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The prevalence of polypharmacy in elderly: a cross section study from Bosnia and Herzegovina

Key words:

polypharmacy,
elderly patients,
drug therapy,
chronic diseases,
primary health care

Abstract

Introduction: We define polypharmacy as a simultaneous usage of five or more drugs, an over usage of medically indicated drugs, or a therapy regime in which at least one type of drug is unnecessary. Since the elderly often suffer from multiple chronic diseases, they generally use multiple drugs.

Objective: The aim was to estimate the prevalence of elderly (>65) patients who continuously used five or more drugs, to single out the most frequently used drugs in reference with sex and age, and to identify potentially inadequate drugs.

Method: The research was actually a cross section study covering 432 consecutive patients older than 65, who were registered with two family clinic teams at the Banja Luka Health Centre. We examined all electronic medical charts of our target patients and entered data on their age, sex, chronic diagnoses, and continuous therapies into questionnaires designed for the purpose of our study for October-December 2015 period.

Results: There were 170 (39.35%) male and 262 (60.65%) female patients. The average age was 73.88 ± 6.5 . Furthermore, 189 (43.75%) patients used five or more drugs as follows: 61 (14.1%) patients with five drugs, 44 (10.2%) with six drugs, 49 (11.3%) with seven drugs, 17 (3.9%) with eight drugs, 11 (2.5%) with nine drugs, and 7 (1.6%) patients with ten drugs. We found no statistically relevant difference for patients with polypharmacy between the number of drugs in reference with either sex ($p=0.119$) or age ($p=0.555$). Mostly used potentially inadequate drugs were nonsteroidal anti-inflammatory drugs and benzodiazepines.

Conclusion: Polypharmacy was detected with almost half the target patients. A clinical assessment of a family doctor along with an individual treatment plan based upon medical, functional, and social conditions should be the foundation of the rational drug prescription at family clinic departments.

Introduction

We define polypharmacy as a simultaneous usage of five or more drugs, an over usage of medically indicated drugs, or a therapy regime in which at least one type of drug is unnecessary¹. As the human population grows older, the multi-morbidity increases and polypharmacy intensifies, all of which consequently represents a risk of new morbidity and mortality. Polypharmacy, the usage of different supplements, non-prescribed drugs, and potentially undesirable drug effects set a challenge for the efficient drug prescription. Adverse drug effects frequently cause hospitalization, and one of USA studies proved that undesirable drug effects caused 25% of hospitalizations of patients aged more than 80².

Drugs play a pertinent part in treating geriatric patients for chronic diseases in order to alleviate the pain and improve quality of life³. It is crucial for a family doctor to rationally prescribe drugs and get well-acquainted with pharmacokinetics and pharmacodynamics of drugs in the elderly⁴.

Aging affects pharmacokinetics and pharmacodynamics of drugs, which further impacts on the choice and dosage of drugs. Drug effects with the elderly may be more or less highlighted than with the younger patients. The nervous system of the elderly is more sensitive to opioid analgesics, benzodiazepines, antipsychotics, and antiparkinsonics. As one grows older, effects of some drugs are minor (e.g. beta blockers), and there are some changes in drug absorption. The reduced absorption is caused by the decreased small intestine surface and the increased stomach pH. The drug distribution within the body is altered due to the decrease in fluids and muscles and the increase in fat tissue. Liposoluble drugs are better distributed with the elderly patients. Furthermore, aging causes changes in metabolism and drug elimination. Metabolism of many drugs is affected by the impaired flow through the liver and the reduced liver mass. The kidney mass and renal flow are reduced and creatinine clearance decreases, which further causes the reduced renal drug elimination that correlates with the creatinine clearance which drops by 50% between the age 25 and 85. Drug pharmacodynamics is closely related with changes in drug sensitivity, which may rise or fall as one ages. These changes are due to deviations in drug-receptor bonds, the decrease in number of receptors, or an altered cellular response^{5,6}.

Polypharmacy represents a large burden for developed countries due to undesirable drug effects. In these countries, approximately 1 to 4 elderly patients get hospitalized because of the prescription of at least one inadequate drug, and around 20% of all hospital patient deaths are caused by potentially preventable undesirable drug effects⁷.

In order to rationally prescribe drugs, one may follow recommendations of Mark Beers, an American geriatric doctor, who defined criteria for drug prescription to elderly patients and who determined which drugs should be avoided,

which should have a limited usage, and the dosage of which should be time-limited^{8,9}. In practice, one may find it rather useful to use criteria singled out by an Irish scientist Gallagher and his associates, who determined which drugs were possibly inadequate for patients aged more than 65 – STOPP (*Screening Tool of Older Person's Prescriptions*) and criteria for drug prescription for patients aged more than 65 under the condition that there were no subscription contraindications – START (*Screening Tool to Alert doctors to Right Treatment*). The purpose of these criteria was to set the evidence-based rules in order to avoid the common, potentially inadequate prescriptions and possible negligence¹⁰.

The aim of our study was to estimate the prevalence of 65+ patients who continuously use five or more drugs and to single out the most frequently used drugs in reference with sex and age.

Method

The research was a cross section study run during October-December 2015 period. During the study, we examined electronic medical charts of all patients older than 65 who were registered at two family clinic departments at the Educational Family Medicine Centre of the Banja Luka Health Centre. The research protocol was approved by the relevant local ethics committee and complies with the Declaration of Helsinki.

Data collected from the electronic medical charts referred to age, sex, chronic diseases (cardiovascular diseases, mental illness and neurological diseases, musculoskeletal diseases, diabetes, malignant diseases, renal insufficiency, glaucoma, benign prostatic hyperplasia, and other chronic diseases) and drugs used in a continuous therapy (antihypertensive, nitrates, diuretics, antiarrhythmic, benzodiazepine, anti-epileptic, anti-parkinsonians, anticoagulation therapy, anti-aggregation therapy, nonsteroidal anti-inflammatory drugs, oral anti-diabetics, insulin, systemic corticosteroids, combination of beta 2 agonist + inhalator corticosteroids, bisphosphonates, statins, alpha1 adrenergic receptors, and other drugs used by the patients in a continuous therapy). We also surveyed the patients on supplementary drugs (ginkgo biloba, omega 3 fatty acids, herbal supplements for treating benign prostatic hyperplasia, vitamin supplements, mineral supplements, etc.) which they use either upon doctor's instructions or they buy it in chemist's self-willingly. All the data were entered into a questionnaire designed for the purpose of our study. Furthermore, data were entered into a Microsoft Excel chart and were statistically processed using SPSS program.

Examinees

The study covered 432 patients registered at two family clinic departments at the Educational Family Medicine Centre of the Banja Luka Health Centre, who were older than 65, suffered from at least one chronic disease, and used at least one drug in a continuous therapy. For the purpose of our study, the patients were singled out in reference with age. The first group were patients aged 65 to 70, the second group were patients aged 71 to 75, the third group were patients aged 76 to 80, and the fourth group were patients aged 80+.

Statistical methods

We used a descriptive analysis of frequency and percentage in order to examine the samples for patients with chronic diseases and the type of drugs they used in a continuous therapy. Chi-Square test was used in order to determine to which extent age affected the usage of most frequently prescribed continuous drugs. The non-parametric Spearman's coefficient was used where appropriate for the regression analyses. The effect of age on the number of continuous drugs with polypharmacy patients was determined by using the non-parametric Kruskal-Wallis test.

Results

In the present study, 3551 patients who were registered at two family clinic departments at the Educational Family Medicine Centre of the Banja Luka Health Centre were screened. A total number of 432 patients aged 65+ were included in this study. Out of 432 patients included, 243 (56.25%) patients continuously used fewer than five drugs as follows: 27 (6.3%) patients used one drug, 44 (10.2%) patients used two drugs, 83 (19.2%) patients used three drugs, and 89 (20.6%) patients used four drugs. On the other hand, 189 (43.75%) patients used five or more drugs as follows: 61 (14.1%) patients used five drugs, 44 (10.2%) patients used six drugs, 49 (11.3%) patients used seven drugs, 17 (3.9%) patients used eight drugs, 11 (2.5%) patients used nine drugs, and 7 (1.6%) patients used ten drugs.

There were 170 (39.35%) male patients and the average age was 73.88 ± 6.5 , in which the youngest patient was 65 and the oldest one was 92 years of age. The group aged 65-70 covered 166 (38.45 %) patients, the group aged 71-75 had 101 (23.37 %), the group aged 76-80 had 86 (19.90 %), and the group aged 81+ had 79 (18.28%) patients. The most common chronic diseases were cardiovascular and musculoskeletal diseases. In addition, 94 patients suffered from diabetes type 2, and 35 patients suffered from a malignant disease (Table 1).

Table 1. Chronic diseases of the patients (n=432)

Variable	Patients N (%)
Cardiovascular diseases	
Hypertension	361(83.6)
Angina pectoris	123 (28.5)
Heart failure	57(13.2)
Heart attack	20(4.6)
Atrial fibrillation	65 (16.0)
Other cardiovascular diseases	91 (21.1)
Mental disorder	
Anxiety	12 (2.8)
Depression	17(3.9)
Psychosis	2 (0.5)
Neurological diseases	
Stroke	19 (4.4)
Parkinson's disease	6 (1.4)
Epilepsy	8 (1.9)
Other neurological diseases	35 (8.1)
Musculoskeletal diseases	
Spondylosis	101 (23.4)
Coxarthrosis	10 (2.3)
Gonarthrosis	47 (10.9)
Osteoporosis	30 (6.9)
Rheumatoid arthritis	17(3.9)
Gout	3 (0.7)
Other musculoskeletal diseases	56 (13.0)
Other diseases	
Diabetes mellitus	94 (21.8)
Malignant diseases	35 (8.1)
Renal failure	11(2.5)
Glaucoma	65(15.0)
Benign prostatic hyperplasia	59 (13.7)
Other chronic diseases (hyper and hypothyroidism chronic gastritis, chronic colitis, etc.)	165 (38.2)

The following were the most frequently used drugs with patients treated for cardiovascular diseases: ACE inhibitors 186 (43.1%), ACE inhibitor + diuretic combination 177 (41.0%), beta blockers 136 (31.5%), calcium channel blockers 131 (30.3%), nitrates 105 (24.3%), statins 114 (26.4%), anti-aggregation therapy (ASA, clopidogrel) 157 (36.3%), and benzodiazepine 195 (45.1%) (Table 2).

Table 2. Drugs used within a continuous therapy (n=432)

Variables	Patients N (%)
Cardiovascular disease treatment drugs	
ACE inhibitors	186 (43.1)
ACE inhibitor + diuretic combination	177 (41.0)
Beta blockers	136 (31.5)
Calcium channel blockers	131(30.3)
Angiotensin II receptor blockers	28 (6.5)
Nitrates	105 (24.3)
Diuretics	64 (14.8)
Antiarrhythmics III generation	41 (9.5)
Anticoagulant therapy (acenocumarol)	21 (4.9)
Anti-aggregation therapy (ASA, clopidogrel)	157 (36.3)
Statins	114 (26.4)
Mental and neurological disease treatment drugs	
Anti-epileptics	8 (1.9)
Anti-parkinsons	6 (1.4)
Benzodiazepines	195 (45.1)
Musculoskeletal disease treatment drugs	
Nonsteroid anti-inflammatory drugs (NSAIL)	54 (12.5)
Corticosteroids	9 (2.1)
Bisphosphonates	10 (2.3)
Other drugs used in a continuous therapy	
Oral antidiabetics	79 (18.3)
Insulin	34 (7.9)
Inhaling Beta 2 agonist + corticosteroid combination	9 (2.1)
BHP drugs	42 (9.7)
Other drugs used in a continuous therapy (levothyroxine, proton pump inhibitors, etc.)	217 (50.2)
Medical supplements	
Omega 3 fatty acids	6 (1.4)
Gingko biloba	11 (2.5)
BHP treatment herbs	5 (1.2)
Supplements -vitamins	47 (10.9)
Supplements -minerals	17 (3.9)
Other OTC supplements	23 (5.3)

We statistically processed the obtained results in order to examine the usage of individual drugs or a group of drugs in comparison with age. The analysis showed that the usage of nitrates ($p = 0.000$), diuretics ($p = 0.005$) and antiarrhythmic drugs ($p = 0.014$) statistically largely increased with age. Speaking of statin usage, there was a statistically relevant difference among our test groups in reference with age ($p = 0.028$), in which case patients aged 71-75 mostly used these drugs and patients aged 81+ used them the least (Table 3).

Table 3. Effect of age on the usage of most commonly prescribed drugs in continuous therapy (n=432)

Drug	Age	N (%)	p*
ACE inhibitor	65-70	64 (38.6)	0.091
	71-75	39 (38.6)	
	76-80	46 (53.5)	
	81 and older	37 (46.8)	
ACE inhibitor + diuretic	65-70	61 (36.7)	0.414
	71-75	42 (41.6)	
	76-80	41 (47.7)	
	81 and older	33 (41.8)	
Beta blockers	65-70	48 (28.9)	0.795
	71-75	35 (34.7)	
	76-80	28 (32.6)	
	81 and older	25 (31.6)	
Calcium channel blockers	65-70	46 (27.7)	0.769
	71-75	34 (33.7)	
	76-80	26 (30.2)	
	81 and older	25 (31.6)	
Nitrate	65-70	24 (14.5)	0.000
	71-75	25 (24.8)	
	76-80	26 (30.2)	
	81 and older	30 (38.0)	
Diuretics	65-70	13 (7.8)	0.005
	71-75	15 (14.9)	
	76-80	18 (20.9)	
	81 and older	18 (22.8)	
Antiarrhythmic	65-70	8 (4.8)	0.014
	71-75	10 (9.9)	
	76-80	9 (10.5)	
	81 and older	14 (17.7)	
Benzodiazepines	65-70	73 (44.0)	0.844
	71-75	46 (45.5)	
	76-80	37 (43.0)	
	81 and older	39 (49.4)	
Antiaggregation therapy (ASA, clopidogrel)	65-70	52 (31.3)	0.076
	71-75	40 (39.6)	
	76-80	40 (46.5)	
	81 and older	25 (31.6)	
Nonsteroidal anti-inflammatory drugs	65-70	18 (10.8)	0.163
	71-75	14 (13.9)	
	76-80	7 (8.1)	
	81 and older	15 (19.0)	
Oral antidiabetic	65-70	27 (16.3)	0.859
	71-75	20 (19.8)	
	76-80	17 (19.8)	
	81 and older	15 (19.0)	
Statins	65-70	42 (25.3)	0.028
	71-75	35 (34.7)	
	76-80	25 (29.1)	
	81 and older	12 (15.2)	

*Statistically relevant difference at $p < 0.05$

There were 65 (34.39%) male and 124 (65.61%) female patients within the group who continuously used five or more drugs. Chi-Square test showed no statistically relevant difference ($p=0.119$) in number of used drugs between male and female patients.

In the regression analysis, number of drugs taken by the study population did not correlate with age ($R^2=0.022$, Figure 1).

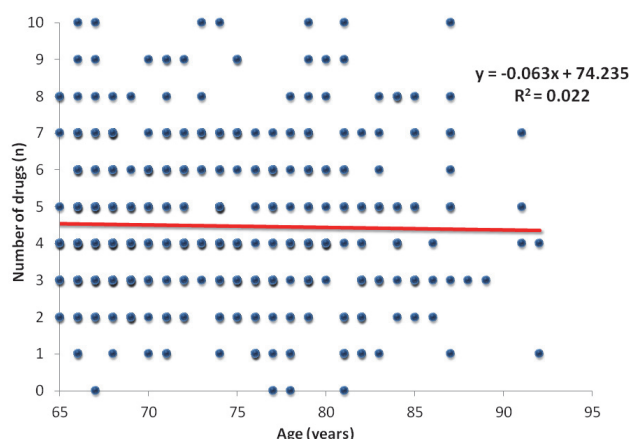


Figure 1. Linear regression of age vs. number of drugs

Furthermore, the effect of age on the number of drugs used in a continuous therapy with polypharmacy patients could not be proved (Kruskal-Wallis, $p=0.555$, Figure 2).

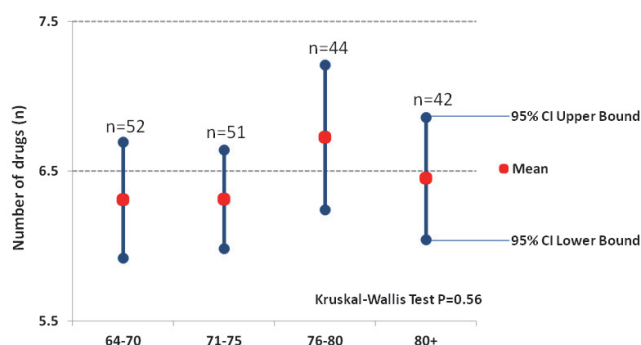


Figure 2. The effect of age on the number of drugs used in a continuous therapy with polypharmacy patients ($n=189$)

Discussion

Results of our study have shown a high percentage of polypharmacy patients (43.75%). This phenomenon exists in most developed countries, which has been proved in multiple studies led by other authors. Hence, Golchin et al conducted a study on 59 patients aged 65+ and proved polypharmacy with 35.6% of the examinees.¹¹ Opposite to our opinion, results of

a UK study that covered 1,900 patients aged 65+ indicated that the number of polypharmacy patients grew as the time passed. Thus, 15.1% of patients used 5 to 9 drugs in 2003, and the figures rose up to 25.2% in 2011. Results of the same study showed that the number of patients using 10 or more drugs grew from 1.3% in 2003 up to 3.8% in 2011¹².

Many authors studied the prescription of potentially inadequate drugs to the elderly and they compared their results with Beers, STOPP, and START criteria. The study of Bradley et al included 166,108 patients aged 70+ and they inferred that 34% of the patients were using potentially inadequate drugs longer than three months – NSAIDs (nonsteroidal anti-inflammatory drugs) 9% and benzodiazepine 6%¹³. In addition, results of our study showed that the patients mostly used NSAIDs (12.5%) as a long-term therapy, and even 45.1 % used benzodiazepine.

A French study showed an upward trend in prescribing drugs to the elderly over the last decade, and the most commonly prescribed drugs were for cardiovascular disease treatment, analgesics, and NSAIDs¹⁴. Likewise, a large national research in Taiwan indicated a high level (86.2%) of prescription of potentially inadequate drugs to the elderly, of which most frequent ones were NSAIDs and benzodiazepine¹⁵. Drugs for cardiovascular disease treatment were also most commonly prescribed drugs in our study but there were also many patients using benzodiazepine, analgesics, and NSAIDs.

According to our study, most commonly prescribed drugs were those for cardiovascular disease treatment, which complies with the most frequent chronic diagnosis. Moreover, 45.1% of benzodiazepine continuous usage is troublesome due to its effect on the fall risk, cognitive damages, delirium, and possible car accidents. A relatively large number of patients using NSAIDs (12.5%) as a long-term therapy is a risk to gastrointestinal bleeding.

Drug prescription to the elderly patients demands a balance between too many or too few drugs. Hence, it is necessary to consider specificities typical of this age as well as the potentially undesirable drug effects.

Conclusion

Polypharmacy was present with 43.75% patients in our study. We found no statistically relevant difference for patients with polypharmacy between the number of drugs in reference with either sex or age. Mostly used potentially inadequate drugs were nonsteroidal anti-inflammatory drugs and benzodiazepines. A clinical assessment of a family doctor along with an individual treatment plan based upon medical, functional, and social conditions should be the foundation of the rational drug prescription at family clinic departments.

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Преваленција полипрагмазије код старих особа - студија пресека из Босне и Херцеговине

Кључне ријечи:

полифармација,
старији пацијенти,
лијекови,
хроничне болести,
примарна здравствена заштита

Сажетак

Увод. Полифармација се дефинише као истовремено коришћење пет или више лијекова него што је то клинички индиковано или као коришћење терапијских режима у којима је бар један лијек непотребан. Будући да старије особе чешће болују од више хроничних болести, истовремено узимају већи број лијекова.

Циљ рада. Утврдити преваленцију пацијената старијих од 65 година који користе пет и више лијекова у континуираној терапији, утврдити најчешће коришћене лијекове у односу на пол и животно доба и идентификовати потенцијално неодговарајуће лијекове.

Метод. Истраживање је студија пресека којом су обухваћена 432 пацијента старија од 65 година, регистрована у два тима породичне медицине у Едукативном центру Дома здравља Бања Лука. У периоду октобар-децембар 2015. године извршен је преглед електронских здравствених картона ових пацијената, а подаци о добу, полу, хроничним дијагнозама и лијековима које користе у континуираној терапији уписивани су у Анкетни упитник формиран за потребе истраживања.

Резултати. Укупно је било 170 (39,35%) пацијената мушког и 262 (60,65%) женског пола. Просјечно животно доба пацијената је 73,88 година (SD 6,477). Пет и више лијекова је користило 189 (43,75%) пацијената - пет лијекова 61 (14,1%), шест лијекова 44 (10,2%), седам лијекова 49 (11,3%), осам лијекова 17 (3,9%), девет лијекова 11 (2,5%) и десет лијекова 7 (1,6%) пацијената. Код пацијената са полипрагмазијом није нађена статистички значајна разлика у броју коришћених лијекова у односу на пол ($p=0,119$) нити у односу на животно доба ($p=0,555$). Најзаступљенији потенцијално неодговарајући лијекови су нестероидни антиинфламаторни лијекови ($NSAIDs$) и бензодиазепини.

Закључак. Полифармација је присутна код скоро половине испитиваних пацијената. Клиничка процјена породичног доктора уз индивидуални план лијечења утемељен на медицинским, функционалним и социјалним условима, треба да буде темељ за рационално прописивање лијекова у породичној медицини.

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