

# Prevalence and factors associated with potentially inappropriate medications and drug interactions in elderly individuals in a primary health care setting

Glenda Pereira Lima Oliveira<sup>1</sup>, Aldren Thomazini Falçoni Júnior<sup>1</sup>, Gracielle Pampolim<sup>2</sup>,  
Luciana Carrupt Machado Sogame<sup>1</sup>

## ABSTRACT

**Objective:** To verify the prevalence and factors associated with drug interactions and potentially inappropriate medications used by elderly people assisted by a Basic Health Unit. **Methods:** Cross-sectional study, carried out with 236 elderly people aged  $\geq 60$  years, assisted by the Family Health Strategy. The dependent variables were the presence of potentially inappropriate medications and drug interactions, using the Beers criteria and the systematic organization *Anatomical Therapeutic Chemical*. The independent variables were age, sex, color, marital status, education, contribution to family income, presence of smoking, presence of alcohol consumption, living alone, leaving home alone, practicing physical activity, practicing leisure activities, practicing activities offered by UBS, self-perceived health, multimorbidity and presence of polypharmacy. Descriptive analyzes were carried out and associative analyzes were carried out using Pearson's Chi-square test. **Results:** 27.5% of the elderly used at least 1 potentially inappropriate medication, being associated with age greater than or equal to 75 years (38.5%), female sex (32.4%), white color (40.3%), absence of smoking (44.4%), absence of leisure activities (31.8%), presence of multimorbidities (34.4%) and practice of polypharmacy (43.8%). Drug interactions were present in 18.2% of the sample and were associated with the female gender (22.7%), practicing activities at the UBS (31.4%), self-perception of health as negative (23.9%), presence multimorbidity (25.3%) and presence of polypharmacy (42.7%). The main potentially inappropriate medication was omeprazole and the main drug interaction was simvastatin with amlodipine. **Conclusion:** The presence of inappropriate medications and undue drug interactions can cause significant functional loss in the elderly, with adverse effects, new diseases or cognitive decline, giving rise to a cascade of prescriptions. Coordination of care for elderly people is necessary to optimize pharmacotherapy and avoid unfavorable outcomes.

**Keywords:** Elderly health, Medication prescriptions, List of potentially inappropriate medications, Drug interactions, Primary health care.

## INTRODUCTION

The increase in life expectancy of the elderly population is a reflection of major social and technological advances, especially in the field of health<sup>1</sup>. In addition to this, older people who live longer tend to live with chronic and degenerative conditions, such as systemic arterial hypertension, diabetes *mellitus*, metabolic syndrome,

mental disorders and osteoarticular pain, often in combination<sup>1,2</sup>. The circumstance in which two or more conditions coexist, associated with the individual's self-perception of illness and biopsychosocial factors, categorizes multimorbidity<sup>3</sup>.

Chronic Noncommunicable Diseases (NCDs) have treatments, both preventive and to control the disease, of indefinite duration<sup>2,4</sup>. This situation may often require

<sup>1</sup>Santa Casa de Misericórdia de Vitória Higher School of Sciences, Vitória, (ES), Brazil.

<sup>2</sup>Federal University of Pampa, Uruguaiana, (RS), Brazil.



multiple drug therapy to control clinical progression and, as a result, the practice of polypharmacy arises, which does not have a concrete definition in the literature, but most studies characterize it as the use of 5 or more daily medications simultaneously, whether prescribed by a professional, purchased without a prescription or used as complementary medicine <sup>2,4,5</sup>.

Once in polypharmacy, there is a risk of the presence of drug interactions (DI) that can generate, in the short or long term, undesirable side effects, decreased quality of life, morbidity and mortality and increased frailty, contributing to the beginning of the cascade of prescriptions <sup>6</sup>. Drug interaction is defined, by the National Health Surveillance Agency (Anvisa), as any clinical or pharmacological response to the administration of two or more drugs simultaneously, causing secondary side effects that would not be caused if they were used separately, such as potentiation or inhibition of the effect of the drug, as well as unconventional side effects <sup>7</sup>.

Furthermore, the aging process causes changes in the pharmacokinetics and pharmacodynamics of medications, which generally increases the risk of side effects and reduces efficacy <sup>8</sup>. Therefore, some drugs, considered safe and effective for pediatric individuals and young adults, have changes in the risk-benefit relationship in the elderly population, and are now grouped and known in what is conventionally called potentially inappropriate medications (PIM) for the elderly <sup>9</sup>. The use of PIMs was associated with unfavorable health outcomes, such as vulnerability, mental confusion, falls, progression of chronic kidney disease and mortality <sup>10,11</sup>.

Therefore, it is observed that the presence of polypharmacy, use of inappropriate medications and multimorbidity are present mainly in the most disadvantaged portion of the population, as seen in Oliveira *et al.* (2022) who analyzed the same community as the present study <sup>12</sup>.

Considering the total amount of polypharmacy found in the previous study to be equal to 37.7%, this work proposes to verify the prevalence and factors associated with drug interactions and potentially inappropriate medications used in the same assisted population.

## METHODS

The study consists of a secondary analysis of the database of a cross-sectional survey with a quantitative approach, carried out at the Family Health Unit (USF) Luiz Castellar da Silva, in the Jesus de Nazareth neighborhood, in Vitória - ES. The sample was made up of elderly people aged 60 years or over, who were assisted by the Family Health Strategy (ESF) in the analyzed territory and who agreed to participate in the study by signing the Free and Informed Consent Form (ICF). The sample calculation was based on the number of elderly people registered at the USF in April 2018, with a margin of error of 0.05, an estimated proportion of 0.5 and an increase of 30% to cover possible losses. In the end, 241 elderly people were interviewed. To select the sample, the names were organized in alphabetical order, by micro-area, and then a simple randomization was carried out, selecting 2 out of every 3 elderly people.

Data collection for the primary study took place from April to June 2018, with a team of previously trained researchers, based on home visits scheduled in advance. For exclusion criteria, we considered those who did not have the conditions or caregiver able to respond to the questionnaire applied, who refused the visit and who died or moved before the interviews and evaluations. In the present study, 5 elderly people were excluded because they did not present data on medication use, totaling a sample of 236 elderly people.

The dependent variables are related to the drugs used daily by the elderly, including the presence of potentially inappropriate medications (PIM) and drug interactions (DI). For MPIs, we used the analysis of the Beers criteria that establish inappropriate substances for elderly people<sup>9</sup>. For this, the drugs used by each elderly person were researched in the list established by the *American Geriatrics Society* and, in this way, the number of MPIs and their respective active ingredients were recorded in columns in a spreadsheet within Microsoft Excel®, in the line corresponding to each elderly.

It is worth noting that the drugs used in the Unified Health System (SUS) are cataloged in the National List of Essential Medicines (RENAME), which consists of a list of all active ingredients available for prescription at the different levels of health care for the health care user. SUS, with most of the MPIs listed in this study being cataloged there<sup>13</sup>. However, some inappropriate drugs used by the elderly, such as muscle relaxants, some anti-inflammatories and some benzodiazepines, are not included in this list.

MPIs in the studied population was listed using the systematic organization *Anatomical Therapeutic Chemical (ATC)* proposed by the *World Health Organization Collaborating Center for Drugs Statistics Methodology*, adopted as an international standard for studying the use of drugs, which classifies them into 5 levels<sup>14</sup>. Level 1, represented by a letter of the alphabet, has 14 groups according to the organ or system in which the drugs act and, within each of these groups, there are subdivisions that relate to the therapeutic group of the drug, forming the level 2, represented by a letter of the alphabet plus two ordinary numbers, which was used in this study to classify medications<sup>14</sup>. Levels 3, 4 and 5 refer to the pharmacological group, chemical group and name of the chemical substance of the drug, respectively<sup>14</sup>, which become very specific for the objective proposed in the study.

DIs can be divided into: (1) drug-drug interaction (DDI) that occurs between two or more drugs; (2) drug-food interaction; and (3) drug-disease interaction, when there is a previously existing pathological condition and is affected by the use of a drug for another clinical treatment (BRASIL, 2010). The present study identified and analyzed drug-drug interactions.

DIs were quantified using the *Lexicomp® Drug tool Interactions*, accessed through the *UpToDate® platform*. The drugs used were researched and selected within the tool, thus enabling the analysis of the existence or not of drug interactions with multiple medications simultaneously, individualized for each elderly person. The interactions found were compiled into columns, using the same recording methodology mentioned above. Afterwards, the three most prevalent

interactions were selected for description in a table, as well as those that presented a higher risk of morbidity and mortality when used in the long term.

The independent variables of the study were divided into sociodemographic, economic and behavioral and health habits. For sociodemographic categorization of the sample, the following were considered: age (60 to 74 years and 75 years or more); sex (male and female); color (white and black); marital status (married and single); education (0 to 4 years, 5 to 11 years and 12 years or more); and family nucleus (lives alone or with someone else). The economic variable was the contribution to family income. The variables of behavioral and health habits include: presence of smoking; presence of alcoholism; leaving the house alone or accompanied; practicing physical activity; practicing leisure activities; practice of activities offered by UBS; self-perception of health, grouped into positive (excellent, very good or good) and negative (bad or very bad); multimorbidity (presence of 2 or more associated diseases); and presence of polypharmacy (use of 5 or more medications).

The descriptive analysis of the data was portrayed using absolute and relative frequency tables. The association between the dependent variables (MPI and IM) and the independent variables (other variables) was made using Pearson's Chi-square test (or Fisher's exact test, if one or more expected frequencies were less than five in a 2x2 table) using the *SPSS*® and *BioEstat*® programs and the adjusted standardized residual was considered in occurrences

greater than 1.96. For this, a significance level of  $p < 0.05$  was adopted, with a 95% Confidence Interval for all analyses.

Finally, the primary project that gave rise to this study is entitled "Health conditions and functionality of elderly people assisted by the family health strategy in Vitória - ES" and was presented to CEP/EMESCAM and approved under nº 2,142,377. The standards established in the Guidelines and Regulatory Standards for Research Involving Human Beings of resolution 466/12 were respected at all stages during the study.

## RESULTS

The prevalence of elderly people using at least 1 medication considered potentially inappropriate was 27.5%. Of these, the majority used only 1 MPI (72.3%). The use of PIM had a statistically significant association with age greater than or equal to 75 years (38.5%), female gender (32.4%), white color (40.3%), absence of smoking (44.4%), absence of leisure activities (31.8%), presence of multimorbidities (34.4%) and practice of polypharmacy (43.8%) (Table 1).

The prevalence of elderly people who had at least 1 drug-drug interaction was 18.2% and the statistically related variables were female sex (22.7%), practice of activities at the UBS (31.4%), self-perception of health as negative (23.9%), presence of multimorbidity (25.3%) and presence of polypharmacy (42.7%) (Table 1).

**Table 1 - Sociodemographic, economic profile and behavioral and health habits of the elderly regarding potentially inappropriate medications (MPI) and drug interactions (DI) at a UBS in Vitória - ES**

Variables	With MPI n = 65		No MPI n = 171		$p^2$ -	With IM n = 43		No IM n = 193		$p^2$ -
	n	(%)	n	(%)		n	(%)	n	(%)	
<b>Age</b>										
60 to 74 years old	40	23.4	131 <sub>4</sub>	76.6	<b>0.021<sup>2</sup></b>	26	15.2	145	84.8	0.052 <sup>2</sup>
75 years or older	25 <sup>4</sup>	38.5	40	61.5		17	21.2	48	73.8	
<b>Sex</b>										
Masculine	18	19.8	73 <sup>4</sup>	80.2	<b>0.034<sup>2</sup></b>	10	11.0	81 <sup>4</sup>	89.0	<b>0.023<sup>2</sup></b> -
Feminine	47 <sup>4</sup>	32.4	98	67.6		33 <sup>4</sup>	22.7	112	77.3	
<b>Color</b>										
White	25 <sup>4</sup>	40.3	37	59.7	<b>0.009<sup>2</sup></b>	14	22.6	48	77.4	0.300 <sup>2</sup>
Black	40	23.0	134 <sub>4</sub>	77.0		29	16.7	145	83.3	
<b>marital status</b>										
Married	36	25.0	108	75.0	0.274 <sup>2</sup>	28	19.4	116	80.6	0.542 <sup>2</sup>
Single	29	31.5	63	68.5	-	15	16.3	77	83.7	
<b>Education</b>										
0 to 4 years	40	29.6	95	70.4	0.697 <sup>2</sup>	24	17.8	111	82.2	0.978 <sup>2</sup>
5 to 11 years	15	25.4	44	74.6		11	18.6	48	81.4	
12 years and over	10	23.8	32	76.2		-	8	19.1	34	
<b>Live alone</b>										
Yes	9	17.3	43	82.7	0.059 <sup>2</sup>	8	15.4	44	84.6	0.538 <sup>2</sup>
No	56	30.6	127	69.4	-	35	19.1	148	80.9	
<b>Contribution to family income<sup>1</sup></b>										
Yes	9	29.0	22	71.0	0.278 <sup>2</sup>	8	25.8	23	74.2	0.641 <sup>2</sup>
No	0	0.0	two	100.0	-	1	50.0	1	50.0	
<b>Smoking<sup>1</sup></b>										
Yes	48	24.6	147 <sub>4</sub>	75.4	<b>0.030<sup>2</sup></b>	35	17.9	160	82.1	0.321 <sup>2</sup>
No	12 <sup>4</sup>	44.4	15	55.6		7	26.0	20	74.0	
<b>Alcoholism<sup>1</sup></b>										
Yes	7	22.6	24	77.4	0.488 <sup>2</sup>	4	12.9	27	87.1	0.398 <sup>2</sup>
No	58	28.6	145	71.4	-	39	19.2	164	80.8	

<b>Leave the house alone<sup>1</sup></b>											
Yes	48	25.5	140	74.5	0.241 <sup>2</sup>	30	16.0	158	84.0	0.063 <sup>2</sup>	
No	16	34.0	31	66.0	–	13	27.7	34	72.3		
<b>Practice of leisure activity</b>											
Yes	15	19.2	63 <sup>4</sup>	80.8	<b>0.042<sup>2</sup></b>	12	15.4	66	84.6	0.416 <sup>2</sup>	
No	50 <sup>4</sup>	31.8	107	68.2		31	19.7	126	80.3		
<b>Practice of physical activity<sup>1</sup></b>											
Yes	40	27.2	107	72.8	0.884 <sup>2</sup>	26	17.7	121	82.3	0.785 <sup>2</sup>	
No	25	28.1	64	71.9	–	17	19.1	72	80.9		
<b>Activity practice at UBS</b>											
Yes	14	27.4	37	72.6	0.987 <sup>2</sup>	16 <sup>4</sup>	31.4	35	68.6	0.006 <sup>2</sup> –	
No	51	27.6	134	72.4	–	27	14.6	158 <sup>4</sup>	85.4		
<b>Self-perceived health</b>											
Positive	31	24.4	96	75.6	0.245 <sup>2</sup>	17	13.4	110 <sup>4</sup>	86.6	0.038 <sup>2</sup> –	
Negative	34	31.2	75	68.8	–	26 <sup>4</sup>	23.9	83	76.1		
<b>Multimorbidity</b>											
Yes	53 <sup>4</sup>	34.4	101	65.6	<b>0.001<sup>2</sup></b>	39 <sup>4</sup>	25.3	115	74.7	0.001 <sup>2</sup>	
No	12	14.6	70 <sup>4</sup>	85.4	–	4	4.9	78 <sup>4</sup>	95.1		

Source: Own authorship.

Caption: <sup>1</sup> variables that do not total 100% of the sample due to the lack of participant information; <sup>2</sup> analyzes carried out using the Chi -square test; <sup>3</sup> analyzes performed using Fisher's Exact test; <sup>4</sup>resíduo do Qui-quadrado  $\geq 1,96$  quando  $p < 0,05$ .

Regarding classes, medications for acidity-related disorders (A02) represented the main potentially inappropriate prescription with 37.6% of the total, represented mainly by omeprazole (88.7%). Drugs that act on the musculoskeletal system, which include Non-Steroidal Anti-Inflammatory Drugs ( NSAIDs ) (M01) and muscle relaxants (M03), come next with 21.4%, 15.0% and 6.4%, respectively, of the total number of inappropriate prescriptions. Drugs that act on the nervous system, such as psycholeptics (N05) and psychoanaleptics (N06), represent 13.9% of the total number

of PIMs, of which 61.5% were benzodiazepines, so that this class represents 8.5% of the total. Of the drugs that act on the cardiovascular system, the main MPI was in the class of calcium channel blockers (C08), represented by rapid-release nifedipine, with 7.5% of the total.

The main interactions found were: simvastatin with amlodipine (25.6%), calcium carbonate with levothyroxine (16.3%) and enalapril with losartan (6.9%). Interactions such as citalopram with amiodarone, citalopram with

chlorpromazine and citalopram with domperidone were sporadic associations with only 1 patient found with each of them, however, it is worth highlighting that they are potentially fatal associations due to the risk of prolongation of the QT segment on the electrocardiogram, culminating in cardiac arrhythmias serious (Table 2).

**Table 2 - Prevalence of the main drug interactions in the elderly at a UBS in Vitória-ES**

Drug interaction	N = 43	
	n	%
	43	18.2
Simvastatin and amlodipine	11	25.6
Calcium carbonate and levothyroxine	7	16.3
Enalapril and losartan	3	6.9
Citalopram and amiodarone	1	2.3
Citalopram and chlorpromazine	1	2.3
Citalopram and domperidone	1	2.3

Source: Own authorship.

Furthermore, 37.7% of the elderly were using polypharmacy, with 39 (43.8%) of them consuming at least one PIM and 38 (42.7%) having at least one DI among the medications used (Table 3).

**Table 3 - Use of PIM and IM in elderly people in polypharmacy practice at a UBS in Vitória - ES**

	Polypharmacy				<i>p</i> <sup>1</sup>
	Yes N = 89		No N = 147		
	<i>n</i>	(%)	<i>n</i>	(%)	
<b>MPI</b>					
Yes	39 <sup>2</sup>	43.8	26	17.7	<b>&lt; 0.001</b>
No	50	56.2	121 <sup>2</sup>	82.3	
<b>IM</b>					
Yes	38 <sup>2</sup>	42.7	5	3.4	<b>&lt; 0.001</b>
No	51	57.3	142 <sup>2</sup>	96.6	

Source: Own authorship.

Caption: <sup>1</sup> analyzes carried out using the Chi-square test; <sup>2</sup> Chi-square residual  $\geq 1.96$  when  $p < 0.05$ .

## DISCUSSION

Potentially inappropriate medications for older people and drug interactions will be progressively more important topics in public health and medical practice, not only thanks to the demographic transition, but also due to the fact that chronic non-communicable diseases are increasingly managed with multiple medications to treat older people. achieve therapeutic targets and further reduce mortality from underlying conditions<sup>9</sup>. The professional who offers to deal with such conditions needs to be aware of the fact that treatment recommendations are dynamic and that therapeutic inertia constitutes a medical error<sup>15</sup>.

However, the fact that the drug appears in some criteria as potentially inappropriate does not prevent it from being prescribed as part of a therapeutic approach, but for this to happen it is necessary for the indication to be individualized taking into account the risk/benefit relationship<sup>9</sup>.

It was observed that 27.5% of the elderly assisted by the studied UBS use at least one MPI, a value close to the results of Gomes *et al.* (2019) (31.3%), however, above those found by Farias *et al.* (2021) (19.3%), and all of these authors analyzed elderly people in Primary Health Care (PHC) at a similar epidemiological moment to the present study<sup>16,17</sup>. In 2021, an important multicenter cohort study with a similar theme was published, in which 21.9% of elderly people in the community remained prescribed PIM during the 2 years of observation<sup>18</sup>.

Studies carried out with elderly people from different regions of the country indicate that older women make up the majority of this population within health

services and have more regular monitoring than elderly men, corroborating the findings of this research<sup>2,4,12, 19</sup>. Therefore, health investigations are more frequent and, as a result, there are more NCD diagnoses, which increases the propensity to use more medications concomitantly and, consequently, interactions between them<sup>4,20</sup>. Furthermore, other studies show that age and the presence of multimorbidities are also related to the practice of polypharmacy<sup>6,12,21</sup>. It is worth highlighting that these variables mentioned above are associated with the presence of MPI and MI.

In relation to the MPIs used, Proton Pump Inhibitors ( PPIs ), medications for disorders related to acidity, were the main ones in the studied population (37.6%), a result found recurrently<sup>6,10,22,23</sup>. Despite having revolutionized the treatment of conditions such as gastroesophageal reflux disease and Peptic Ulcer Disease (PUD), the use of PPIs is only recommended for 8 to 12 weeks and situations that require chronic use are rare and specific<sup>2,9,24</sup>. The temporal limitation is mainly due to the fact that the class is associated with an increased risk of bone fractures, hypovitaminosis B12 and greater susceptibility to *Clostridioides difficile* acquired in the community, in addition to nosocomial pneumonia and spontaneous bacterial peritonitis in patients with ascites<sup>2,24</sup>. Deprescription must be carried out actively, when the patient makes chronic use of PPI without clinical indication, in order to avoid such problems.

Otherwise, one of the most common complaints in the elderly population is the presence of chronic pain, the diagnosis and management of which can be a real challenge for the attending physician<sup>25</sup>. A bibliographical review carried out with studies from three continents shows that

the prevalence can reach almost 70% in the elderly <sup>26</sup>, with the main cause being rheumatological in origin, but also represented by pain resulting from other clinical complications, such as diabetes, neoplasms, fractures and diseases of the central nervous system (CNS) <sup>26</sup>.

Therefore, one of the first medications that both healthcare professionals and patients tend to use are NSAIDs, represented by 15.0% of the PIMs prescribed in this study. These medications act by reducing the synthesis of prostaglandins by inhibiting cyclooxygenase enzymes (COX 1 and 2), producing analgesic, anti-inflammatory and antipyretic effects in the body. However, this class, when used in elderly patients, can increase the risk of bleeding in the gastrointestinal system or PUD and its perforation, as well as the chance of SAH and Acute Kidney Injury (AKI) <sup>9,25</sup>. In order to avoid Part of this problem, the literature recommends concomitant use with PPIs or the preference for a selective COX-2 inhibitor, however, the cardiorenal risk remains unchanged, meaning restricted use is therefore indicated for patients with comorbidities related to these organs, especially those with low *clearance* of creatinine <sup>9,25</sup>.

Professionals who deal directly with the geriatric population can dispose of other medications and non-pharmacological measures to resolve pain, such as non-opioid analgesics, physical exercises aimed at gaining strength and mobility, water aerobics, low-impact Chinese martial arts and psychotherapy to prevent the progression of chronic pain <sup>25</sup>.

Benzodiazepines represented 8.5% of the total number of PIMs in the sample, a value below the average found in other

recent national studies, which are close to 20% <sup>17,22</sup>. This class of medications can be considered the prototype of PIM, as they cause cognitive decline and a high risk of fractures due to falls, which seriously alter the autonomy, independence, functionality and quality of life of elderly patients <sup>9,17,22</sup>.

Associated with this, drugs with hypotensive potential through direct vasodilation are also related to the risk of fractures, as is the case of nifedipine in the rapid release formulation, the main PIM with action on the cardiovascular system present in the studied population <sup>24</sup>. Extended-release forms of the same active ingredient are not classified as MPIs, but are not usually available in the SUS, therefore, when faced with the need to prescribe a dihydropyridine calcium channel blocker for an elderly person in PHC, amlodipine <sup>24</sup> should be chosen, <sup>27</sup>.

Regarding drug interactions, the most common was simvastatin-amlodipine (25.5%), which can be considered positive, since it is not necessarily iatrogenic, given the relevance of using drugs for primary and secondary prevention. These two drugs are essential for preventing major cardiovascular events, to the point that they reduce cardiovascular mortality <sup>28</sup>. However, the association does not fail to increase the myotoxic effects of simvastatin without increasing its effectiveness in reducing *low density lipoprotein cholesterol* (LDL-c), while patients undergoing drug interactions should receive closer monitoring for early detection of symptoms of myopathy and rhabdomyolysis <sup>28,29</sup>.

One way to prevent the occurrence of this DI is to exchange simvastatin for atorvastatin, as this statin does not increase myotoxicity due to amlodipine <sup>30</sup>

. However, atorvastatin has not yet been incorporated into the list of basic medicines available through the SUS, limiting the PHC therapeutic arsenal and exposing patients to an avoidable risk<sup>13,30</sup>.

Another DI considered clinically significant found in use in the elderly in the study was calcium carbonate associated with levothyroxine (16.3%). This concomitant administration can cause variations in thyrohormonal levels, with an increase in TSH and a decrease in T4 fractions<sup>31</sup>, due to the decreased absorption of this active ingredient when used together with formulas containing different proportions of calcium<sup>31,32</sup>. In order to minimize these signs, studies suggest delaying calcium administration by 6 to 8 hours or changing the levothyroxine tablet to gel capsules or liquid formulations<sup>31-33</sup>.

There were three cases of MI that can be considered a serious failure of therapy. The use of citalopram in association with amiodarone, domperidone and chlorpromazine. The three associations have a high potential for prolongation of the QTc interval, cardiac arrhythmias such as *torsades de pointes* and sudden death<sup>34</sup>. Interactions like these are the main reason why there are so many tools for evaluating drug-drug interactions, concern regarding the topic and highlight the urgent need for awareness and continued education of prescribers at all levels of care regarding the issue<sup>34</sup>.

In view of these MPI and MI results, it is recommended that they be incorporated into the clinical practice of professionals who deal with the elderly population, in addition to the Beers criteria, the *STOPP criteria* ( *Screening Tool of Older Persons' Prescriptions* ) and *START* ( *Screening Tool to Alert I'm Right Treatment* ), which take into account the specific clinical context for

the drug to be prescribed or deprescribed for the elderly patient, or the Brazilian Consensus on Potentially Inappropriate Medications (CBMPI) which unifies the experiences of international criteria for the reality of care and the pharmaceutical market for a South American country<sup>35,36</sup>.

The main limitation of the study developed was the lack of collection of clinical data from patients, since such information would be useful for classifying medications as inappropriate according to the STOPP criteria, complementary to those of Beers. Data such as main comorbidities, glomerular filtration rate and symptom complaints could help identify MPIs using the criteria adopted according to specific conditions. It is worth mentioning that the research is cross-sectional, which prevents it from generating a cause-and-effect relationship, and was carried out based on the territory of a single UBS, which may have affected the prevalence of MPIs and MI depending on the prescribers in the location.

## CONCLUSION

In the studied population, 27.5% used at least one PIM and 18.2% were subject to drug interactions considered risky. The factors associated with the conditions were: polypharmacy, multimorbidity, sex, age, color, absence of smoking, absence of leisure activities and activities at the UBS and negative self-perception of one's health, with the first three being common factors between the two variables.

With the results obtained in this study, it is clear that the prevalence of MPIs and DIs can be concrete data to integrate indicators of quality of care provided in PHC and at different levels of care. As it enables

practices to optimize pharmacotherapy and avoid unfavorable outcomes, thus bringing a clear benefit to the elderly population.

## REFERENCES

- Martinez R, Morsch P, Soliz P, Hommes C, Ordunez P, Vega E. Life expectancy, healthy life expectancy, and burden of disease in older people in the Americas, 1990–2019: a population-based study. *Rev Panam Salud Publica*. 2021; 45:e114.
- Farias NAS, Rodrigues RV. The influence of polypharmacy on elderly people attending a family health unit in Porto Velho – RO. *BJD*. 2022; 8(4):27459-88.
- Johnston MC, Crilly M, Black C, Prescott GJ, Mercer SW. Defining and measuring multimorbidity: a systematic review of systematic reviews. *Eur J Public Health*. 2019; 29(1):182-9.
- Sousa CR, Coutinho JFV, Freire Neto JB, Barbosa RGB, Marques MB, Diniz JL. Factors associated with vulnerability and frailty in the elderly: a cross-sectional study. *rev Bras Sick*. 2022; 75(2):e20200399.
- World Health Organization (WHO). Medication Safety in Polypharmacy: Technical Report. Geneva: WHO; 2019.
- Oliveira PC, Silveira MR, Ceccato MGB, Reis AMM, Pinto IVL, Reis EA. Prevalence and Factors Associated with Polypharmacy in Elderly People Assisted in Primary Health Care in Belo Horizonte-MG, Brazil. *Collective health science*. 2021; 26(4):1553-64.
- Brazil. Ministry of Health. National Health Surveillance Agency. Resolution - RDC nº 60, of December 17, 2010. Brasília (DF): Ministry of Health; 2010.
- Balaram K, Balachandran S. Psychopharmacology in the Elderly: Why Does Age Matter? *Psychiatrist Clin North Am*. 2022; 45(4):735-44.
- American Geriatrics Society. The 2019 American Geriatrics Society Beers Criteria® Update Expert Panel. American Geriatrics Society updated AGS Beers Criteria® for potentially inappropriate medication use in older adults. *J Am Geriatr Soc*. 2019; 67(4):674-94.
- Kimura H, Yoshida S, Takeuchi M, Kawakami K. Impact of Potentially Inappropriate Medications on Kidney Function in Chronic Kidney Disease: Retrospective Cohort Study. *Nephron*. 2022; 16:1-8.
- Buckley E, Jonsson A, Flood Z, Lavelle M, O'Sullivan N, Nurdin N, et al. Potentially inappropriate medication use and mortality in patients with cognitive impairment. *Eur J Clin Pharmacol*. 2022; 78(12):2013-20.
- Oliveira GPL, Dias LL, Sogame LCM, Pampolim G. Analysis of the medication profile and factors associated with polypharmacy in elderly people assisted by a Health Unit in Vitória ES. *Rev. Colomb. Science. Chem. Farm.* 2022; 51(2):1005-24.
- Brazil. Ministry of Health. Secretariat of Science, Technology, Innovation and Strategic Inputs in Health. Department of Pharmaceutical Assistance and Strategic Inputs. National List of Essential Medicines Rename 2022. Brasília: Ministry of Health; 2022.
- World Health Organization (WHO). Collaborating center for drug statistics methodology [Internet]. Geneva: WHO; 2023 [accessed 23 March 2023]. Available at: [http://www.whocc.no/atc\\_ddd\\_index/](http://www.whocc.no/atc_ddd_index/).
- Malaquias BSS, Buso ALZ, Silvano CM, Nardelli GG, Martins GT, Santos Álvaro S. Evaluation of medication prescriptions for elderly people in a geriatric outpatient clinic. *Medicine (Ribeirão Preto)* [Internet]. 2016; 49(5):440-5.
- Gomes MS, Amorim WW, Morais RS, Gama RS, Graia LT, Queiroga HM, et al. Polypharmacy in older patients at primary care units in Brazil. *Int J Clin Pharm*. 2019; 41(2):516-24.
- Farias AD, Lima KC, Oliveira YMC, Leal AAF, Martins RR, Freitas CHSM. Prescription of potentially inappropriate medications for the elderly: a study in Primary Health Care. *Collective health science*. 2021; 26(5):1781-92.
- Fernández A, Gómez F, Curcio CL, Pineda E, Souza JF. Prevalence and impact of potentially inappropriate medication on community-dwelling older adults. *Biomedicine*. 2021; 41(1):111-22.
- Aires JMP, Silva LT, Frota DL, Dewulf NLS, Lopes FM. Potentially inappropriate medications prescribed to patients at a Reference Center for Health Care for the Elderly. *Rev. bras. geriatr. gerontol*. 2020; 23(4):e200144.
- Carneiro JA, Ramos GCF, Barbosa ATF,

- Medeiros SM, Lima CA, Costa FM, et al. Prevalence and factors associated with polypharmacy in community-dwelling elderly people: a population-based epidemiological study. *Medicine (Ribeirão Preto)* [Internet]. 2018; 51(4):254-64.
21. Morin L, Johnell K, Laroche ML, Fastbom J, Wastesson JW. The epidemiology of polypharmacy in older adults: register-based prospective cohort study. *Clin Epidemiol* . 2018; 10:289-98.
  22. Praxedes MFS, Pereira GCS, Lima CFM, Santos DB, Berhends JS. Prescription of potentially inappropriate medications for the elderly according to the Beers Criteria: systematic review. *Collective health science*. 2021; 26(8):3209-19.
  23. Harrison S, O'Donnell LK, Miltre R, Dyer SM, Gnanamanickam ES, Bradley CE, et al. Costs of potentially inappropriate medication use in residential aged care facilities. *BMC Geriatr*. 2018; 18:9.
  24. Seto SL, Barra ME, Hamidi A, Sin JH, Devine LT. Efficacy and Safety of Immediate-Release Nifedipine in Critically Ill Patients. *J Pharm Practice* . 2022; 14:8971900221074953.
  25. Schwan J, Sclafani J, Tawfik VL. Chronic Pain Management in the Elderly *Anesthesiol Clin*. 2019; 37(3):547-60.
  26. Kshesek GB, Souza LGH, Leandro LA. Prevalence of chronic pain in the elderly: integrative literature review. *Braz. J. Hea . Rev*. 2021; 4(5):21367-81.
  27. Barroso WKS, Rodrigues CIS, Bortolotto LA, Mota-Gomes MA, Brandão AA, Feitosa ADM, et al. Brazilian Arterial Hypertension Guidelines - 2020. *Arq. Bras. Cardiol* . 2021; 116(3):516-658.
  28. Fuhrmann S, Koppena A, Seeling A, Knoth H, Schröder J. Analysis of secondary care data to evaluate the clinical relevance of the drug-drug interaction between amlodipine and simvastatin. *ZEvid \_ Fortbild Qual Gesundhwes* . 2019; 146:21-7.
  29. Wang YC, Hsieh TC, Chou CL, Wu JL, Fang TC. Risks of Adverse Events Following Coprescription of Statins and Calcium Channel Blockers: A Nationwide Population-Based Study. *Medicine (Baltimore)*. 2016; 95(2):e2487.
  30. Wiggins BS, Saseen JJ, Page RL, Reed BN, Sneed K, Kostis JB, et al. On behalf of the American Heart Association Clinical Pharmacology Committee of the Council on Clinical Cardiology; Council on Hypertension; Council on Quality of Care and Outcomes Research; and Council on Functional Genomics and Translational Biology. Recommendations for Management of Clinically Significant Drug-Drug Interactions With Statins and Select Agents Used in Patients With Cardiovascular Disease: A Scientific Statement From the American Heart Association. *Circulation* . 2016; 134(21):e468-95.
  31. Singh N, Singh PN, Hershman JM. Effect of calcium carbonate on the absorption of levothyroxine. *JAMA*. 2000; 283(21):2822-5.
  32. Zamfirescu I, Carlson HE. Absorption of levothyroxine when coadministered with various calcium formulations. *Thyroid* . 2011; 21(5):483-6.
  33. Morini E, Catalano A, Lasco A, Morabito N, Benvenga S. In thyroxine-replaced hypothyroid postmenopausal women under simultaneous calcium supplementation, switch to oral liquid or softgel capsule L-thyroxine ensures lower serum TSH levels and favorable effects on blood pressure, total cholesterolemia and glycemia. *Endocrine* . 2019; 65:569-79.
  34. Meid AD, von Medem A, Heider D, Adler JB, Günster C, Seidling HM, et al. Investigating the Additive Interaction of QT-Prolonging Drugs in Older People Using Claims Data. *Drug Saf*. 2017; 40(2):133-144.
  35. O'Mahony D. STOPP/START criteria for potentially inappropriate medications/potential prescribing omissions in older people: origin and progress, *Expert Rev Clin Pharmacol*. 2020; 13(1):15-22.
  36. Oliveira MG, Amorim WW, Oliveira CRB, Coqueiro HL, Gusmão LC, Passos LC. Brazilian Consensus on Potentially Inappropriate Medications for the Elderly. *Geriatr Gerontol Aging* . 2017; 10(4):168-84.

**CONTRIBUTION INDICATION**

- 1 - Substantial contribution to the study outline or data interpretation: GPLO, ATFJ, GP, LCMS.
- 2 - Participation in writing the preliminary version: GPLO, ATFJ, GP, LCMS.
- 3 - Participation in the review and approval of the final version: GPLO, ATFJ, GP, LCMS.
- 4 - Compliance with being responsible for the accuracy or integrity of any part of the study: GPLO, ATFJ, GP, LCMS.

**SOURCE OF SUPPORT:** there are no sources of support.

**ACKNOWLEDGMENTS:** there are no external acknowledgments.

---

**Corresponding Author:**

Glenda Pereira Lima Oliveira  
glendapl.oliveira@gmail.com

Received: apr 30, 2023

Approved: may 12, 2023

Editor: Profa. Dra. Ada Clarice Gastaldi

---