Factors associated with polypharmacy in residents of an elderly community

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Abstract

The practice of polypharmacy in the elderly has often been related to adverse effects, drug interactions, hospitalizations and prolonged hospitalization. In this sense, the objective of the study was to determine the prevalence of polypharmacy in the elderly and to identify the factors associated with this practice using the classification of 3 or more medications. A cross-sectional, population-based and home-based study including 316 elderly (age ≥ 60 years) from a small municipality was conducted. The use of polypharmacy was considered as the concomitant use of 3 or more drugs, and sociodemographic, behavioral and health conditions were collected through a questionnaire. The average age of the elderly was 74.2±9.8 years, with 54.7% being female. The prevalence of elderly who used three or more medications (polypharmacy) was 40.8%; of these, 56.8% reported being hypertensive, 80% diabetic and 65.2% with multimorbidity. In the adjusted analysis, polypharmacy was associated with females (PR = 1.40; 95% CI: 1.08-1.81; p = 0.011), in those aged 70 to 79 years (PR = 1.58; 95% CI: 1.18-2.11; p = 0.002), insufficiently active (PR = 1.41; 95% CI: 1.11-1.78; p = 0.005), hypertensive (PR = 2.37; 95% CI: 1.24-4.52; p = 0.009), diabetic (PR = 1.49; 95% CI: 1.22-1.82; p <0.001) and with multimorbidity (PR = 4.35; IC95 %: 1.20-15.73; p = 0.025). There was a high prevalence of elderly people who use polypharmacy, being associated with females, aged 70 to 79 years old, insufficiently active, hypertensive, diabetic and with multimorbidity. These findings demonstrated that the use of 3 or more medications already exposes the elderly to the risks of polypharmacy.

Keywords: Elderly. Use of medicines. Polymedication.

INTRODUÇÃO

The aging process and the epidemiological changes increase the prevalence of chronic noncommunicable diseases (CNCDs)[1], and the use of drugs is one of the main forms of treatment for the control and prevention of chronic conditions, these conditions predispose them to the consumption of multiple drugs[2].

The term polypharmacy is used to translate the use of multiple drugs simultaneously[3,4], although there is no clear definition in the literature[5,6], some studies point to the use of 2 or more drugs[7], 3 or more[8,9] and even 5 or more drugs[10,11,12,13].

The practice of polypharmacy in the elderly has been associated with many adverse health outcomes and may trigger symptoms such as nausea, abdominal pain, gastrointestinal disorders, headache, dizziness, allergies, cough, sweating, hypotension or hypertension, and changes in heart and respiratory rhythms[14].

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The use of polypharmacy is also related to poor treatment adherence, drug interactions, hospitalizations, prolonged hospitalization and readmissions[9].

Population-based studies have indicated some factors associated with polypharmacy, such as female gender[10,11], increasing age, negative self-rated health[11], private health plan[1,10], having been hospitalized in the last year[1,10], having four or more self-reported diseases[10], being hypertensive[1,15], being diabetic[1,15], being fragile and being unable to read[15].

Considering that most studies on factors associated with polypharmacy in the elderly used the classification of five or more drugs, it is

interesting to investigate the factors associated with polypharmacy using the classification of three or more drugs to assist in planning actions to promote the rational use of drugs, and thereby fill some gaps in areas of public health and aging.

Given the above, this study aimed to determine the prevalence of polypharmacy in the elderly and identify the factors associated with this practice using the classification of 3 or more drugs.

METHODOLOGY

Study design, population and data collection

This was a cross-sectional study. The information used was extracted from a populational and household-based database of the epidemiological study entitled "Nutritional status, risk behaviors and health conditions of the elderly of Lafaiete Coutinho-BA" held in January 2011.

A census was conducted from the list of all elderly registered in the Family Health Strategy (FHS), which covers 100% of the population of the municipality. All urban residents aged ≥60 years, of both sexes, were selected for interviews and evaluations (anthropometric measurements).

The study population consisted of 355 elderly, in which 17 (4.8%) refusals were registered and 22 (6.2%) were not found after three home visits on alternate days, being considered losses. The result was a final population of 316 (89%) elderly.

For data collection, a specific form was used, based on the questionnaire used in the Health, Welfare and Aging Survey (SABE), conducted in seven countries of Latin America and the Caribbean[16].

Data collection occurred in two stages: The first consisted of a home interview, conducted by only one interviewer, covering personal information, health status and lifestyle. The second stage was performed at the FHS units, scheduled at intervals of one to three days after the home interview, during which anthropometric measurements were collected.

The study protocol was approved by the Research Ethics Committee of the State University of Southwest Bahia, BA, Brazil, (No. 064/2010). Participation was voluntary, and all individuals gave written informed consent.

Polypharmacy (dependent variable)

To verify the practice of polypharmacy, the elderly person was asked to answer the following question: "Could you tell me the name of the continuous use medicines you are using or taking?". After the response, they were asked to show the continuous use drugs that were being used at the time of collection for confirmation. Polypharmacy practice was defined as those elderly who took three or more medications[8,9].

Associated Factors (Independent Variables)

The independent variables were distributed in the following blocks:

Sociodemographic characteristics

Gender (female, male), age group (60 to 69, 70 to 79, ≥80 years) and family arrangement (accompanied, alone) categorized according to the number of residents in the household. Knowing how to read and write a message (yes, no) was assessed through the question "Do you know how to read and write a message?", and race (white and not white) was inquired of.

Behavioral Aspects

The physical activity level (Insufficiently active, active) was assessed by the *International Physical Activity Questionnaire* (IPAQ) - long form[17] and adapted for the elderly in Brazil[18]. Active individuals were those who practiced moderate and/or vigorous physical activity for at least 150 minutes per week[19]. There was also alcohol intake (≤1 day/week and ≥2 days/week), having as reference the last three months and cigarette consumption (smoker, former smoker and never smoked), assessed through the question "Do you have or had a habit of smoking?"

Health conditions

Arterial hypertension (yes and no) and Diabetes (yes and no), for the diagnosis, the report of the elderly referred to by some health professional was considered;

Number of chronic diseases [none, one and two or more (multimorbidity)]. For this classification the report given by the elderly regarding the diagnosis referred to by some health professional was considered for: hypertension, diabetes, cancer (except skin), chronic lung disease, cardiac problems, circulatory problems, arthritis/ arthrosis/ rheumatism and osteoporosis;

Hospitalization in the last year (yes, no). This information was obtained through the following question" during the last 12 months, how many different times have you been admitted to the hospital?";

Self-perception of health: categorized as positive (excellent, very good, good) and negative (fair, poor). This variable was obtained through the question "Would you say your health is excellent, very good, good, fair or poor?";

Falls (yes, no), assessed by self-reported falls within the last 12 months;

Functional Capacity (independent, dependent on Instrumental Activities of Daily Living - IADL, dependent on IADL and Basic Activities of Daily Living - BADL). This variable was measured BADL by using the Katz et al. scale[20] and IADL by using the Lawton and Brody[21] scale. The elderly individuals were classified as independent when performing the activities without help, and dependent when they needed help in at least one of the activities. Functional capacity was hierarchized[22] and divided into the three categories mentioned previously;

Body mass index (BMI) (<22 kg/m^2 = insufficient weight, ≥22 BMI ≤ 27 kg/m^2 = adequate and BMI >27 kg/m^2 = overweight)[23]. Body mass (BM) was measured using a portable digital scale, with a maximum capacity of 150 Kg (Zhongshan Camry Electronic, G-Tech Glass 6, China), where the subject remained barefoot and wearing as few clothes as possible. Height was measured according to the Frisancho technique[24], using a portable compact stadiometer (Wiso, China) installed in an appropriate place, according to the manufacturer's standards. The elderly individuals, still barefoot, were positioned upright, with their feet together, their heels, buttocks and head in contact with the wall, and their eyes fixed on a horizontal axis parallel to the floor (Frankfurt Line).

Statistical analysis

A descriptive analysis of the data (mean and standard deviation, absolute and relative frequency) was performed. The association between polypharmacy and independent variables was verified by crude and adjusted analyses using Poisson regression, with a robust calculation of prevalence ratios (PR) and 95% confidence interval (95% CI). In the crude analysis, the prevalence of polypharmacy was calculated for each category of independent variables and the significance level was tested by the Wald heterogeneity test. Variables that presented a statistical significance of at least 20% (p≤0.20) in the crude analyses remained for the adjusted analysis, based on the order of the hierarchical model for the determination of results (Figure 1). The effect of each independent variable on the outcome was controlled by variables of the same level and higher levels in the model. The significance level adopted in the study was 5%. Data were tabulated and analyzed using the statistical program SPSS ® version 21.0.

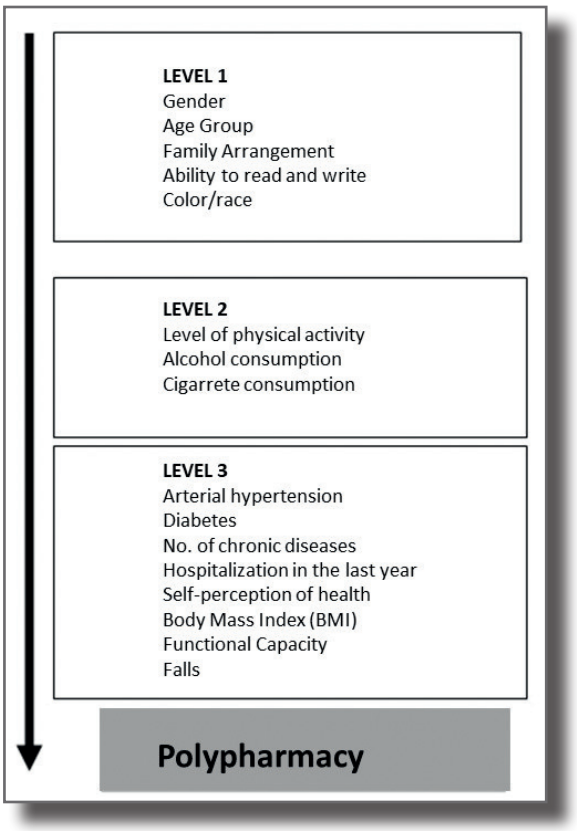

Figure 1– Conceptual model for outcome determination.

RESULTS

The study included 316 elderly with an average age of 74.2 ± 9.8 years. It was observed that 54.7% of the elderly are female, 63.5% were aged ≥70 years old, 47.7% had insufficient levels of physical activity, 65.6% reported being hypertensive, 11.4% diabetic, 45.5% reported having two or more chronic diseases (multimorbidity), 75.5% had already been hospitalized once, 58.1% reported negative self-rated health and 25.8% reported having fallen at least once. The other characteristics of the population are presented in Table 1. The prevalence of the elderly who used three or more drugs (polypharmacy) was 40.8%.

Table 1 – Characteristics of the study population. Lafaiete Coutinho, Brazil, 2011.

Variables	% response	N	%
Sex	**100**		
Female		173	54.7
Male		143	45.3
Age group (years)	**99.7**		
60-69		115	36.5
70-79		106	33.7
≥ 80		94	29.8
Family arrangement	**100.0**		
Alone		52	16.5
Lives with companion		264	83.5
Reads/writes	**100.0**		
Yes		105	33.2
No		211	66.8
Race	**95,9**		
White		64	21.1
Not white		239	78.9
Physical activity	**98.1**		
Insufficiently active		148	47.7
Active		162	52.3
Tobacco	**99.7**		
Smoker		35	11.1
Ex-smoker		147	46.7
Never smoked		133	42.2
Alcohol consumption	**99.7**		
≤ 1 day/week		296	94
≥ 2 days/week		19	6
Hypertension	**99.4**		
Yes		206	65.6
No		108	34.4
Diabetes	**97.5**		
Yes		35	11.4
No		273	88.6
No. of chronic diseases	**95.9**		
None		62	20.5

to be continued...

...continuation- Table 1

Variables	% response	N	%
One		103	34.0
Multimorbidity		138	45.5
Hospitalization	**99.4**		
Yes		237	75.5
No		77	24.5
Health Self-Perception	**95.9**		
Positive		127	41.9
Negative		176	58.1
BMI	**94.6**		
Insufficient weight		83	27.8
Suitable		131	43.4
Overweight		85	28.4
Functional capacity	**97.2**		
Independent		130	42.3
IADL Dependent		126	41
BADL Dependent		51	16.6
Fall	**99.4**		
Yes		81	54.7
No		233	45.3

BMI: Body Mass Index.

Table 2 presents the prevalence of polypharmacy, according to the independent variables. The use of polypharmacy was significantly more frequent in elderly females, who were older, insufficiently active, hypertensive, diabetic, multimorbid with a negative health perception and low functional capacity. However, the use of polypharmacy was less frequent among elderly smokers and those underweight.

Table 2– Prevalence of polypharmacy and its relationship with the independent variables of the study. Lafaiete Coutinho, Brazil, 2011.

Variables	%	RP bruta	IC95%	p-valor
Sex				
Female	50.9	1.77	1.32-2.39	< 0.001
Male	28.7	1		

to be continued...

...continuation- Table 2

Variables	%	RP bruta	IC95%	p-valor
Age group (years)				
60-69	28.7	1		
70-79	50.9	1.78	1.26-2.50	0.001
≥ 80	44.7	1.56	1.10-2.24	0.018
Family arrangement				
Alone	34.6	0.82	0.55-1.23	0.340
Lives with companion	42.0	1		
Reads/writes				
Yes	35.2	1		
No	43.6	1.24	0.91-1.67	0.166
Race				
White	31.3	1		
Not white	43.1	1.38	0.93-2.04	0.108
Physical activity				
Insufficiently active	50.7	1.58	1.20-2.08	0.001
Active	32.1	1		
Tobacco				
Smoker	20	0.40	0.20-0.80	0.009
Ex-smoker	38.1	0.77	0.59-1.00	0.053
Never smoked	49.6	1		
Alcohol consumption				
≤ 1 day/week	41.2	1		
≥ 2 days/week	36.8	0.89	0.49-1.64	0.716
Hypertension				
Yes	56.8	5.58	3.14-9.89	<0.001
No	10.2	1		
Diabetes				
Yes	80.0	2.23	1.77-2.80	<0.001
No	35.9	1		
No. of chronic diseases				
None	4.8	1		
One	30.1	6.22	1.98-19.50	0.002
Multimorbidity	65.2	13.48	4.44-40.9	<0.001
Hospitalization				
Yes	38.8	0.81	0.61-1.07	0.138
No	48.1	1		
Health Self-Perception				

to be continued...

...continuation- Table 2

Positive	30.7	1		
Negative	47.2	1.54	1.13-2.08	0.006
BMI				
Insufficient weight	28.9	0.65	0.44-0.96	0.031
Suitable	44.3	1		
Overweight	48.2	1.09	0.81-1.46	0.566
Functional capacity				
Independent	26.9	1		
IADL Dependent	53.2	1.82	1.22-2.71	0.003
BADL Dependent	49.0	1.97	1.42-2.74	<0.001
Fall				
Yes	43.2	1.08	0.81-1.45	0.598
No	39.9	1		

BMI: Body Mass Index.

In the adjusted analysis presented in Table 3, polypharmacy was associated with the variables gender, age group, physical activity, hypertension, diabetes and number of chronic diseases. There was a higher prevalence of elderly women with polypharmacy (PR = 1.40; 95%CI: 1.08-1.81; p = 0.011) aged 70 to 79 years (PR = 1.58; 95%CI: 1.18-2.11; p = 0.002) in the insufficiently active (PR = 1.41; 95%CI: 1.11-1.78; p = 0.005), hypertensive (PR = 2.37; 95%CI: 1.24-4.52; p = 0.009), diabetic (PR = 1.49; 95%CI: 1.22-1.82; p <0.001) and with multimorbidity (PR = 4.35; 95%CI: 1.20-15.73; p = 0.025).

Table 3– Adjusted analysis of polypharmacy with independent study variables. Lafaiete Coutinho, Brazil, 2011.

Variables	Ajusted PR	95%CI	p-value
Sex			
Female	1.40	1.08-1.81	0.011
Male	1		
Age group (years)			
60-69	1		
70-79	1.58	1.18-2.11	0.002
≥ 80	1.14	0.83-1.58	0.413
Physical activity			

to be continued...

...continuation- Table 3

Variables	Ajusted PR	95%CI	p-value
Insufficiently active	1.41	1.11-1.78	0.005
Active	1		
Hypertension			
Yes	2.37	1.24-4.52	0.009
No	1		
Diabetes			
Yes	1.49	1.22-1.82	<0.001
No	1		
No. of chronic diseases			
None	1		
One	2.90	0.81-10.36	0.100
Multimorbidity	4.35	1.20-15.73	0.025
BMI			
Insufficient weight	0.77	0.52-1.13	0.182
Suitable	1		
Overweight	0.79	0.61-1.02	0.070
Functional capacity			
Independent	1		
IADL Dependent	1.01	0.79-1.53	0.583
BADL Dependent	1.21	0.91-1.61	0.182

BMI: body mass index, BADL: basic activities of daily living, IADL: instrumental activities of daily living.

DISCUSSION

Polypharmacy, considered by the present study as the use of 3 or more medications, was reported by 40.8% of the elderly. According to national studies, the prevalence of polypharmacy in the elderly ranges from 10.30%[13] to 63.2%[25]. However, it should be taken into account that in Brazil, most studies consider 5 or more drugs as polypharmacy. Thus, these rates would tend to be higher if the studies had considered 3 drugs. International studies indicate a variation between 27.4%[8,9] and 49.6%[26].

According to Bueno *et al.*[2] the practice of polypharmacy can be explained by the increased morbidity that affects the elderly population. This finding was also observed

in the present study, where 45.5% of the elderly had multimorbidity, characterized by the simultaneous presence of two or more diseases.

In the present study, a significant difference between the sexes regarding the use of polypharmacy was demonstrated, indicating the most prevalent gender as female, which corroborates the study by Sales *et al.*[10]. This finding may be due to the biological, psychological characteristics and higher demand of the elderly women for health services[27].

Regarding the age group, it was observed that individuals between 70 and 79 years old had a greater use of medication when compared to those from 60 and 69 years old and those ≥ 80 years old; which were also found by Sales *et al.*[10] and Almeida *et al.*[13]. However, the findings by Pereira et al.11 state that the older elderly people practice polypharmacy more often. Age is considered an important factor that contributes to drug use, which can be explained by the natural aging process, which predisposes individuals to physiological changes and, consequently, a greater need for drug use[28].

This study identified that the insufficiently active elderly had a higher prevalence in using polypharmacy. This finding corroborates population-based studies that demonstrated an association between physical activity level and polypharmacy, indicating that the higher the level of physical activity, the lesser use of medications[2,29].

Physical inactivity is considered a risk factor for noncommunicable diseases, including cardiovascular disease and cancer, reducing life expectancy and being one of the leading causes of death worldwide[30]. Thus, physical activity can act as a non-pharmacological treatment reducing morbidity and mortality from noncommunicable diseases and consequently promoting health recovery[31].

Of the elderly who used three or more medications in the present study (polypharmacy use), 56.8% reported being hypertensive, 80% diabetic and 65.2% with multimorbidity. In a study by Carvalho *et al.*[27], the authors also observed a relationship between polypharmacy and hypertension, diabetes and multimorbidities. This finding was expected, since these morbidities are prevalent among the elderly and increase the need to use various medications to control them.

The therapeutic approach in the elderly population is a challenge for prescribers and for the Unified Health System. It is extremely important to evaluate not only the number of drugs, but also the classes and doses used. The pharmacokinetic and pharmacodynamic properties should also be taken into consideration, as well as the drug interactions and the possibility of inappropriate use for the elderly.

Most national studies[1,10,11,15] related to polypharmacy describe very well the classification of this term for the use of 5 or more drugs; however, there is a gap when considering the term for the use of 3 or more drugs. In this perspective, this study used polypharmacy as the use of 3 or more drugs and found similar results to studies that used the classification with five or more drugs, such as: higher prevalence in females[10,11], hypertensive elderly, diabetes[1,15], having multimorbidities[10] etc.

These findings become important for planning intervention strategies, since the use of 3 or more drugs already exposes the elderly to the risks of polypharmacy. Therefore, it is essential that prescribers, pharmacists, and healthcare professionals monitor the simultaneous use of multiple medications, avoiding the risks that polypharmacy can cause.

Thus, it is worth highlighting the importance of the pharmaceutical professional in the multidisciplinary team, which can contribute to prevention and health promotion, collaborating with the optimization of care for patients with chronic diseases, improving the quality of medication use and, thus, minimizing the negative consequences and ensuring the safety of pharmacotherapy[13,32].

A strong point of this article is its design, as it is a population-based study conducted with all elderly residents in the urban area and registered in the health units of a small municipality. Another strong point was the interviewers' request of the elderly to show the medicines that were in continuous use.

This study had some limitations, such as self-reported disease by the elderly, which may underestimate the prevalence of morbidity. Moreover, because it is a cross-sectional study, it does not establish a temporality relationship between the outcome and associated factors. Thus, longitudinal studies are needed to better understand the risk factors for polypharmacy.

CONCLUSION

There was a high prevalence of elderly people who use polypharmacy, being associated with females, aged 70 to 79 years old, insufficiently active, hypertensive, diabetic and having multimorbidity.

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