

Polypharmacy, automedication, and the use of potentially inappropriate medications: cause of intoxications in the elderly

polifarmácia, automedicação e uso de medicamentos potencialmente inapropriados: causa de intoxicações em idosos

Ana Flávia da Silva¹ , José de Paula Silva¹ 

ABSTRACT

Introduction: It is a fact that the elderly comprise an exponentially growing age group in Brazil. Inevitably, the high demand of most of this population for medicines and health services impacts public health policies in terms of the effort required to ensure the rational use of medicines, avoid iatrogenesis and improve the quality of life of the elderly. Potentially inappropriate drugs are those that should be avoided in the elderly, where the risk of adverse events outweighs the benefit.

Objective/ methodology: The study, of descriptive and retrospective nature and based on the research and analysis of secondary health data, aimed to broaden knowledge about the impact of the use of medicines by the elderly population, by collecting information on intoxications due to the use of medicines available on the DATASUS (Departamento de informática do Sistema Único de Saúde) website. **Results:** In about ten years related to the studied period, there were 2946 hospitalizations of the elderly caused by pharmacological intoxications, being relevant in number of cases the class of anticonvulsants, sedatives, hypnotics, antiparkinsonian drugs. **Conclusion:** The results found show a growing trend of problems associated with the use of medications by the elderly, making clear the impotence of effective pharmacovigilance strategies aimed at the health of this population.

Keywords: Self-medication; Iatrogenic Disease; Elderly; Polymedication; Longevity.

¹ Universidade do Estado de Minas Gerais, Passos, Minas Gerais, Brasil.

Associate Editor Responsible:
Enio Roberto Pietra Pedroso

Corresponding Author:
Ana Flávia da Silva
E-mail: anaflaviaafs@hotmail.com

Conflicts of Interests:
None.

Received in: 27 May 2021.
Approved on: 28 November 2021.
Publication Date: 31 March 2022.

DOI: 10.5935/2238-3182.2022e32101

RESUMO

Introdução: É fato que os idosos compreendem um grupo etário que cresce exponencialmente no Brasil. Inevitavelmente, a alta demanda da maioria dessa população por medicamentos e serviços de saúde acarreta impacto nas políticas de saúde pública no que tange o esforço necessário para garantir o uso racional de medicamentos, evitar iatrogenia e melhorar a qualidade de vida dos idosos. Medicamentos potencialmente inadequados são aqueles que devem ser evitados em idosos, em que o risco de eventos adversos supera o benefício. **Métodos:** O estudo, de caráter descritivo e retrospectivo e partindo da pesquisa e análise de dados secundários em saúde, objetivou ampliar o conhecimento sobre o impacto do uso de medicamentos pela população idosa, através da coleta de informações sobre as intoxicações por uso de medicamentos disponíveis no site do DATASUS (departamento de informática do Sistema Único de Saúde). **Resultados:** Em cerca de dez anos relacionados ao período estudado, entre 2010 a 2020, houveram 2.946 internações de idosos causadas por intoxicações farmacológicas, sendo relevante em número de casos as classes dos anticonvulsivantes, sedativos, hipnóticos, antiparkinsonianos. A região com maior número de casos foi a Sudeste. Há diferenças significativas na probabilidade de intoxicação em idosos, sendo maior nos casos de exposição a álcool, a fármacos analgésicos, antipiréticos e antirreumáticos, e a fármacos com ação no sistema nervoso central. **Conclusão:** Os resultados encontrados advêm da tendência crescente dos problemas associados ao uso de medicamentos por idosos, tornando-se clara a importância de estratégias efetivas de farmacovigilância voltadas a saúde dessa população.

Palavras-chave: Automedicação; Doença Iatrogênica; Idoso; Polimedicação; Longevidade.

INTRODUCTION

It is estimated that in 2025 Brazil will occupy the 6th place in the world in number of elderly people. This scenario will require improvements in health care, especially related to the efficiency of pharmaceutical assistance provided to the elderly population.¹

Aging is a process that variably leads to a decline in the body's cognitive, physical, and functional functions. In this context, it is a fact that elderly patients in general use a larger number of medications, being the most frequent target of iatrogenic effects.²

Polypharmacy is defined as the simultaneous use of five or more medications. It is known that the risk of adverse drug reactions with the concomitant use of two drugs is 13%, if five, the percentage reaches 58%, and reaches up to 82% when the pharmacotherapy is of seven or more items.³

Because of the pharmacokinetic and pharmacodynamic changes related to the physiological changes of aging, responses to drugs in the elderly differ from those in younger individuals. The occurrence of these changes is more pronounced and more severe in relation to certain drugs, especially those with long half-lives and narrow therapeutic

range, where the therapeutic serum concentration is very close to the toxic concentration.¹

Moreover, self-medication is a common practice and an aggravating factor in the treatment of health problems, because it leads to pharmacological interactions and negative side effects.⁴

It is common to use medications classified as potentially inappropriate for the elderly, which can lead to health risks for this age group and which should have limited use. Among the so-called Potentially Inappropriate Medicines (PIM), first classified by studies by Beers and collaborators, are described, for example, certain drugs belonging to the class of benzodiazepines, antihypertensives, laxatives, antiarrhythmics, anti-inflammatory drugs, and antidepressants.⁵

The goals of the Beers criteria are to facilitate medication choice, reduce adverse events, and provide a tool to assess the cost, standards, and quality of care for people aged 65 and older. These criteria were published in 1991 and have been updated every three years since 2011. The 2019 update proposes that the criteria can play an important role in making decisions about treatment options that meet the needs of the elderly while keeping them as safe as possible. The Beers criteria divide potentially inappropriate medications into five

categories: medications that are potentially inappropriate in most elderly people, those that should normally be avoided in the elderly with certain conditions, medications to be used with caution, drug interactions, and drug dose adjustment based on renal function.⁶

In order to avoid therapeutic complications, it is necessary to have a pharmaceutical care aimed at investigating the use of such drugs and to critically reflect on the aggravations resulting from their use.⁷

According to the World Health Organization, the rational use of medicines is characterized by the appropriate supply of medicines to patients, according to their clinical conditions, considering appropriate doses and periods and the costs individually and to the community.⁸

When not prescribed or used properly, a medication can cause harm to the patient, characterizing an iatrogenic condition. This topic reflects the need for attention and care in the treatment of the geriatric population.⁴

In this scenario, with the aim of expanding knowledge about the impact of the use of medications by the elderly population, the study proposed to determine the profile of drug intoxication in the elderly, as well as to identify the main therapeutic classes involved and their relationship with the Beers criteria.

METHODOLOGY

This is a descriptive and retrospective study, and the research population is made up of the elderly.⁹ Thus, we analyzed the hospital admissions of people aged 60 years or older, recorded in Brazil by the SUS Hospital Admissions System (SIH-SUS), from January 2010 to May 2020.

The data that make up the available information on drug intoxication were collected on the DATASUS (the Unified Health System IT Department) *website* in SUS Hospital Morbidity (SIH/SUS), selecting External Causes, by place of hospitalization - from 2008. Then the data were analyzed according to the variables available for tabulation from Cause group X40-X49 Accidental poisoning [intoxication] by and exposure to harmful substances. Data were then obtained about the places of hospitalization by regions in Brazil and year of occurrence, average length of stay in hospitalization, number of deaths and mortality rate caused by such poisoning, related to the age range affected.

The group of causes Accidental poisoning [intoxication] by and exposure to harmful substances includes accidents related to the use of drugs, medicines and biological substances in medical or surgical procedures. It also includes (self-inflicted) poisoning, when it is not specified whether accidental or intentional, and finally, poisoning due to accidental overdose, erroneous administration or ingestion, and inadvertent ingestion of drugs. The group is subdivided into categories, these being: accidental poisoning [intoxication] by and exposure to analgesics, antipyretics and antirheumatics, non-opioids; accidental poisoning [intoxication] by and exposure to anticonvulsants [antiepileptics], sedatives, hypnotics, antiparkinsonians and psychotropic drugs not elsewhere classified; Accidental poisoning [intoxication] by and exposure to narcotics and psychodysleptics [hallucinogens] not elsewhere classified; Accidental poisoning [intoxication] by and exposure to other pharmacological substances of action on the autonomic

nervous system; Accidental poisoning by and exposure to other drugs, medicines and biological substances not otherwise specified; Accidental poisoning by and exposure to alcohol; Accidental poisoning by and exposure to organic solvents and halogenated hydrocarbons and their vapors; Accidental poisoning by and exposure to other gases and vapors; Accidental poisoning by and exposure to pesticides; Accidental poisoning by and exposure to other harmful chemicals and those not otherwise specified.

RESULTS

In the period between January 2010 and May 2020, 2946 hospitalizations of the elderly related to drug intoxication were recorded by the SUS Hospital Admissions System (SIH- SUS). It was observed that these notifications showed no increasing or decreasing trend of cases, with a variation between the highest number of cases in 2010 (374) and the lowest number of cases in 2017 (235), and in the year 2020, until the month of May, the number of hospitalizations was 112. The region of the country with the most cases of hospitalization due to exposure to drugs and consequent intoxication was the Southeast. As for the occurrence of such intoxications by sex, it was found that about 55% were in men and 45% in women.

Chart 1 shows the profile of intoxications in the elderly that caused hospitalizations, according to the categories of the group of causes Accidental poisoning [intoxication] by and exposure to harmful substances, available in SIH-SUS. In the period studied, 52% of poisonings were caused by exposure to drugs or unspecified substances, 12% by alcohol ingestion, 10% caused by anticonvulsants [antiepileptics], sedatives, hypnotics, antiparkinsonians, 9% by pesticides, 8% by use of analgesics antipyretics and anti-rheumatics, not opiates, about 4% from exposure to organic solvents and halogenated hydrocarbons and their vapors, 3% caused by drugs that have action on the central nervous system, and finally, 1% of the poisonings in the elderly were due to narcotics and psychedelics.

Chart 2 shows a comparison of drug intoxication in the elderly and non-elderly according to the categories described above. Through the chi-square test, it can be seen that there are significant differences in the probability of intoxication, being in the elderly higher in cases of exposure to analgesic, antipyretic and anti-rheumatic drugs, non-opioids (p value 0.0039); to drugs that have an action on the autonomic nervous system (p value 0.0101), also as a result of alcohol ingestion (p value 0.0024) and other drugs (p value 0.0000) not specified according to the group of causes X40-X49. In the non-elderly, according to the data obtained, the highest probability of intoxication occurred in cases of exposure to narcotics and psychedelics (hallucinogens) (p value 0.0417), to pesticides (p value 0.0007), to organic solvents and halogenated hydrocarbons and their vapors (p value 0.0002), and to harmful chemical substances and those not specified (p value 0.0000).

As for the mortality rate, it is observed that it has an increasing tendency as the age range increases, and is thus higher in the elderly. This fact is explained in graph 3, obtained through data available at DATASUS. Furthermore, it can be concluded that the mortality rate in the elderly was more expressive, in the period studied, when it resulted from pesticide poisonings, followed by narcotic and psychedelic

Hospitalizations caused by poisoning between 2010 and

2020

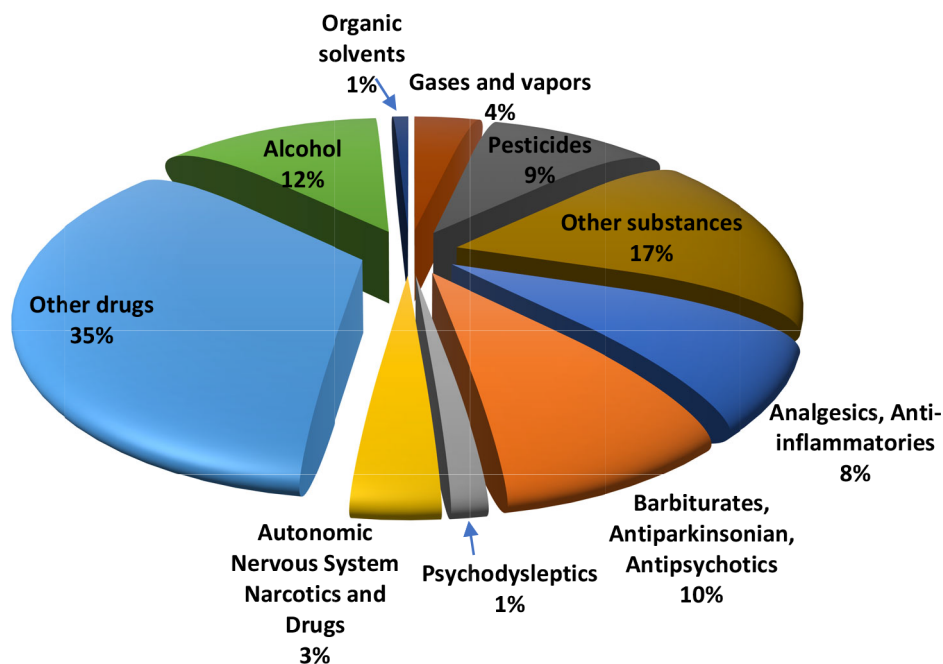


Chart 1. Hospitalizations caused by poisoning between 2010 and 2020 in the elderly.
Source: Prepared by the author.

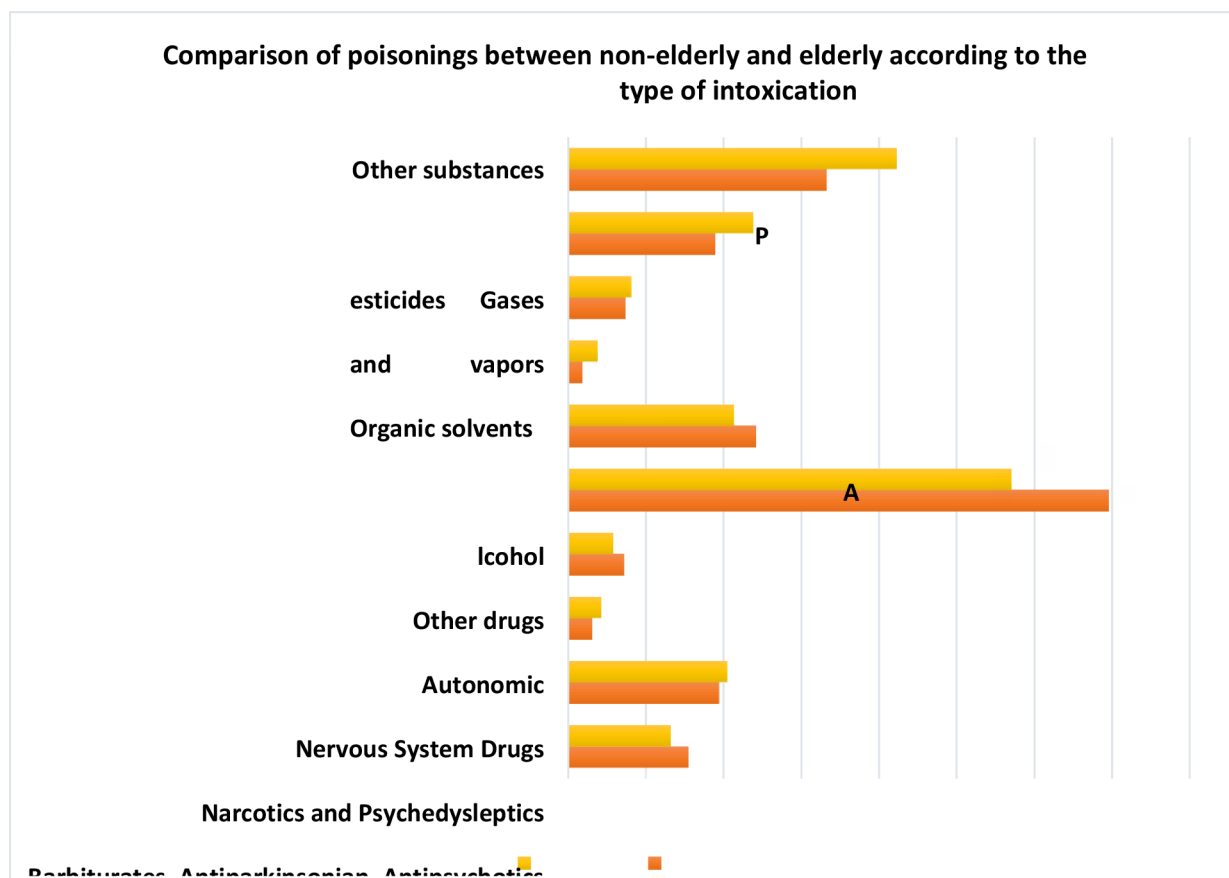


Chart 2. Comparison of poisonings between non-elderly and elderly according to the type of poisonings between the years 2010 and 2020.
Source: Prepared by the author.

poisonings, and by those caused by analgesics, antipyretics, and antirheumatics. In addition to these categories of poisoning, which have a decreasing tendency in the mortality rate, gas and vapor poisoning, other substances and unspecified drugs, alcohol, drugs that have an action on the nervous system, and finally, those caused by the use of barbiturates, antiparkinsonian drugs, and antipsychotics contribute to the number of deaths.

With regard to the average number of days of hospitalization, a higher number, 5.63 days, is observed in the case of intoxications caused by drugs that act on the autonomic nervous system, contrary to the mortality rate caused by these drugs, which is the third lowest among the categories studied. The other average hospitalization days are between 3.03 and 5.47, as shown in graph 4.

DISCUSSION

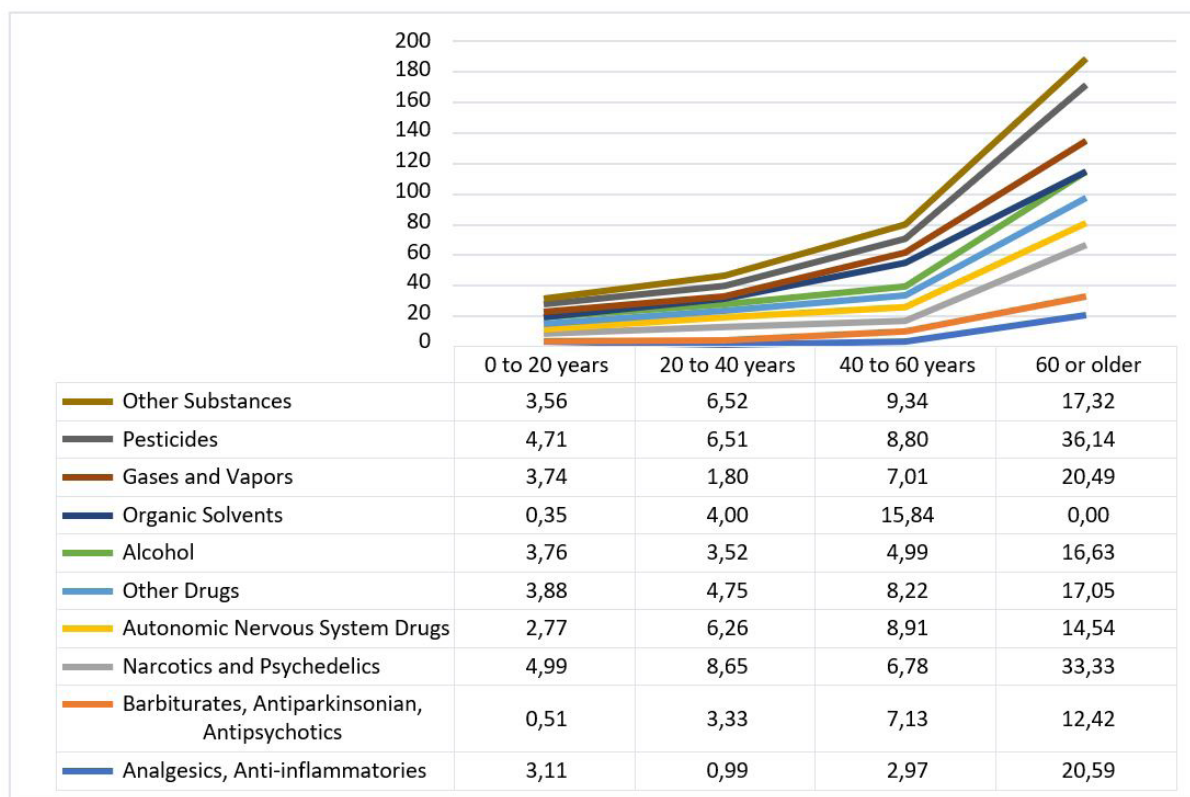
The increase in life expectancy and consequent aging of the population is a factor directly related to the formulation of strategies aimed at promoting health and quality of life among citizens. It is known that currently most elderly people use more than one medication continuously, and if hospitalized, they receive an average of eight to fifteen.²

In this sense, it is necessary to know the profile of drug consumption by this age group in order to establish strategies for the prescription and rational use of medicines. The use of drugs is considered inappropriate when the risk of adverse events is greater than the clinical benefit.

According to the results described, it is possible to notice the need to deepen the investigation about the subdivision denominated in DATASUS as non-specified drugs, in order to get to know which drugs would be those, which together are responsible for the highest rate of intoxication, as well as to study the possible pathophysiological mechanisms involved in the adverse effects caused by such drugs. It is worth mentioning the existence of the SINITOX (Sistema Nacional de Informações Tóxico- Farmacológicas) database, currently outdated, which until 2018 presented the cases of drug intoxication in the elderly in general, which may or may not have caused hospitalization, according to variables such as region of the country, age group, gender, evolution, and others. Such outdatedness reflects the lack of clinical-epidemiological data on the profile of use of inappropriate medications by the elderly, which hinders the creation of methods to protect against iatrogenesis in the elderly.

Another limitation of the present study is the possible underreporting of cases of drug intoxication in the elderly, which culminates in incomplete secondary data from the SIH-SUS and the deficiency of consistent national epidemiological information on the subject.

According to the available literature on the subject, income and education have a strong impact on the health status of the elderly population, since the elderly with higher educational levels and higher incomes are more independent for self-care, including the correct use of medications, means of transportation, and communication, while those with lower purchasing and intellectual power are more



Graph 3. Poisoning mortality rate between 2010 and 2020 according to age group.
Source: Prepared by the author.

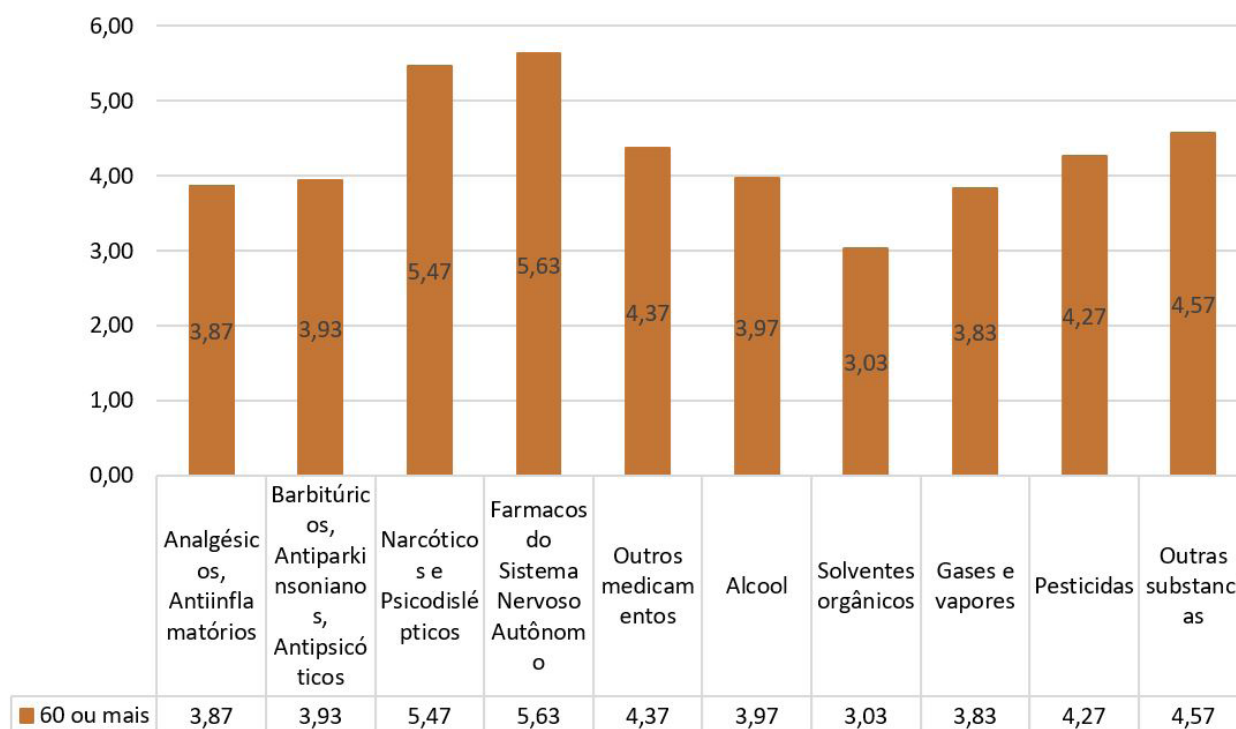


Chart 4. Average hospitalization days by category of intoxication in the elderly.
Source: Prepared by the author.

susceptible to diseases and also to iatrogenesis related to the use of medications.¹⁰

The data obtained also refer to alcohol consumption in today's society as a public health problem, since it represents a negative impact on the health of the elderly and contributes to such rates of hospitalization for intoxication. A study released in 2020 reveals that both the consumption and abuse of alcohol by the elderly follow an upward trend. Data available in the DATASUS system indicate that the age group 55 years or older makes up, each year, a greater portion of the total hospitalizations attributable to alcohol, increasing from 26% to 36%, between 2010 and 2018.¹¹

According to Beers and Fick's criteria, among the drugs that should be avoided in the elderly regardless of clinical condition are those that act on the central nervous system and psychotropic drugs, such as antiparkinsonian drugs with strong anticholinergic action, benzodiazepines, first-generation antipsychotics, barbiturates, and first-generation antihistamines, which is in accordance with the aforementioned results, in which 10% of drug intoxications were due to the use of such drugs.¹² It is worth noting that the high prevalence of neurodegenerative disorders, such as Parkinson's and Alzheimer's diseases, and mood disorders, such as depression, insomnia, and anxiety, may explain the use of these medications by this population group.¹³

In relation to the southeastern region of the country having been identified as the one with the highest percentage of hospitalization cases due to exposure to drugs and consequent intoxication, this can be assumed due to its larger population.

It becomes evident that it is pertinent to have studies and measures to prevent iatrogenesis in hospitals and inpatient

units, in order to avoid harm and damage to the health of the elderly resulting from drug interactions and excessive or erroneous prescriptions, ensuring quaternary prevention to the health of the elderly population.

The work of an interdisciplinary team, for example in the Family Health Strategy Program, can play an important role in the health assessment of the elderly, checking whether the complaints are due to illness or just adverse reactions to the use of medications. If they are adverse reactions, one can consider changing the prescription and monitoring the elderly, aiming to observe the outcomes.¹⁴

The results found in the study showed an important incidence of potential physiological impacts of drugs prescribed to the elderly population, once the profile of hospitalizations was described, as well as factors associated with these and clinical worsening resulting from polypharmacy, erroneous prescription and drug iatrogenesis. One can affirm the need for health care and the implementation of strategies that make pharmacotherapy safer and more appropriate for the elderly, also aiming to prevent drug intoxication in this age group.

Furthermore, it is important to emphasize the relevance of public policies related to the health of the elderly that can ensure pharmacovigilance and protection of their health, monitoring the different stages of the process of medication use: prescription, dispensing, marketing, administration and adherence to treatment. Poisoning from these substances, with consequent hospitalizations, represent not only a physical, emotional, and social impact for patients and families, but also a potentially avoidable cost to public health.

COPYRIGHT

Copyright © 2020 Silva et al. This is an Open Access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original article is properly cited

BIBLIOGRAPHIC REFERENCES

1. Garske CCD, Cassol D, Morch LM, Schneider APH. Medicamentos potencialmente inapropriados para idosos dispensados por uma farmácia básica dosul do Brasil. *Rev Interdisciplin Promoç Saúde*. 2018 Abr/Jun;1(2):96-104.
2. Silva JEG. Acompanhamento farmacoterapêutico em um abrigo de longa permanência para idosos: detecção de RNM e intervenções [dissertação]. Teresina (PI): Universidade Federal do Piauí (UFPI); 2011.
3. Resende ACGD, Costa FBC, Gomes IR, Araújo JG, Suguino MM, Vidal CEL. Avaliação do uso de medicamentos em idosos de acordo com o critério de Beers. *Rev Med Minas Gerais*. 2017;27(Supl 1):S30-S6.
4. Chaimowicz F. Saúde do Idoso. 2ª ed. Belo Horizonte: Núcleo de Educação em Saúde Coletiva (NESCO)/Universidade Federal de Minas Gerais (UFMG); 2013.
5. Gorzoni ML, Fabbri RMA, Pires SL. Medicamentos potencialmente inapropriados para idosos. *Rev Assoc Med Bras*. 2012 Jul/Ago;58(4):442-6.
6. Comelato C, Serrano PG. Atualização dos critérios de Beers AGS 2019, para medicações potencialmente inapropriadas em idosos. São Paulo (SP): HCFMUSP; 2019.
7. Hufferbaeche P, Varallo FR, Mastroianni PC. Medicamentos inadequados para idosos na estratégia da saúde da família. *Rev Ciênc Exatas*. 2012;8(3):56-67.
8. World Health Organization (WHO). The rational use of drugs: report of the conference of experts, Nairobi, 25-29 November 1985. Geneva: WHO; 1987.
9. Ministério da Saúde (BR). Estatuto do Idoso. Série E. Legislação de saúde. 2ª ed. Brasília (DF): Ministério da Saúde; 2003.
10. Cintra FA, Guariento ME, Miyasaki LA. Adesão medicamentosa em idosos em seguimento ambulatorial. *Ciênc Saúde Colet*. 2010;15(Supl 3):3507-15.
11. Andrade, AG. Álcool e a saúde dos brasileiros: panorama 2020. São Paulo (SP): Centro de Informações sobre Saúde e Álcool (CISA); 2020.
12. American Geriatrics Society Beers Criteria® Update Expert Panel. American Geriatrics Society 2019 updated AGS Beers Criteria® for potentially inappropriate medication use in older adults. *J Am Geriatr Soc*. 2019 Apr;67(4):674-94. DOI: <https://doi.org/10.1111/jgs.15767>
13. Chaimowicz F, Ferreira TJXM, Miguel DFA. Use of psychoactive drugs and related falls among older people living in a community in Brazil. *Rev Saúde Pública*. 2000 Dec;34(6):631-35.
14. Silvestre SD, Goulart FC, Marin MJS, Lazarini CA. Prescrição de medicamentos potencialmente inapropriados para idosos: comparação entre prestadores de serviços em saúde. *Rev Bras Geriatr Gerontol*. 2019;22(2):e180184.



This is an open access article distributed under the terms of the Creative Commons Attribution License.