this group. Finally, the third most widely consumed medications were antilipid medications in men (13.6%) and gastrointestinal medications in women (27.1%). Like our study, in Nobili *et al.*'s study, too, cardiovascular medications (66%) were the most prevalently consumed

medications in the elderly, and after that, gastrointestinal medications (42%), antibiotics (41%), and medications for musculoskeletal system (38%) were the most consumed medications.^[27] In other studies also, the increase of polypharmacy was followed by increased consumption of antidepressant, antidiabetic, and heart medications.^[28,38] In Sabzwari *et al.*'s study, the most prevalently consumed group of medications in polypharmacy included psychoactive, cardiovascular, nonsteroidal anti-inflammatory, and oral hypoglycemic medications.^[36] In another study, polypharmacy in European countries was associated with consumption of antidepressant, antithrombotic, anticholinergic, and antipsychotic medications.^[39]

In the present study, marital status, being retired, or being employed apart from homemakers was significantly associated with the increase of polypharmacy. In Carvalho *et al.*'s study, higher income and being employed were directly connected to polypharmacy in the elderly.^[5] However, in another study, polypharmacy was associated with poverty.^[28] In Charlesworth *et al.*'s study, marital status was not related to polypharmacy.^[28] In our study, there was no significant connection between polypharmacy and level of education. In another similar study, too, participants' level of education had no significant relation with polypharmacy.^[28] However, in some other studies, the low level of literacy and awareness of elderly patients were the most prevalent causes of polypharmacy.^[12-14]

In the present study, there was no significant relation between polypharmacy, MMSE score, and Geriatric Depression Scale. In Sganga *et al.*'s study, too, polypharmacy was not significantly associated with MMSE score and Geriatric Depression Scale.^[40] However, in our study, there was a significant connection between polypharmacy and depression ($P = 0.000$). In another study, likewise, there was a relation between polypharmacy, depression, and cognitive capacity.^[38]

CONCLUSIONS

The results of this study indicate that the prevalence of polypharmacy is high in the elderly people and is associated with demographic factors such as being married, being female, being in the age group of 60–69 and 75–79 years, having comorbidity, being retired, and being employed apart from homemakers. As a result, it is important to plan for specific interventions for rational and correct administration of medications, especially in the elderly with the above-mentioned characteristics. Since it is anticipated that the population of the elderly increase remarkably over the coming decades and be followed by the increase of chronic

diseases and polypharmacy, assessment and management of polypharmacy by physicians, pharmacists, and authorities of health-care centers are highly required. Moreover, increase of awareness among physicians, experts, authorities, and families about characteristics of the elderly people and factors affecting polypharmacy can help in the proper and safe use of medications, and as families' awareness increases, it encourages the proper culture for using medications and decreases the negative effects of this problem.

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Conflicts of interest

There are no conflicts of interest.

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