Prevalence of and factors associated with polypharmacy among elderly persons resident in the community

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Abstract

Objective: to verify the prevalence of and factors associated with polypharmacy among elderly residents of the city of Cuiabá, in the state of Mato Grosso. *Method*: a cross-sectional study of 573 people aged 60 and over was performed. Polypharmacy was defined as the use of five or more medications. To investigate the association between polypharmacy and sociodemographic variables, health and access to medication, the Mantel Haenszel chi square test was used in bivariate analysis and Poisson regression was used in multivariate analysis. The significance level adopted was 5%. *Result:* the prevalence of polypharmacy was 10.30%. Statistically significant associations were found between polypharmacy and living with others, describing suffering from circulatory, endocrine, nutritional and digestive tract diseases, and referring to financial difficulties for the purchase of medicines. *Conclusion:* some social and health condition factors play an important role in the use of multiple medications among the elderly.

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INTRODUCTION

The population of Brazil has undergone a rapid aging process, creating challenges for health services in terms of the provision of care and the maintenance of quality of life. Aging also brings an exponential increase in the prevalence of chronic diseases and medication use[1], often with negative consequences for health.

The increased use of medications by the elderly leads to polypharmacy, defined as the regular use of five or more drugs[2]. Concomitant use of multiple medications can lead to undesirable health outcomes such as an increase in adverse reactions and drug interactions, lower adherence to drug therapy, decreased functional capacity, and cognitive decline.

In addition to these effects, polypharmacy can result in a greater demand for care, an increase in the number of hospital admissions, and higher costs for the health system[3]. It can also affect the quality of a prescribed drug treatment when it is combined with self-medication, which is common among the elderly[4].

Some studies have evaluated the use of medications and the presence of polypharmacy among the elderly. In developed countries, polypharmacy among the elderly varied between 39%[5] and 45% of the population[6]. In Brazil, a study with elderly people living in the metropolitan area of the city of São Paulo found a prevalence of polypharmacy of 36.0%[2].

A number of factors have been associated with polypharmacy among the elderly, such as the female gender, having a poor self-perception of health, belonging to a more advanced age group, having a low level of schooling and the presence of chronic diseases[2,7-9]. Added to this is the ease of obtaining medicines in pharmacies without prescriptions, which increases the exposure of the elderly to excessive drug use and unnecessary financial expense[10].

In addition to these factors, the presence of cognitive deficits, chronic disease and low schooling, which are common among the elderly,

are considered to compromise their ability to perform activities of self-care[11].

Considering the complexity of the relationship between aging and medication use, there is a need to gather new scientific evidence on this phenomenon in developing countries such as Brazil, so that health managers and professionals can better understand these exposure factors and act to prevent polypharmacy. Thus, the objective of the present study was to verify the prevalence of and factors associated with polypharmacy among elderly persons resident in the community.

METHOD

A cross-sectional population-based study was performed. The data analyzed was taken from a study carried out by Cardoso et al.[12] which evaluated the self-reported health conditions of elderly persons living in the city of Cuiabá, in the state of Mato Grosso. For the present study, individuals aged 60 years or older living in the urban area of the city of Cuiabá in 2012 were selected. Institutionalized elderly individuals with evidence of cognitive deficit or with a condition that prevented them from answering the questions were excluded, as were those living in rural areas.

The procedures proposed by Luiz and Magnanini[13] for finite populations were used to determine the sample size. Based on a total number of elderly people aged 60 years or over of 45,649[14], and adopting a significance level of 5% (corresponding to a 95% confidence interval, z $[\alpha]/2=1.96$), with a sampling error tolerance of 5%, an estimated maximum prevalence of polypharmacy among the elderly of 50% and a design effect of 1.3, a required sample of 495 participants was identified. This number was increased by 10% to explore associations between the independent variables and polypharmacy. It was then increased by a further 10% to compensate for any losses and refusals. A total of 26 elderly people refused to participate, resulting in a final sample of 573 interviewees. The data collection instrument used was the Brazil Old Age Schedule (BOAS) for the multidimensional evaluation of the elderly, which was validated by Veras and Dutra[15].

Data collection was performed as follows: from the starting point of the census sector, a clockwise route was followed from house to house until the end of the sector. Researchers asked if anyone aged 60 years or older lived at each house. If the answer was yes, the interviewer identified themselves and explained the research objectives, and the elderly persons were invited to participate in the study. The interviews took place either at the time or were scheduled for a later date. All elderly people living in the household (men and women) were interviewed. The interviews were carried out in the home of the elderly person, in a comfortable, well-lit environment that was free from interference. Several strategies were adopted to guarantee the quality of the data, from the preparation of a data collection manual, the standardization of the data collection form, the selection and training of the interviewers and the direct accompanying of the researchers in the field. In addition, data collection was assessed on a weekly basis and all the questionnaires were checked to identify failures in the completion of the answers, provide complementary information and complete the database.

The dependent variable in the present study was the presence of polypharmacy – defined as the regular use of five or more medications[2] and evaluated by asking about the use of medication during the application of the questionnaire.

The following independent variables were evaluated: a) sociodemographic characteristics: gender (male/female), age group (classified as 60 to 69 years, 70 to 79 years and 80 years and over), marital status (classified as married and single/other), schooling (classified as illiterate, up to 4 years of schooling or more than 4 years of schooling), monthly income of elderly person (classified as having no income or an income), occupational status (classified as active, when the individual declared that they performed some kind of labor activity, irrespective of remuneration, or inactive); b) health conditions: use of medical services (classified as public institution or others), self-medication (yes, when any medication, prescribed by a doctor or otherwise, was used), self-reported health (classified as poor or very poor, good, good or very good), presence and type of self-reported disease (classified as presence of self-reported disease and reclassified as circulatory disease (yes/no), endocrine disease, nutritional and metabolic disease (yes/no), musculoskeletal and connective tissue disease (yes/no), diseases of the digestive tract (yes/no), diseases of the ear and the mastoid process (yes/no) and other diseases (yes/no); c) variables related to access to medication: financial difficulties in the acquisition of medication (yes/no), difficulty finding the medication in the pharmacy (yes/no), difficulty in obtaining a prescription for controlled medication (yes/no).

The active principles of each drug were described in accordance with the Anatomical Therapeutic and Chemical classification (ATC), level 5 (chemical substance)[16].

In bivariate analysis, the crude associations between the outcome variable (polypharmacy) and the other exposure variables were identified. The chi-square test ($p<0.05$), using the Mantel Haenszel method (95% CI), or Fischer's exact test were applied as indicated.

Multiple analysis was performed using the Poisson Regression model, including all variables that presented an association with p-value <0.20 in the crude analysis, adopting the insertion of variables by block technique (sociodemographic first, followed by health conditions and then acquisition of medication). All variables that retained an association were included in the final model, using the progressive withdrawal of variables method (Stepwise backward). Variables with a statistically significant association p-value <0.05 were considered in the final model.

The project was approved by the HUJM Research Ethics Committee (CEP/HUJM), under record number 132/CEP-HUJM/2011, and all the participants signed a Free and Informed Consent Form (FICF).

RESULTS

Of the 573 elderly persons surveyed, the majority were female (55.67%), aged from 60 to 69 years (46.07%), and illiterate or with up to 4 years of schooling (83.06%). In terms of polypharmacy, 59 (10.30%) individuals reported the regular use of five or more medications (Table 1).

Table 1. Distribution of elderly persons according to gender. age group. marital status and level of schooling (n=573). Cuiabá. Mato Grosso. 2012.

Variables	n (%)
Gender	
Female	319 (55.67)
Male	254 (44.33)
Age range (years)	
Over 80	105 (18.32)
70-79	204 (35.60)
60-69	264 (46.07)
Marital Status	
Married	307 (53.58)
Single/other	266 (46.43)
Schooling (years of study)	
More than four	144 (25.06)
Up to four	332 (58.00)
Illiterate	97 (16.95)
Polypharmacy	
Five or more medications	59 (10.30)
Up to four medications	514 (89.70)

Table created by study authors.

In total, 350 medications were used by the elderly persons, according to ATC classification. Among the 20 most frequently used medications were those that acted on the cardiovascular system (55.0%), the alimentary tract and metabolism (25.0%), the nervous system (10.0%), and systemic hormonal preparations (5.0%). The active principles most commonly used by the elderly persons were hydrochlorothiazide (6.6%), acetylsalicylic acid (6.3%), metformin (6.0%), captopril (4.9%), nifedipine (3.7%), simvastatin (3.7%) and omeprazole (3.7%) (Table 2).

In terms of health conditions, elderly individuals who used public health services (PR=5.03, CI=1.59-15.93) and who described their health as poor or very poor (PR=5.03; CI=1.59-15.93) were associated with the use of polypharmacy. The presence of polypharmacy was more frequent among those who reported diseases of the circulatory system (PR=4.88, CI=2.14-11.16), endocrine, nutritional and metabolic diseases (PR=3.78, CI=2.37-6.05) and diseases of the digestive tract (PR=3.17, 1.68-6.00) (Table 4).

In terms of variables relating to access to medicines, elderly persons who had financial difficulties in purchasing medicines (PR=3.63, CI=2.26-5.84), difficulties finding the drug in the pharmacy (PR=3.15, CI=1.88-5.28) and difficulties obtaining a prescription for controlled drugs (PR=3.15, CI=1.61-5.80) reported a greater presence of polypharmacy (Table 4).

Table 2. Distribution of 20 medications most frequently used by elderly persons practicing polypharmacy, Cuiabá, MT, 2012.

Medications (5th level, ATC WHO chemical substance)	Frequency (%)
Hydrochlorothiazide (C03AA03)	6.6
Acetylsalicylic acid (B01AC06)	6.3
Metformin (A10BA02)	6.0
Captopril (C09AA01)	4.9

continued from table 2

Medications (5th level, ATC WHO chemical substance)	Frequency (%)
Nifedipine (C08CA05)	3.7
Simvastatin (C10AA01)	3.7
Omeprazole (A02BC01)	3.7
Enalapril (C09AA02)	3.1
Glibenclamide (A10BB01)	2.9
Propranolol (C07AA05)	2.6
Insulin (human) (A10AB01)	2.3
Levothyroxine Sodium (H03AA01)	2.3
Carvedilol (C07AG02)	2.0
Furosemide (C03CA01)	2.0
Losartan (C09CA01)	2.0
Atenolol (C07AB03)	1.7
Multivitamins and Calcium (A11AA02)	1.4
Amitriptyline (N06AA09)	1.4
Cinnarizine. combinations (N07CA52)	1.4

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Table 3. Bivariate analysis of polypharmacy and sociodemographic variables (n=573). Cuiabá, Mato Grosso, 2012.

Variables	%	PR	CI 95%	p-value
Gender				
Female	11.29	1.25	0.76-2.05	0.383
Male	9.06	1.00		
Age range (years)				
Over 80	10.48	1.13	0.59-2.16	0.713
70-79	8.37	0.80	0.39-1.64	0.544
60-69	11.83	1.00		
Marital Status				
Married	12.70	1.69	1.01-2.82	0.042
Single/other	7.52	1.00		
Schooling (years of study)				
More than 4	3.81	0.45	1.13-1-54	0.193
Up to 4	14.81	1.75	0.77-3.99	0.166
Illiterate	8.45	1.00		
Living arrangements				
With other person/people	11.13	3.40	0.85-13.56	0.057
Alone	3.28	1.00		
Monthly income				
No income	26.92	2.74	1.38-5.44	0.006
Income	9.82	1.00		
Occupational status				
Active	11.68	1.18	0.69-2.03	0.542
Inactive	9.86			

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Table 4. Bivariate analysis of polypharmacy, health conditions and access to medication of elderly persons (n=573). Cuiabá, Mato Grosso, 2012.

Variables	%	PR	CI 95%	*p*-value
Health conditions				
Health services				
Public institution	11.24	6.41	1.17-289.89	0.020
Others	1.75	1.00		
Self-medicating				
Yes	15.91	1.61	0.78-3.35	0.203
No	9.83	1.00		
Self-reported health				
Poor/Very poor	18.64	5.03	1.59-15.93	<0.001
Good	7.05	1.90	0.58-6.20	0.272
Very good	3.70	1.00		
Self-reported circulatory system disease				
Yes	14.36	4.88	2.14-11.16	<0.001
No	2.94	1.00		
Self-reported endocrine, nutritional and metabolic disease				
Yes	24.39	3.78	2.37-6.05	<0.001
No	6.44	1.00		
Self-reported musculoskeletal and connective tissue disease				
Yes	12.17	1.30	0.79-2.13	0.301
No	9.38	1.00		
Self-reported digestive tract disease				
Yes	29.63	3.17	1.68-6.00	<0.001
No	9.34	1.00		
Self-reported ear and mastoid apophysis				
Yes	15.00	1.51	0.70-3.30	0.311
No	9.94	1.00		
Other self-reported diseases				
Yes	14.56	1.56	0.90-2.68	0.116
No	9.36	1.00		
Access to medications				
Financial difficulties in acquiring medications				
Yes	22.70	3.63	2.26-5.84	<0.001
No	6.25	1.00		
Difficulty finding medications in pharmacy				
Yes	26.79	3.15	1.88-5.28	<0.001
No	8.51	1.00		
Difficulty obtaining prescription for controlled medications				
Yes	28.57	3.05	1.61-5.80	<0.001
No	9.36	1.00		

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Table 5. Poisson Multiple Regression Model and variables associated with polypharmacy among elderly persons. Cuiabá, MT, 2012.

Variables	Crude PR	Adjusted PR	CI 95%
Lives			
With other person/people	3.40	1.04	1.00-1.08
Alone	1.00	1.00	
Self-reported circulatory system disease			
Yes	4.88	1.04	1.02-1.07
No	1.00	1.00	
Self-reported endocrine, nutritional and metabolic disease			
Yes	3.78	1.07	1.01-1.12
No	1.00	1.00	
Self-reported digestive tract disease			
Yes	3.17	1.13	1.01-1.26
No	1.00	1.00	
Financial difficulties in purchasing medications			
Yes	3.63	1.07	1.02-1.12
No	1.00	1.00	

Table created by study authors.

In Poisson Multiple Regression, the variables that remained significantly associated with polypharmacy were: living with another person or other people (p=0.012, PR=1.04), self-reported circulatory system disease (p=0.002, PR=1.04); self-reported endocrine, nutritional and metabolic disease (p=0.011, RP=1.07); (p=0.038, RP=1.13) and described financial difficulties in purchasing medicines (p=0.008, RP=1.07) (Table 5).

DISCUSSION

The prevalence of polypharmacy identified in this study was similar to that observed in Belgrade, Serbia, in a survey of 480 elderly people receiving care at a Health Care Center[17], and a study of 400 individuals aged 60 and over residing in an area covered by the Family Health Strategy in Recife[18]. However, other studies found prevalences ranging from 13.9% to 57.0%[2,19,20].

The most frequently used medications were those aimed at cardiovascular performance, the alimentary/metabolic tract and the nervous system, a result that collaborates with other studies[2,4]. These findings are consistent with the morbidity profile of those practicing polypharmacy in the present study. It should be noted that omeprazole was the sixth most frequently used medication among the elderly. This medication has a high potential for drug interactions with medications commonly used by the elderly, such as acetylsalicylic acid, glibenclamide and nifedipine[21,22], making its consumption even more of a concern among elderly users of a number of medications.

In the present study, the fact that an elderly person lived with another person or people was associated with the use of polypharmacy. Cintra et al.[23] stated that elderly people with such living conditions adhere more to the treatments recommended by the health service. Among the probable explanations for this are the fact that, under these conditions, the family member or caregiver, who has a more accurate perception of the health conditions of the elderly individual, encourages him or her to more frequently seek medical care, which can also lead to the increased prescription and consumption of medicines for such elderly people.

Paradoxically and unexpectedly, elderly persons who reported financial difficulties in purchasing medications were associated with a greater use of polypharmacy. This finding was further corroborated, in bivariate analysis, by the fact that elderly persons who practiced polypharmacy had greater difficulty finding the drug in the pharmacy or even obtaining a prescription for controlled medications.

In this context, the National Medication Policy of the Sistema Único de Saúde (SUS) (the Unified Health System) has among its objectives the guaranteed access of the population to what are considered essential drugs, and to make medicines for the treatment of chronic diseases available free or at a lower cost[24]. However, there is a lack of medicines in primary care, forcing the elderly person to seek the unavailable drugs in local commercial pharmacies and drugstores. In these establishments, staff are financially compensated for increased sales of medications, including those not included in pharmacological prescriptions[25]. The necessity to spend more when purchasing these drugs may conversely contribute to the underutilization of such medications[26] and subsequently greater financial difficulties in their acquisition[27]. There is a fine line between risk and the benefit of the practice of polypharmacy by the elderly. Elevated use of medications can adversely affect the quality of life of the elderly due to the greater occurrence of adverse effects and drug interactions. In contrast, these same medications help to prolong life, for the most part. In this way, it is not necessarily polypharmacy that exposes the elderly to the potential risk of adverse events, but rather the irrational nature of their use[28].

The rational use of medicines is defined as use appropriate for the clinical conditions in question, in doses appropriate to the needs of the individual, for a suitable period and at the lowest cost to the individual and the community. Among other criteria, such rational use recommends that when the is necessary, its efficacy and safety should be prioritized and the prescribed therapeutic regimen be fulfilled in the most suitable way[29]. However, complex drug prescriptions, combined with the reduced dexterity and auditory and visual acuity of elderly persons, as well as the high illiteracy rate present in most

Brazilian elderly individuals, can compromise the understanding of a medical prescription, leading to incorrect use of the medication[30].

It is important to consider that elderly persons have a range of comorbidities, meaning that prescriptions for medications are constantly reviewed in terms of pharmaceutical form, packaging and labels, and other factors. Additionally, the improper prescription of medications is often attributed to a lack of training among doctors who prescribe medicine to geriatrics, as well as a deficiency in pharmaceutical training when attending the elderly[31]. Thus, the presence of the pharmacist in the process of pharmaceutical care for the elderly is important to ensure the rational use of medications and the reduction of prescribing or dosing errors, as well as preventing the misuse of drugs and limiting the occurrence of adverse reactions. However, pharmaceutical care remains incipient in primary care, which is the priority locus of health care for the elderly.

The association between the various comorbidities evaluated and polypharmacy found in this study is consistent with other studies of the elderly[17,32]. A study conducted in Japan found that polypharmacy was more common in the treatment of hypertension, hyperlipidemia, gastric ulcers and diabetes[33]. Similarly, Carvalho et al.[2] in a study carried out in the metropolitan region of São Paulo found that elderly persons with hypertension and diabetes were also more likely to practice polypharmacy. These diseases are the main causes of mortality among the global elderly population[33,34]. The high prevalence of diseases of the digestive system can often lead to the unnecessary intake of other drugs, thus explaining the use of polypharmacy in this population[32]. This condition can lead to a cascade of negative effects on the health of the elderly and on the health system.

This study was cross-sectional in nature, and its strengths include the use of measures of association of prevalence in both bivariate analysis and in the multiple final model[35]. However, care is suggested when interpreting the associations between the explanatory factors and the use of polypharmacy among community dwelling elderly

persons. As both sets of information were obtained simultaneously, the possibility of reverse causality, where the explanatory variables may not have occurred before the response variable, cannot be excluded. The occurrence of memory bias can also not be excluded as the study was based on the evaluation of recall, in which the capacity to remember the past may be more closely related to the use of polypharmacy.

CONCLUSION

The prevalence of polypharmacy found in the present study was similar to that found in communities in other regions. Elderly persons who lived with others, described having financial difficulties in acquiring medications, and who suffered from a comorbidity or comorbidities were associated with polypharmacy, demonstrating that a number of aspects of social and health conditions play an important role in the use of multiple medications among the elderly.

The present study allows a greater understanding of the use of multiple medications by elderly persons living in the community and the main factors associated with this practice. Closer monitoring by health professionals, including questions regarding the acquisition of medications during screening tests for the multidimensional evaluation of the elderly, may result in more suitable treatment of the comorbidities that are common among individuals of this age group.

It is important to include the pharmacist in basic health care. The efficient use of medications requires the interrelated work of a team of professionals who directly assist the health care user. The pharmacist is responsible for the monitoring of therapeutic results and adverse effects, and is of great importance for the care of elderly people practicing polypharmacy.

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