

# Characteristics of polypharmacy in nonagenarians and centenarians

## *Características da polifarmácia em nonagenários e centenários*

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### ABSTRACT

**Introduction:** Nonagenarians and centenarians are often affected by multiple morbidities that require the concomitant use of several drugs. Polypharmacy is defined as the consumption of five or more drugs and poses a cautionary challenge in healthcare. It is important to ensure the correct and safe use of medications. **Objectives:** To study the sociodemographic and clinical characteristics of polypharmacy in nonagenarians and centenarians. **Methods:** The location of the descriptive, cross-sectional, retrospective study was in the capital of the southern region of Brazil. A total of 243 nonagenarians and centenarians were evaluated between June 2016 to November 2016. **Results:** A total of 1450 medications were identified, corresponding to  $5.9 \pm 2.87$  medications per participant. Among the participants, 163 (67%) were considered as polypharmacy. The frequency of polypharmacy was higher than most reports in the literature, related to poor vision (74.18%,  $p=0.025$ ), a history of cardiovascular diseases (78.00%,  $p<0.001$ ), gastric diseases (77.33%,  $p=0.023$ ), anxiety (80.00%,  $p=0.041$ ), respiratory diseases (83.33%,  $p=0.014$ ), arthrosis (76.53,  $p=0.010$ ), thyroid disease (82.00%,  $p=0.012$ ), symptoms of xerostomia (75.65%,  $p=0.008$ ), dyspnea (78.85%,  $p=0.042$ ), wheezing (81.10%,  $p=0.049$ ), and fear of falling (72.90%,  $p=0.049$ ). **Conclusion:** We concluded that polypharmacy is a prevalent phenomenon among nonagenarians and centenarians; importance of sociodemographic and clinical characteristics must be taken into consideration when providing primary healthcare to this population.

**Keywords:** Polypharmacy, Public Health, Aging, Comorbidity.

### RESUMO

**Introdução:** Nonagenários e centenários são frequentemente acometidos por múltiplas morbidades que requerem o uso concomitante de diversos medicamentos. A polifarmácia é definida como o consumo de cinco ou mais medicamentos e representa um desafio preventivo na área da saúde. É importante garantir o uso correto e seguro dos medicamentos. **Objetivos:** Estudar as características sociodemográficas e clínicas da polifarmácia em nonagenários e centenários. **Métodos:** Estudo descritivo, transversal, retrospectivo realizado na capital da região sul do Brasil. Foram avaliados 243 nonagenários e centenários no período de junho de 2016 a novembro de 2016. **Resultados:** Foram identificados 1.450 medicamentos, correspondendo a  $5,9 \pm 2,87$  medicamentos por participante. Entre os participantes, 163 (67%) foram considerados como polifarmácia. A frequência de polifarmácia foi maior do que a maioria dos relatos na literatura, relacionada à má visão (74,18%,  $p=0,025$ ), história de doenças cardiovasculares (78,00%,  $p<0,001$ ), doenças gástricas (77,33%,  $p=0,023$ ), ansiedade (80,00%,  $p=0,041$ ), doenças respiratórias (83,33%,  $p=0,014$ ), artrose (76,53,  $p=0,010$ ), doença da tireoide (82,00%,  $p=0,012$ ), sintomas de xerostomia (75,65%,  $p=0,008$ ), dispneia (78,85%,  $p=0,042$ ), chiado no peito (81,10%,  $p=0,049$ ) e medo de cair (72,90%,  $p=0,049$ ). **Conclusões:** Concluímos que a polifarmácia é um fenômeno prevalente entre nonagenários e centenários; a importância das características sociodemográficas e clínicas devem ser consideradas na atenção primária a essa população.

**Palavras-chave:** Polifarmácia, Saúde Pública, Envelhecimento, Comorbidade.

## Introduction

The phenomenon of population aging in Brazil occurred quickly, the country had around 20 years to adapt to an increase from 10% to 20% in the proportion of elderly people (from 60 years old). However, among the elderly, the group that has grown the most in the country is the oldest old (80 years or more), who have different clinical characteristics<sup>3</sup>.

Older-adults, particularly nonagenarians and centenarians, are often affected by multiple morbidities that require the concomitant use of several medications<sup>1</sup>. Polypharmacy, defined as the consumption of five or more medications, is a public health problem in Brazil and an obstacle to providing quality healthcare with the correct and safe use of drugs<sup>2</sup>.

The biological aging process is often accompanied by changes in the pharmacokinetics and pharmacodynamics of elderly people<sup>10</sup>, and adverse effects and damage may occur with the increase in the number of medications<sup>9</sup>. In the elderly, the risk is even greater for adverse effects due to reduced kidney and liver function, lower lean body mass, reduced hearing, vision, cognition and mobility<sup>9</sup>. Despite the existence of a higher comorbidity level, there are no studies on polypharmacy specific to Brazilian nonagenarians and centenarians, resulting in a lack of understanding of the characteristics.

## Objectives

Investigate the potential relationship between polypharmacy and the sociodemographic and clinical characteristics of the participants.

## Method

### Study Design

The present work is a cross-sectional analysis of the baseline assessment of a cohort study, developed by a project of research and extension of a Community University involving nonagenarians and centenarians living in a capital of a state in the southern region of Brazil. Retrospective data refers to the initial assessment carried out in 2016 (sociodemographic and clinical assessment).

## Population and sample

The population chosen for this work is composed of nonagenarians and centenarians, exemplified by the sample evaluated in 2016. The study sample was recruited by home visits to randomly selected census sectors of different neighborhoods of Porto Alegre City using the system provided by the Brazilian Institute of Geography and Statistics (IBGE). The sampling methodology has been published by Rocha<sup>3</sup>. All nonagenarians and centenarians were evaluated during home visits between June of 2016 to November of 2016.

## Data collection

The home-based research tool captured socioeconomic and clinical characteristics, including active medication consumption. Participant medication use was collected by a multiprofessional team utilizing extensive review prior to determination of inclusion of the term polypharmacy.

## Study variables

The study variables were cognition, sociodemographic variables (gender, education, age group, years of schooling, living arrangements, marital status, and skin color), clinical variables (self-perception of general health, appetite, vision, and hearing, presence of comorbidities and symptoms), depressive symptoms and functional and basic skills (ease of performing 12 functional activities and activities of daily living) all self-reported by participants.

The Mini Mental State Examination (MMSE) assessed the cognitive status of the participants. The MMSE involves ten questions related to temporal and spatial orientation, three related to immediate memory, five to attention and calculation, three to recall (evocative memory), and ten regarding language, scoring from 0 (lowest cognition level) to 30 (highest performance)<sup>4</sup>. As recommended by Lourenço and Veras for Brazilian older adults<sup>5</sup>, the cut-off point for screening for cognitive impairment is 18 for illiterates and 24 for those with any school education. Screening for geriatric depres-

sion was performed using the Geriatric Depression Scale with five-item (GDS-5). Almeida<sup>6</sup> suggests a cut-off point of less than two positive answers, is considered as “Absence of depression” and greater or equal to two answers is considered as “Presence of depression”.

Functional and basic skills were assessed using an instrument proposed by Simonsick et al.<sup>7</sup>, adapted by Macedo<sup>8</sup>. Functional skills were walking 400m, climbing ten steps, carrying five kilos, getting up from a chair without support, squatting, raising arms above head level and grasping objects with hands. The basic skills were transferring between seats, bathing alone, dressing alone, eating alone and using the bathroom. Respondents were asked how easy it was to perform these activities (self-perception of effort), assigning a score of 0 if they could not perform, 1 if difficult to perform, 2 if somewhat easy to perform and 3 if easy to perform. The total sum of the functional skills scores was 21 points ( $3 \times 7 = 21$ ). For each participant, the sum of the scores was divided by this total value (21) and multiplied by 100 to quantify the percentage of functional skills. A participant achieving a maximum score would receive 100% on functional skills. The same formula was applied with the calculation of the basic skills scores, where the sum of each participant was divided by 15 ( $3 \times 5$ ) and multiplied by 100. Functional skills were maintained when the result was greater than or equal to 50% and basic skills when the result was greater than or equal to 80%<sup>8</sup>.

The self-perception of health (general health, appetite, vision, and hearing) was answered by the oldest-old person or by the person responsible, through the simple choice of questions: excellent, good, and not good.

To identify polypharmacy in nonagenarians and centenarians of the project group, the list of drugs of each of the participants was reviewed initially with the aim of standardizing the description of the drug in its composition. To carry out this research, to categorize polypharmacy, two levels were considered: with polypharmacy ( $\geq 5$  drugs) and without polypharmacy ( $< 5$  drugs), as recommended by Masnoon<sup>9</sup>.

## Data analysis

A descriptive analysis of the 2016 evaluation results was performed comparing the distribution of sociodemographic and clinical characteristics among participants with and without polypharmacy using descriptive statistics. Frequencies were tested by Chi-square and averages by t-Student test. A value of  $p < 0.05$  was considered significant and with statistical trend if between 0.1 and 0.05. The analysis was performed using Epi Info version 7.2.3.

## Ethical issues

As we have seen, the present study is a subproject that uses an umbrella project database. On July 18, 2016, the Research Ethics Committee of the University approved this study. 6. All participants signed an informed consent form. Clarified (ICF) authorized the research and contact by phone. For this research, the project was submitted and approved by the University's Research Ethics Committee on October 5, 2020. The researchers committed to the confidentiality of the use of project data through a Term of Commitment.

## Results

In the present research, data from 243 nonagenarians and centenarians monitored by the project were evaluated, with the objective of identifying the possible relationship between polypharmacy and sociodemographic and clinical characteristics of the participants. To better demonstrate the results found, they are presented based on the objectives.

A total of 1450 medications were identified in use by the study participants, corresponding to  $5.9 \pm 2.87$  medications per participant. Of the total number of elderly people studied, 163 (67%) were on polypharmacy, 80 (33%) without polypharmacy, among which 9 (4% of the total) did not use any medication.

Table 1 shows the sociodemographic characteristics of nonagenarians and centenarians with and without polypharmacy, whose frequencies and means were compared using the chi-square statistical test and Student t test, respectively, with no statistical significance being observed between the groups.

**Table 1.** Sociodemographic characteristics of nonagenarians and centenarians with and without polypharmacy between groups.

	With polypharmacy	No polypharmacy	Total	P
<b>Sex</b>				
Feminine	120 (67.04%)	59 (32.96%)	179 (73.66%)	0.983
Male	43 (67.19%)	21 (32.81%)	64 (26.34%)	
<b>Age (years ±SD)</b>	92.4±3.761	92.1±3.320	92.3±3.540	0.597
<b>Age group</b>				
100+	10 (71.43%)	4 (28.57%)	14 (5.76%)	0.864
95-99	23 (63.89%)	13 (36.11%)	36 (14.81%)	
90-94	130 (67.36%)	63 (32.64%)	193 (79.42%)	
<b>Years of study</b>	5.9±4.58	6.4±4.18	6.05±4.38	0.237
<b>Living arrangements</b>				
Caregiver	16 (80.00%)	4 (20.00%)	20 (8.23%)	0.107
Familiar	127 (68.28%)	59 (31.72%)	186 (76.54%)	
Alone	20 (54.05%)	17 (45.95%)	37 (15.23%)	
<b>Marital status</b>				
Married	32 (62.75%)	19 (37.25%)	51 (21.00%)	0.305
Other	16 (54.14%)	12 (42.86%)	28 (11.52%)	
Widower	115 (70.12%)	49 (29.88%)	164 (67.49%)	
<b>Ethnic group</b>				
Caucasian	135 (67.50%)	65 (32.50%)	200 (82.30%)	0.540
African Brazilian	25 (62.50%)	15 (37.50%)	40 (16.46%)	
<b>Total</b>	163 (67.07%)	80 (32.92%)	243 (100%)	

Women were the majority (74%), and the prevalence of polypharmacy among them was like that observed in the total sample (67%). The relationship between sex and polypharmacy was not significant ( $p=0.983$ ). Participants in polypharmacy had an average of  $5.9\pm 4.58$  years of study, which was lower than those without polypharmacy ( $6.4\pm 4.18$  years), although the difference was not significant ( $p=0.237$ ). Regarding age group, most were individuals between 90 and 94 years old (79%), among them the percentage of polypharmacy was 67%. The age group with the highest prevalence of polypharmacy was centenarians with 71% ( $p=0.864$ ). Most participants lived with a family member (77%). Of these, 68% were in polypharmacy. The group of those who

lived with caregivers, 8% of the participants, was the group with the highest percentage in polypharmacy (80%,  $p=0.107$ ).

Regarding marital status, widowers were the majority (67%). Of these, 70% were in the polypharmacy category, which was the highest rate of polypharmacy among the different marital statuses ( $p=0.305$ ). As expected of the southern Brazilian colonization, Caucasian were the majority (83%) with 67.5% of them in polypharmacy, thus being the ethnic group with the highest percentage ( $p=0.540$ ).

Table 2 shows the characteristics of self-perception of health of nonagenarians and centenarians with and without polypharmacy, whose frequencies were compared using the chi-square test.

**Table 2.** Characteristics of self-perception of health of nonagenarians and centenarians with and without polypharmacy.

	With polypharmacy	No polypharmacy	Total	P*
<b>General health</b>				
Great or Good	92 (64.34%)	51 (35.66%)	143 (58.85%)	0.089
Not good	66 (74.16%)	23 (25.84%)	89 (36.63%)	
No answer			11 (4.53%)	
<b>Appetite</b>				
Great or Good	105 (64.00%)	59 (36.00%)	164 (67.50%)	0.091
Not good	57 (75.00%)	19 (25.00%)	76 (31.28%)	
No answer			3 (1.24%)	
<b>Vision</b>				
Great or Good	74 (60.66%)	48 (39.34%)	122 (50.21%)	0.025
Not good	89 (74.17%)	31 (25.83%)	120 (49.38%)	
No answer			1 (0.41%)	
<b>Hearing</b>				
Great or Good	70 (63.06%)	41 (36.94%)	111 (45.68%)	0.190
Not good	93 (71.00%)	38 (29.00%)	131 (53.91%)	
No answer			1 (0.41%)	
<b>Total</b>	163 (67.08%)	80 (32.92%)	243 (100%)	

\* Disregarding non-respondents.

Most participants (59%) reported being in excellent or good health. The percentage of individuals in polypharmacy with self-perception of good health was lower (64%) than among those with self-perception of poor health (74%). The relationship between general health and polypharmacy had a statistical trend ( $p=0.089$ ). Participants who reported poor appetite (31%) had a higher frequency of polypharmacy (75%). The relationship between appetite and polypharmacy had a statistical trend ( $p=0.091$ ). Among those who reported good vision (50%), 61% were in polypharmacy. This percentage was 74% among those with poor vision, with a statistically significant relationship ( $p=0.025$ ). Poor hearing was reported by 54%, with a percentage of polypharmacy (71%) also higher than the group with good hearing (63%), although the relationship was not significant ( $p=0.190$ ).

Table 3 presents the characteristics of comorbidities in nonagenarians and centenarians with and without polypharmacy, whose frequencies were compared using the chi-square test.

45% of participants reported having been diagnosed with heart disease, with 78% in polypharmacy, a percentage significantly higher than expected (67%). The relationship between polypharmacy and diagnosis of heart disease was statistically significant ( $p=0.001$ ). The same happened with those who reported intestinal problems (77%,  $p=0.023$ ), anxiety (80%,  $p=0.041$ ), respiratory diseases (83%,  $p=0.014$ ), arthrosis (77%,  $p=0.010$ ) and thyroid disease. (82%,  $p=0.012$ ). Those who reported a previous diagnosis of cerebrovascular accident (CVA) (79%) also presented a higher percentage than expected, with a statistical trend ( $p=0.099$ ). The of participants in polypharmacy was also higher than that of the entire sample, although there was no significant relationship between participants reporting the diagnosis of hypertension (71%,  $p=0.102$ ).

Table 4 represents the characteristics of mood, cognition and functional performance of nonagenarians and centenarians with and without polypharmacy.



**Table 3.** Characteristics of comorbidities in nonagenarians and centenarians with and without polypharmacy.

Chronic Conditions	With polypharmacy	No polypharmacy	Total	P
Cardiovascular diseases	85 (78.00%)	24 (22.00%)	109 (44.90%)	0.001
Stroke	27 (79.41%)	7 (20.60%)	34 (14.00%)	0.099
Hypertension	113 (70.63%)	47 (29.40%)	160 (65.84%)	0.102
Dementia	14 (60.90%)	9 (39.13%)	23 (9.50%)	0.505
Diabetes	31 (75.61%)	10 (24.40%)	41 (16.90%)	0.202
Depression	53 (73.61%)	19 (26.40%)	72 (29.63%)	0.160
Gastric Diseases	58 (77.33%)	17 (22.70%)	75 (30.90%)	0.023
Anxiety	36 (80.00%)	9 (20.00%)	45 (18.52%)	0.041
Respiratory diseases	35 (83.33%)	7 (16.70%)	42 (17.30%)	0.014
Osteoarthritis	75 (76.53%)	23 (23.50%)	98 (40.33%)	0.010
Urinary infection	32 (68.09%)	15 (31.91%)	47 (19.34%)	0.870
Thyroidopathy	41 (82.00%)	9 (18.00%)	50 (20.60%)	0.012
Other Disease	23 (65.71%)	12 (34.30%)	35 (14.40%)	0.853
<b>Total</b>	163 (67.10%)	80 (32.92%)	243 (100%)	

**Table 4.** Mood, cognition and functional performance characteristics of nonagenarians and centenarians with and without polypharmacy.

	With polypharmacy	No polypharmacy	Total	P
<b>GDS</b>				
Changed	73 (70.90%)	30 (29.13%)	103 (44.00%)	0.331
Normal	84 (64.62%)	46 (35.38%)	130 (56.00%)	
<b>MMSE Result</b>				
Preserved Cognition	102 (69.90%)	44 (30.14%)	146 (60.10%)	0.257
Cognitive Impairment	61 (62.90%)	36 (37.11%)	97 (39.92%)	
<b>TUG Interpretation</b>				
Changed	113 (66.90%)	56 (33.13%)	169 (69.55%)	0.914
Normal	50 (67.60%)	24 (32.40%)	74 (30.45%)	
<b>Functional Skills</b>				
Not preserved	75 (69.44%)	33 (30.60%)	108 (44.44%)	0.483
Preserved	88 (65.20%)	47 (34.81%)	135 (55.60%)	
<b>Basic Skills</b>				
Not preserved	66 (71.74%)	26 (28.30%)	92 (37.90%)	0.227
Preserved	97 (64.24%)	54 (35.80%)	151 (62.14%)	
<b>Total</b>	163 (67.10%)	80 (32.92%)	243 (100%)	

GDS= Geriatric Depression Scale, MMSE= Mini Mental State Examination, TUG = Timed up and Go test.

Comparing the total percentage of participants in polypharmacy (67%), Table 4 shows a higher percentage among those with altered GDS (71%,  $p=0.331$ ), Timed Up and Go (TUG) altered test (70%,  $p=0.914$ ), functional abilities not maintained (69%,  $p=0.483$ ) and basic abilities not preserved (72%,  $p=0.227$ ).

Table 5 presents the characteristics of the symptoms of the participants with and without polypharmacy. The relationship of symptoms between groups was tested by chi-square.

Those who reported xerostomia (76%,  $p=0.008$ ), dyspnea (79%,  $p=0.042$ ), wheezing (81%,  $p=0.049$ ) and fear of falling (73%,  $p=0.049$ ). Participants reporting constipation (73%,  $p=0.058$ ) and falls in the last 6 months (63%,  $p=0.073$ ) presented a relationship of statistical trend with polypharmacy. Although not showing a significant relationship, participants reported dizziness (71%,  $p=0.337$ ), diarrhea (72%,  $p=0.500$ ), respiratory symptoms (69%,  $p=0.422$ ), palpitation (74 %,  $p=0.2588$ ), fatigue (70%,  $p=0.476$ ) and cough (69%,  $p=0.594$ ).

**Table 5.** Characteristics of the symptoms of nonagenarians and centenarians with and without polypharmacy.

	With polypharmacy	No polypharmacy	Total	P
Urinary incontinence	95 (67.40%)	46 (32.62%)	141 (58.02%)	0.907
Unaltered sleep	72 (63.20%)	42 (36.84%)	114 (46.91%)	0.221
Sleepy apathetic	54 (67.50%)	26 (32.50%)	80 (34.90%)	0.882
Hyperactive agitated	37 (67.27%)	18 (32.73%)	55 (24.12%)	0.897
Dizziness	75 (70.75%)	31 (29.25%)	106 (44.70%)	0.337
Presents choking	56 (66.70%)	28 (33.33%)	84 (34.60%)	0.921
Xerostomia	87 (75.65%)	28 (24.35%)	115 (48.20%)	0.008
Constipation	83 (73.45%)	30 (26.55%)	113 (46.70%)	0.058
Diarrhea	26 (72.22%)	10 (27.80%)	36 (14.90%)	0.500
Pain	81 (65.32%)	43 (34.70%)	124 (51.20%)	0.858
Daytime sleepiness	24 (63.20%)	14 (36.84%)	38 (15.60%)	0.575
Respiratory symptoms	122 (68.54%)	56 (31.50%)	178 (73.20%)	0.422
Dyspnea	41 (78.85%)	11 (21.15%)	52(21.40%)	0.042
Palpitation	32 (74.42%)	11 (25.60%)	43 (17.70%)	0.259
Fatigue	50 (70.42%)	21 (29.60%)	71 (29.20%)	0.476
Wheezing	30 (81.10%)	7 (18.92%)	37 (15.20%)	0.049
Cough	69 (69.00%)	31 (31.00%)	100 (41.10%)	0.594
Fall last 6 months	87 (62.60%)	52 (37.41%)	139 (57.70%)	0.074
Fear of falling	102 (72.90%)	38 (27.14%)	140 (59.80%)	0.049
<b>Total</b>	163 (67.10%)	80 (32.92%)	243 (100%)	

## Discussion

In this work, different analyses were carried out in order to assess the possible relationship between polypharmacy and sociodemographic and clinical characteristics in nonagenarians and centenarians of the project. The results were presented according to their corresponding objectives; the discussion will follow the same format.

In the present research, the drug consumption profile showed a high frequency of polypharmacy. According to a study carried out by Pazan and Wehling<sup>10</sup>, the prevalence of polypharmacy found in the literature varies from 4% in young elderly people living in the community to approximately 96.5% in hospitalized elderly people. This prevalence varied depending on the age group and European countries studied. The authors found a prevalence of polypharmacy for the population aged 85 years or older of 46.5% (95% CI 44.6–48.4), a frequency lower than that found in the present study. On the other hand, corroborating the findings of the present study, the prevalence of polypharmacy between the sexes observed by the authors was similar for women and men<sup>10</sup>.

Oliveira et al.<sup>11</sup> analyzed the prevalence of polypharmacy among elderly people treated at Basic Health Units in Belo Horizonte-MG. Regarding sociodemographic characteristics, of the 227 participants, almost 71% were women, like the present study. According to the authors, 76% of the participants did not live alone, another data very close to our findings, 68% lived with family members and 80% with caregivers. The frequency of polypharmacy on Oliveira et al. study was lower (57.7%) than observed in the present study. The authors also found no significant characteristics between the studied genders. On the other hand, the authors found lower prevalence in older people, different from what was observed in the present study, where centenarians were the ones with the highest prevalence. As for education, higher education was associated with a higher prevalence for the authors, which differs from the findings of the present study, where the average number of years of study was lower among participants in polypharmacy. The information that elderly residents alone had a higher frequency of

polypharmacy was also divergent. Among the nonagenarians and centenarians evaluated in this research, those who lived alone had a lower frequency. The information that elderly residents alone had a higher frequency of polypharmacy was also divergent. Among the nonagenarians and centenarians evaluated in this research, those who lived alone had a lower frequency. The information that elderly residents alone had a higher frequency of polypharmacy was also divergent. Among the nonagenarians and centenarians evaluated in this research, those who lived alone had a lower frequency<sup>11</sup>.

According to Lu et al.<sup>12</sup>, little is known about the prevalence and relevant factors of polypharmacy in nonagenarians and centenarians. For this reason, they carried out a population-based cross-sectional study of adults aged 90 and over residing in rural Dujiangyan, a small town in western China. The study included 859 nonagenarians with a mean age of  $93.7 \pm 3.3$  years. The number of medications was  $0.8 \pm 1.4$  per participant, 20.3% of participants used two or more medications, and 3.7% used five or more. Previous studies have found that sociodemographic factors (e.g. age, sex, income and education), illness (e.g. hypertension), symptoms (e.g. shortness of breath) and health factors (e.g. affordability of medication) are associated to polypharmacy in the elderly, aged <85 years<sup>12</sup>.

A cross-sectional study conducted in Sweden found that centenarians on average used a similar number of medications as octogenarians. In the study by Lu et al.<sup>12</sup>, minor polypharmacy was defined as the concomitant use of two to four drugs and major (major) polypharmacy, concomitant use of five or more medications. The prevalence of minor and major polypharmacy was 16.5% and 3.7% respectively. The association between age and number of medications was very weak and not significant ( $r=0.02$ ,  $p=0.559$ ). As in the present study, the number of medications had a significant association with self-rated health ( $p<0.001$ )<sup>12</sup>.

As observed by different authors<sup>11-12</sup>, in the present study, a higher frequency of participants in polypharmacy with a clinical diagnosis of almost all diseases was observed, being significant for cardiovascular, gastric diseases, anxiety, respiratory diseases, arthrosis and thyroid disease, while the



relationship between stroke diagnosis and polypharmacy was indicative of significance. However, the frequency of participants in polypharmacy was also higher than that of the entire sample, although without a significant relationship, among the participants who reported a diagnosis for the other clinical conditions. Only participants with a clinical diagnosis of dementia had a lower than expected frequency of polypharmacy.

In the study by Oliveira et al.<sup>11</sup>, self-perception of health was significantly associated with polypharmacy. Participants with a negative self-perception of health had a higher frequency of polypharmacy ( $p=0.005$ ), a phenomenon that was also observed in the present study. The presence of depressive symptoms was also associated with a higher frequency of polypharmacy, both in the present study and in the study by Oliveira et al.<sup>11</sup>.

Oliveira et al.<sup>11</sup> also evaluated the relationship between functionality and the presence of polypharmacy. Participants with incapacity for instrumental activities of daily living had a higher frequency of polypharmacy, similar to that observed in the present study. However, cognitive disability showed a higher frequency of polypharmacy in the study by Oliveira et al.<sup>11</sup>, which was lower in the present study. In both studies these factors were not statistically significant. In the same sense, the systematic review by Gutiérrez-Valencia et al.<sup>13</sup> that evaluated the relationship between weakness/frailty and polypharmacy in the elderly did not have clear results.

Vision self-perception was significantly associated with the prevalence of polypharmacy in the present study. Participants reporting good vision had a lower frequency of polypharmacy. We did not find, in the scientific literature, any reference that supports or contradicts this observation, which is an unprecedented result. However, the present study has limitations regarding the participants' difficulty in remembering the medications currently used. The project was developed by a multidisciplinary team, some of the interviewers had no experience with drug nomenclature, meaning that, in some cases, their description could not be translated into a correct drug name, causing an underestimation of polypharmacy.

## Conclusions

In the present study, it was possible to observe that polypharmacy was frequent among the nonagenarians and centenarians studied (67%). This frequency was higher than most reports in the literature. Older participants, living with a caregiver or family member, widowed, general health not good, with poor appetite, vision and hearing good, with a history of cardiovascular diseases, stroke, hypertension, diabetes, depression, gastric diseases, anxiety, respiratory diseases, arthrosis, thyroid disease, with depressive symptoms, functional and basic skills not maintained, with urinary incontinence, apathy or drowsiness, agitation, dizziness, dry mouth, constipation, diarrhea, respiratory symptoms, dyspnea, palpitations, fatigue, wheezing, coughing and fear of falling showed a higher frequency of polypharmacy.

This work leads us to a more careful and attentive look at the elderly population and the rational use of their medicines. It demonstrates that health professionals, especially pharmacists, play a key role in identifying PIMs for the elderly and possible drug interactions arising from polypharmacy. Respect and education are everyone's responsibility to ensure a better quality of life for the polymedicated oldest-old.

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