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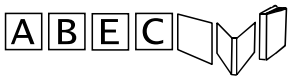

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How to overcome challenges and find strength from within: Resilience and Gerontology

Resilience, as a psychological concept, has gained an importance over the past few years that goes far beyond the academic sphere. Notably, the concept has been employed in international debates in the context of urbanization, environmental disasters and other crises, and increasingly refers not only to individuals, but also to communities and environments. It is applicable to the many contexts in which individuals, communities or systems need to adapt to new conditions without losing their functionality.

The concept of resilience is therefore closely linked to geriatrics and gerontology. Over the life course, and especially in old age, people need to compensate for losses, overcome challenges, and adapt to physical, mental, environmental and social changes. The same applies to communities, which, for example, as a result of population ageing, face new challenges. One example would be the need to adapt public spaces to a society with more older people and fewer children. It therefore seems almost impossible to study geriatrics and gerontology without understanding the concept of resilience.

There are also close ties between resilience and gerontological concepts such as the idea of active ageing and its fundamental capitals (vital capital, social capital, finance capital and knowledge capital). It is these reserves that are necessary to adapt and learn from the challenges one encounters throughout life, and which make a person or a community more resilient. Thus, the concept of resilience is indispensable to understanding active ageing as the *process of optimizing opportunities for health, participation, lifelong learning and security to improve, or maintain, quality of life as people age* (ILC-Brazil 2015).

With increasing longevity in contexts of increasingly rapid and abrupt change, mainly related to digitalization, building resilience during the life course is essential to ensure well-being and quality of life in old age. The mantra of "the sooner the better, it is never too late" also applies to the building of resilience. We must invest in creating resilience at all ages and levels.

The 4th Industrial Revolution, which is characterized by a disconcerting new fusion of technologies in the digital, physical and biological domains, causes disruptive changes. Those who lack resources, including the intellectual capital and, for example, the mental stability to cope with and adapt to these changes will become excluded. In contrast, someone who is used to dealing with technological changes and who has accumulated financial, social and intellectual resources along the life course will overcome the challenges more easily.

The discussion of the issue of resilience is also necessary today because of the many crises that the world, and in particular Brazil, are experiencing. A glance at the newspaper reveals numerous situations requiring resilience: violence in Brazil's urban centers occurring alongside terrorism in Europe, wars and humanitarian crises in the Middle East and Africa, and growing populism and xenophobia in the USA and Europe.

In short, the challenges we encounter in life are constant and cover all areas of life, from health and security to social participation and lifelong learning. Some will use barriers, whether big or small, as a spring board, while others will need more support to overcome these challenges and to be able to see them as challenges and not as limits.

It is in this context that the Fifth International Longevity Forum will address the theme of building resilience across the life course. To overcome the challenges created by the complex relationship between population ageing, digitalization and the risks set out above, individual resilience must be created throughout life, as well as at the community and society level. The Fifth Forum, which takes place on October 19 and 20 in Rio de Janeiro, brings together speakers from Brazil and other countries from various fields, including psychology, sociology, demography, gerontology, geriatrics, nursing, architecture and design. As in other years, the content from the Forum will be summarized in a succinct and useful document to promote core ideas about resilience in an increasingly long-lived world.

Ina Voelcker, Technical Director, International Longevity Centre Brazil (ILC-Brazil)

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Consumption and social and demographic profile of the different household arrangements of the elderly in Brazil: analysis from the Study on Family Budgets

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Mirely Bonin Silveira[2]

Abstract

Objective: to define the social and demographic profile of the different household arrangements involving the elderly, as well as to calculate the average annual consumption of such household arrangements according to the Pesquisa de Orçamentos Familiares (the Study on Family Budgets) (2008/2009). *Method*: a quantitative, descriptive, cross-sectional study was performed using secondary data extracted from the micro-data of the Study on Family Budgets (2008/2009), carried out by the Instituto Brasileiro de Geografia e Estatística (the Brazilian Institute of Geography and Statistics). In order to define the social and demographic profile of different household arrangements an exploratory analysis of the data was carried out, and the Gini index was used to identify if there was inequality in the distribution of consumption. *Results*: The results showed that elderly consumers can be seen as constituents of new generations, while most have only an elementary education and reside in an urban region of Brazil. There was a predominance of female heads of households in which there was no spouse present. When evaluating the distribution of the annual consumption of all the families, a greater weighting of the categories miscellaneous expenses, housing, transportation and food was found. *Conclusions*: Understanding the socioeconomic characteristics of the different home arrangements of the elderly, as well as their relationships with the consumption of goods and services, is extremely important, since the goods and services offered to this segment of the population can provide satisfaction with and improvement in quality of life.

Keywords: Elderly. Population Characteristics. Family Characteristics. Brazil.

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INTRODUCTION

The social changes that have occurred in society from the 1970s onwards, especially those related to the reduction of fertility and mortality rates and increased longevity, have had a direct impact on the size and composition of families, as well as on gender relations and consumption patterns[1]. One of the most important social changes relates to the demographic increase of the elderly, with population aging increasing in all economically developed or developing societies[2].

In Brazil in general and especially in some specific regions of the country, population aging is also growing. Since 2004 there has been a change in the format of the population age pyramid, with the aging of 60-year-old or older individuals, predominantly women (8.0% of the total population, with men of such age making up 4.3%). In 2015, the estimated population of Brazil was 204.9 million people, representing a growth of 0.8%, or 1.7 million people, in relation to the previous year, with 14.3% of this population classed as elderly[3]. The accelerated pace of aging in Brazil therefore creates new challenges for contemporary society, as this process occurs in a scenario of profound social, economic, urban, industrial and family transformations.

As in several other developing countries, population aging in Brazil has occurred faster and in an unfavorable socio-economic context due to low rates of economic growth; the fiscal crisis of the state; high levels of social inequality; high rates of illiteracy; problems with sanitation, housing, poverty; and also the lack of properly consolidated institutions, among other problems[4].

The economic stabilization the *Plano Real* brought to Brazil resulted in an increase in the purchasing power and well-being of Brazilian families. With these economic changes, the pattern of consumption changed, with changes in the structures of household spending and incomes[5,6].

In general, the demographic profile of the elderly, their geographical distribution, and the physiological and psychological effects of the aging process which they undergo has been much studied. Little is known, however, about how people over 60 think and behave as consumers. If, on the one hand, the importance of these people in the economic, social and political life of the country has grown, there is also a lack of data on their purchasing and consumption habits [7]. Some authors have corroborated this claim, affirming that unlike in Brazil, research on elderly consumer behavior has increased significantly in recent decades in North American countries, while the transformation of the purchasing habits of the elderly has also been observed in India[8].

Population aging therefore has a significant impact on several sectors, as this segment of the population has its own demands, and a large portion is economically active and concerned about living longer and better[9]. The new generation of elderly persons is more technologically aware, participatory and demanding, leading to innumerable consumer relations, which are no longer restricted only to the contracting and use of health-related services[10].

It is also important to emphasize that, as one gets older, preferences and needs for products and services tend to change. The needs and expenditures of a family are affected by factors such as the number of members, their age, and the number of adults working outside the home. As family needs and expenditures change over time, the importance of the family life cycle, which combines trends in income and family composition with changes in the demands placed on this income[11], as in the case of the elderly, should be highlighted.

The importance of studying the behavior of the consumer is therefore clear, since understanding cultural and social characteristics allows the needs and perceptions of consumers to be identified and makes it easier to satisfy them[12].

It is essential to understand the consumption behavior of the elderly and their families, since it can contribute significantly to the design of public policies, mainly relating to social security, since an analysis of family expenditures, especially of low income families, provides an important parameter for measuring their survival[13]. In this sense, it should be emphasized that understanding the consumer relations of this segment is extremely relevant if the goods and services offered are to provide satisfaction and improvement of the quality of life of the elderly[14].

It is therefore important to analyze how the different household arrangements intervene in the consumption of goods and services by the elderly, which can contribute to a greater understanding of the dimension of aging in terms of consumption. The objective of the present study was therefore to delineate the social and demographic profile of the elderly consumer in different household arrangements in Brazil, as well as to identify, calculate and compare the types of goods and services that elderly household arrangements consume, according to the data of the Pesquisa de Orçamentos Familiares (Family Budget Survey) (POF 2008/2009).

The POF (2008/2009) aims to measure consumption, expenditure, income and part of the property variation of the family, making it possible to profile the living conditions of the Brazilian population based on the analysis of their household budgets. The POF (2008/2009) also investigates several characteristics of households and families, thus increasing the potential uses of the results of the survey [15].

METHOD

The data analyzed in this article are part of the project "The Behavior of the Elderly Consumer in Different Family Arrangements: A Historical and Comparative Analysis from the Data of the Family Budget Surveys".

The present research was quantitative, descriptive and cross-sectional in nature and used secondary data extracted from the *Expenses, Income and Living Conditions* microdata of the Family Budget Survey (2008/2009), carried out by the Instituto Brasileiro de Geografia e Estatística (Brazilian Institute of Geography and Statistics) (IBGE). The choice of these data is due to the fact that this is a national survey that includes detailed questions about the two measures of well-being: consumption and income, besides allowing comparison throughout Brazil as it covers both rural and urban areas.

The POF (2008/2009) is the fifth and most current survey conducted by the IBGE on family budgets. The data collection period of the POF was May 2008 to May 2009 and included 55,970 households from all regions of the country[15].

Among the several variables that make up the POF 2008/2009 database, the following variables were selected for this study to describe the social and demographic profile of the household arrangements of the elderly: gender; age; skin color/ethnicity; Brazilian state; highest educational level; status in house (reference person, spouse, child, other relative, aggregate, pensioner, domestic employee and relative of domestic employee); household size; value of total household income. In relation to the types of goods and services consumed in the different household arrangements of the elderly, the following consumption variables were selected: food (inside and outside the home), housing, clothing, transportation, hygiene and personal care, health care, education, recreation, smoking, financial expenses (expenses with banking services, pension, insurance etc.) and miscellaneous expenses (pet expenses, professional services, ceremonies etc.).

To satisfy the objectives proposed in this study, the universe of analysis consisted of seven different household arrangements, which constituted domestic units, of elderly persons who lived in all regions of the country. The choice of the age limit in the classification of the elderly (60 years or older) was based on the criteria established by the Statute of the Elderly[16].

It is important to mention that the POF (2008/2009) does not present a classification of the types of home arrangements. In this sense, an analytical classification was constructed to study the household arrangements of the elderly, which was as follows: Single person (elderly living alone); Composite (reference person of the home and other relatives); Couple without children (reference person who resides only with spouse); Couple with children (reference person, spouse and child); Couple without Children but with Relatives (reference person, spouse and other relatives); Couple with Children and Relatives (reference person, spouse, child or children and other relatives); and Single Parent (reference person, child or children and/or other relatives).

In all the household arrangements at least one of the constituent members was elderly. The reference person was considered the individual who was responsible for household expenses. The spouse was the resident who lived with the person of reference. A child was considered to be the legitimate, adoptive

or biological child of the reference person and/or his or her spouse. Other relatives were considered individuals with or without any degree of kinship with the reference person or with their spouse. This classification was made from the aggregation of the categories "other relative", "aggregate", "pensioner", "domestic employee" and "relative of domestic employee" that the POF (2008/2009) uses to classify the residents of the consumption units.

In order to delineate the socioeconomic profile of the different household arrangements, an exploratory analysis of the data was performed [17].

To identify if there was inequality in the distribution of consumption among the household arrangements, the Gini index of the expenditure variables of the arrangements was used. This index varies from 0 to 1, with scores of closer to zero representing greater equality and a score equal to one representing the maximum degree of inequality[18].

In order to obtain estimates of the universe of analysis of the POF (2008/2009) it was decided to perform the calculations using the expansion factor. Thus, of the 180,650 million people included in the survey, 20,314 million were 60 years old or older, representing 11.25% of the total population. However, in order to reach the objectives proposed here and considering only the household arrangements of the elderly as a consumer unit, the presence of outliers for the annual household consumption variable was detected. A sample size cut-off point was applied to improve the normality assumptions and to allow greater accuracy of the estimators. The criterion used was two standard deviations in relation to the first and last consumption percentage (equivalent to observations below R$300.00 and over R$228,819.00). The same problem was detected for the income variable, and therefore a sample cut-off point was also applied using the same criterion as the consumption variable for the lower income limit, and a standard deviation below 90% for the upper income limit (equivalent to observations below R$93.00 and over R$28,567.00). Therefore, the final sample of this study consisted of 13,899,071 people distributed in the home settings where at least one of the members was elderly.

Although the data of this study related to humans, as they came from a public use and access database, there was no need to submit the study to the Research Ethics Committee.

RESULTS AND DISCUSSION

In order to understand the elderly as private individuals within a broader study focus, an exploratory analysis of the data was carried out by means of a brief characterization of their living conditions by studying the following variables: age, gender, level of education, skin color/ethnicity and regions of the country.

The POF (2008/2009) surveyed 20,314 million people aged 60 years or over. These elderly individuals had a mean age of 69.9 years (± 7.9), with a minimum age of 60 and a maximum of 104 years. A total of 75% were 75 years old or younger and 10% were 81 years old or older. The sample was predominantly female, with 11.3 million women (55.6%). Data from the Demographic Census of 2010[19] show that the highest concentration of women in the most advanced ages is related to male over-mortality, a phenomenon present in almost all age groups. In the elderly group, due to the effect of higher male mortality, a smaller number of men reach such ages [20].

Regarding the educational level of the elderly studied by POF, 69.09% (n =10.8 million) described having only an elementary education, with an average of 4.5 years of study.

Regarding the skin color/ethnicity of these elderly persons, 55.36% (n=11.2 million) were white/Caucasian; 35.11% (n=7.1 million) brown/mixed race; 7.71% (n=1.5 million) black/Afro-Brazilian; 1.03% (n=0.20 million) yellow/Asian-Japanese; and 0.48% (n=0.09 million) indigenous. The rest did not know or did not want to provide this information.

When analyzing the geographic distribution of these people aged 60 and over according to their residence and state, there was a higher concentration of elderly people in the Southeast region, which represented 46.5% (n=9.4 million). It should be noted that the country's three most populous states (São Paulo, Minas Gerais and Rio de Janeiro) also contained the largest number of elderly people, as well as the highest proportion of elderly people as a percentage of the total population. On the other

hand, the states with the lowest presence of elderly people were, in order of importance: Sergipe, Amazonas, Distrito Federal, Tocantins, Rondônia, Acre, Amapá and Roraima. Together, these states contained less than 5% of the Brazilian elderly population, possibly due to migration from these regions and the search for a better quality of life in other regions of the country.

Regarding the gender distribution by state of the elderly persons surveyed in the POF, the Brazilian states with the highest percentages of elderly women were: Rio Grande do Norte (61.09%), Rio de Janeiro (60.74%) and Pernambuco (59.85%). The states of Tocantins (54.14%), Amapá (52.66%), Mato Grosso (51.19%) and Acre (51.03%), meanwhile, had the most elderly men. According to data from the Demographic Census of 2010[19], the states of Tocantins, Acre and Mato Grosso have more elderly men than elderly women due to the history of immigration in this region, which differs by gender.

It was possible to verify that 82.89% (n=16.8 million) of the elderly lived in urban areas of the country, characterizing this population segment as urbanized, a trend that can be explained by the fact that the elderly population seek better conditions and care for their needs in urban areas, which are also the regions where the majority of the Brazilian population are concentrated.

With regard to the household arrangements in which the elderly persons were inserted, the three most common types were single parents, couples with no children, and one-person households. Other surveys[20] show that the traditional family model, consisting of a heterosexual couple, with the man being the provider and the woman the home caregiver is disappearing, giving rise to new family arrangements, mainly with single-parent and single-person families. The three less common household arrangements were couples with no children but with relatives, composite arrangements, and couples with children and relatives (Table 1).

With regard to the geographic distribution of the household arrangements studied, it was seen that most of the households were located in the southeast region of Brazil, with 51.59% (n=1,398,400) of couples without children; 50.96% (n=1,296,292) of single persons; 46.30% (n=1,027,368) of couples with child; 43.44% (n=529,843) of the composite arrangement; 43.41% (n=1,201,134) of single parents; and, 37.39% (n=667,246) of couples with children and other relatives. Only the majority of couples without a child but with other relatives arrangement were located in the northeast (35.86% or n=234.733) of the country.

In all the residential arrangements under study, the majority resided in urban areas of the country. Some authors[21] also noted that there is an incentive towards urban life and that the rural environment is becoming increasingly uninhabited. The process of urbanization in Brazil can explain this fact, as well as the fact that the aging process cause a need for greater attention to health, which is provided in the urban environment.

Table 2 shows the differences in the characteristics of the household arrangements in which the elderly were inserted which are part of the study sample.

Table 1. Household situation of elderly persons in Brazil. Brazil, 2009.

Type of Home Arrangement	n (%)
Couple without children and relatives	654,498 (4.71)
Composite	1,219,845 (8.78)
Couple living with children and relatives	1,784,372 (12.84)
Couple that lives with children	2,219,154 (15.97)
Single person	2,543,565 (18.30)
Couple without children	2,710,413 (19.50)
Single parent	2,767,224 (19.90)
Total	13,899,071 (100.00)

Table 2. Characterization of domestic arrangements of elderly persons. Brazil, 2009.

Arrangement	Age (Years)	Gender (%)		Study (Years)	Gender (%)						Total Income (Mean/R$)
		Fem.	Mal.		White	Brown	Black	Yellow	Indigenous	N. I.	
Single Person	72.4 (±7.9)	67.79	32.21	4.63	58.16	32.10	8.28	0.54	0.83	0.09	1.855.61
Composite											2.550.43
Head	61.7 (±15.36)	75.69	24.31	6.38	51.31	37.62	8.70	1.14	0.50	0.50	
Other Relatives	43.99 (±27.53)	61.53	38.47	5.82	49.92	41.32	7.52	0.74	0.28	0.22	
Elderly person	73.2 (±8.9)	83.48	16.52								
Couple Without Children											2.687.80
Head	69.6 (±7.91)	9.32	90.68	5.08	60.23	30.90	7.42	1.15	0.22	0.08	
Spouse	65.5 (±9.29)	90.68	9.32	5.06	62.26	29.43	6.71	0.91	0.59	0.11	
Elderly person	69.7 (±6.9)	45.53	54.47								
Couple With Child/Children											3.596.03
Head	67.1 (±7.91)	6.98	93.02	5.01	54.43	35.47	7.71	1.84	0.31	0.23	
Spouse	59.9 (±10.40)	93.02	6.98	5.22	54.03	36.85	6.94	1.34	0.31	0.52	
Child	25.9 (±11.34)	39.06	60.94	7.98	51.51	40.59	6.20	1.02	0.39	0.29	
Elderly person	67.7 (±6.5)	36.26	63.74								
Couple Without Children But With Other Relatives											2.806.95
Head	65 (±12.25)	10.91	89.09	4.56	44.62	46.40	8.19	0.37	0.30	0.12	
Spouse	60.9 (±12.70)	89.09	10.91	4.61	42.11	46.15	10.60	0.55	0.34	0.25	
Other Relatives	31.7 (±28.96)	50.96	49.04	4.20	43.39	47.74	6.74	1.42	0.34	0.37	
Elderly Person	71.1 (±8.6)	49.22	50.78								
Couple With Child or Children and Other Relatives											3.387.16
Head	58.5 (±13.89)	12.78	87.22	5.12	46.28	43.95	7.84	1.02	0.47	0.43	
Spouse	54.4 (±14.11)	87.22	12.78	5.42	47.35	42.81	7.76	1.06	0.83	0.18	
Child	22.2 (±11.75)	49.74	50.26	6.81	44.64	46.61	7.14	0.77	0.31	0.52	
Other Relatives	32.2 (±30)	55.76	44.24	3.68	45.55	45.10	7.36	0.96	0.54	0.49	
Elderly person	70.4 (±8.4)	49.88	50.12								
Single Parent											2.634.11
Head	67.9 (±11.42)	83.35	16.65	4.39	50.22	38.97	9.89	0.17	0.51	0.25	
Child	33.9 (±12.83)	47.94	52.06	7.78	44.71	44.25	9.87	0.35	0.31	0.51	
Other Relatives	25.8 (±24.61)	50.77	49.23	4.37	41.71	48.38	8.86	0.21	0.40	0.44	
Elderly Person	70.9 (±7.9)	80.36	19.64								

N.I.= not informed.

It was noted that the level of education of the heads of households and spouses in all the home arrangements under study is low, with the large majority having only an elementary education. The level of schooling of children was better, however, with a higher rate of high school and higher-level educations, probably due to the greater opportunities that the children had to attend school in relation to their parents. The level of education of the other relatives was also a little higher than heads or spouses, although elementary education still predominates among this group.

It is worth mentioning that the average years of study by the members of the household arrangements was six years, with children having more years of study (7.5), thus reaffirming the higher level of schooling of the children. In relation to the total income of the household arrangements, the arrangements couple with children and couple with children and relatives had higher average incomes.

It is also verified that the arrangement couple with children included elderly people who were on average younger than those in the other arrangements, which can be explained by their life cycle. In contrast, the elderly of the composite arrangements had the highest average age. Older women predominated in composite, single-parent and single-person arrangements.

Regarding the consumption of the household arrangements studied, an asymmetric distribution of total annual consumption was evidenced by the higher consumption of households located in the 90th percentile. This asymmetry is reflected in a mean (R$ 25,470.00) that is significantly higher than the median (R$ 14,340.00).

In contrast, the 25% of lower income households from the study sample had an annual consumption of R$6,851.00. The minimum consumption identified was R$317.00 while the highest was R$ 228,332.00.

In addition, a more detailed study of the distribution of consumption found that the 10% of households with the highest consumption spent approximately 17 times more than the 10% of households with the lowest consumption. This inequality in the distribution of consumption is evidenced by a Gini coefficient of 0.55.

The household arrangement with the best distribution of annual consumption was the couple with children and other relatives. At the other extreme, the single-parent arrangement shows had the most unequal total consumption distribution (Figure 1).

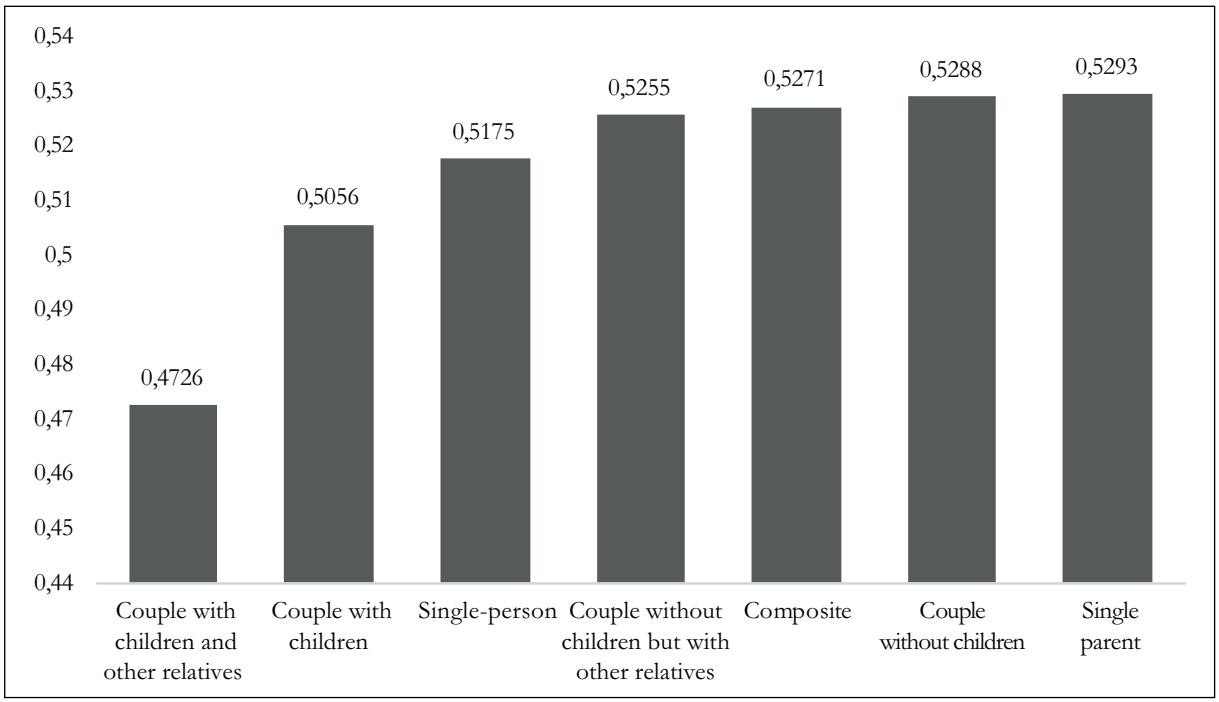

Figure 1. Gini coefficient for annual consumption according to home arrangement. Brazil, 2009.

When studying the distribution of the categories of annual consumption of all the households in the study, a greater weight in the miscellaneous expenses category was found, followed by the category of housing, transportation and food. Data from the POF of 2002/200322 showed that housing expenses were the most important of consumption expenditure for all types of household composition. In terms of food, other authors[23] have considered that the main criterion of food choice in the population is price, where people are often aware of the importance of food for good health, but make choices that may benefit their health due to the resources available, and must evaluate what they can and should not buy. The less important categories were smoking, food eaten outside the home and education (Figure 2).

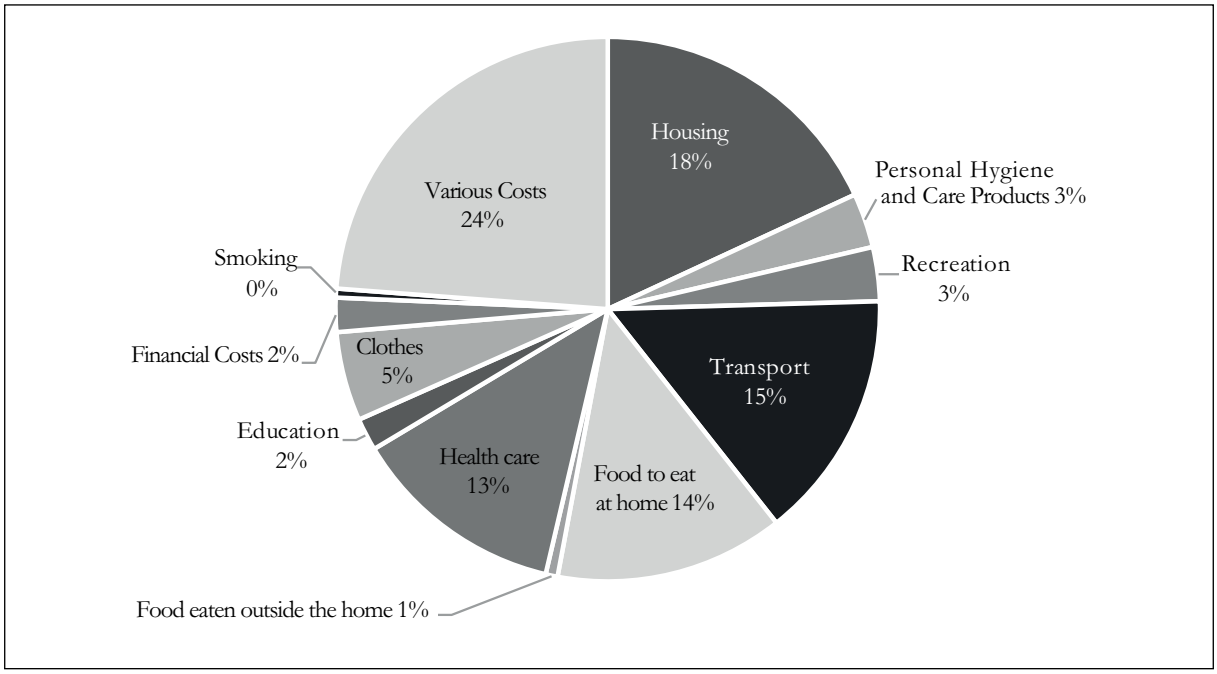

Figure 2. Distribution of consumption by cost category. Brasil, 2009.

The consumption distribution of the different household arrangements evidences a higher expenditure on housing and miscellaneous expenses, followed by health care and food eaten at home. The single-person arrangement had the highest consumption in three types of expenditures: housing, health care, and food eaten at home, accounting for 63.38% of its income. These data are in line with those presented in another study[14], where it was found that in one-person and two person with spouse arrangements in Brazil, expenditures on housing, eating at home and health care were the highest in the household arrangements studied. The couple with children arrangement stood out from the others in consumption on education and transport (Table 3), which can be explained by the presence of children at home and by the stage of the life cycle of the family.

With the exception of smoking, it is interesting to note that the least consumed item was food eaten outside the home for all the studied arrangements. Although not investigated in this study, such a habit may be related to the search for healthy eating practices that will improve quality of life.

Table 3. Percentage distribution of consumption by household arrangement. Brazil, 2009.

Spending variable/ Household arrangements	Composite	Single relative	Single person	Couple with children	Couple with children and relatives	Couple without children	Couple without children but with relatives
Housing	19.57	17.83	26.86	15.64	15.26	19.51	19.48
Hygiene products	4.23	3.52	2.53	3.31	3.79	2.12	2.57
Recreation	3.75	3.32	2.78	3.60	3.36	2.38	2.84
Transport	10.99	13.18	6.93	18.52	16.66	15.90	14.64
Food eaten in the household	15.16	12.24	17.49	12.72	12.27	13.79	14.88
Food eaten outside the home	0.76	0.92	0.75	0.83	0.64	0.73	0.40
Health Care	14.13	10.24	19.03	11.48	9.65	16.43	14.50
Education	1.81	2.53	0.59	2.92	2.64	0.42	1.06
Clothing	6.27	5.99	4.51	5.30	6.47	3.58	3.98
Financial expenses	1.72	1.52	1.36	3.13	1.89	2.18	1.76
Smoking	0.49	0.66	0.40	0.46	0.51	0.52	0.62
Miscellaneous expenses	21.13	28.04	16.77	22.10	26.85	22.43	23.28

It is interesting to note that the items that were least consumed by all household arrangements in the study were smoking, financial expenses, education and meals outside the home, which can be explained by the stage of the life cycle of the elderly. Other studies[24] also reveal that one of the most significant changes that older people have made in relation to their lifestyle is the cessation of tobacco use, since smoking is considered an increasing risk factor for diseases.

Although a limitation for the discussion of the results due to the difficulty in comparing studies, the research performed is made more relevant due to the lack of bibliographical materials that deal with the subject of the elderly public in the different home arrangements.

CONCLUSIONS

The accelerated process of aging of the Brazilian population and the consequent change in the demographic profile of the country has generated social and economic challenges and increased the need for research in the area of aging.

One of the most important social transformations that has occurred in society in recent years is related to the demographic increase of the elderly, due to the increase in life expectancy combined with a reduction in fertility rates. As a consequence, a new population group has started to consume different goods and services, searching for prices and brands that meet their needs, thus increasing market demand.

However, it was noticed when carrying out the present study that the three most common types of arrangements in which the elderly are inserted are single person, couple without children and single relative, which may be an indication that in widowhood they prefer to live alone than to reside with other relatives. The less common arrangements were couples without children but with relatives, composite, and couples with children and relatives. Although the percentage of older women is higher than that of men, they are only a majority in three types of home-based arrangements: composite, single-person and single-relative, which are, in turn, the two most vulnerable arrangements in terms of income.

The items most consumed by the residential arrangements where the elderly were included were housing, health care and food within the household, which made up more than 40% of the income of five studied arrangements, except for couples with children, and a couples with children and relatives. The commitment of a large part of the income means that less financial resources are available for leisure and other types of expenses such as hygiene and clothing products.

There are still few studies on the elderly consumer, and it is necessary to carry out other works like this one, in order to enrich and complement this study, since to understand the consumer relations of this segment is extremely relevant if the goods and services offered are to provide satisfaction and improvement of the quality of life. The discussion raised is not exhaustively treated here, but it is believed that the results of this study contribute to the advance of researches into the behavior of the elderly consumer in different home arrangements.

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Elderly patients with facial trauma: a 10 year review

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Abstract

Objective: to analyze the epidemiological profile of geriatric patients with facial trauma treated at a Maxillofacial Surgery Department in southern Brazil over a period of 10 years. *Methods:* a retrospective analysis of the medical records of patients aged over 60 years treated for facial trauma in the period from January 2001 to December 2010 was performed. *Result:* of a total of 1,385 analyzed medical records of patients with facial trauma, 86 (6.2%) belonged to the group aged 60-89 years. The male gender was the most affected and the age group 60-69 years was the most frequently involved. The middle third was the most affected, and the zygomatic bone was the most commonly fractured. *Conclusion*: special attention should be given to the 60-69 age group, as while such patients present physiological changes inherent to aging, they remain active in society and exposed to risk factors for facial trauma.

Keywords: Surgery, Oral. Epidemiology. Health Services for the Aged.

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INTRODUCTION

The increase in the active elderly population is likely to be reflected in the profile of patients receiving care in the area of oral and maxillofacial traumatology[1]. Today, those aged between 20 to 29 years most often receive care through this specialty[2,3] with the elderly representing a smaller portion of the total number of patients[1,4]. Among this group, the main etiological factors of trauma are falls and traffic accidents[3]. There are a large number of publications on the epidemiology of facial trauma from around the world[3-5], with the results varying in terms of etiology, age of patient and gender, depending on factors that include socioeconomic conditions and educational and cultural level[4]. The indices vary from country to country, according to social, cultural and environmental factors[5].

Trauma to the facial region often results in injuries to the soft tissue, teeth, and the major skeletal components of the face, including the mandible, maxilla, zygoma, nasoorbitoethmoidal complex and supraorbital structures. There may also be injuries to other parts of the body. Dealing with and rehabilitating facial trauma patients involves a detailed understanding of the types, methods of assessment and surgical treatment of facial injuries[2,3].

Although elderly patients are subject to the same trauma mechanisms as other age groups, they are unique in their responses to these injuries. The physiological, metabolic and biomechanical changes that occur with age can affect the ability to resist stress, as well as increasing the incidence of complications and reducing the chance of survival[6]. In general, women are subject to a greater loss of mandibular mineral bone content than men. The presence of osteoporosis in the maxillary bones is still under debate in literature[7]. Trauma care should take into account the systemic condition of these patients and the care provided to them should differ from that given to other patients[6].

The objective of the present study was to analyze the epidemiological profile of geriatric patients with facial trauma treated at an Oral Maxillofacial Surgery Service in the south of Brazil over a 10-year period (January 01, 2001 to December 31, 2010).

MATERIALS AND METHODS

This retrospective observational study was carried out at the Hospital São Vicente de Paulo in Passo Fundo, Rio Grande do Sul, Brazil in conjunction with the Serviço de Arquivo Médico e Estatístico (Medical Records and Statistics Service) (SAME), where the medical records of geriatric patients treated by professionals from the field of oral maxillofacial traumatology during a ten (10) year period between January 1, 2001 and December 31, 2010 were analyzed.

Data collection was performed by a single researcher, who collected the following data from the SAME medical records: etiological agent of the lesion, age and gender of the patient, location of the fractures and, above all, whether or not some kind of traumatic injury associated with facial trauma occurred. Patients with lesions exclusively in the soft facial tissue were excluded from the study.

The geriatric population, which had an initial age of 60 years, was divided into three groups, with the first group containing individuals aged from 60 to 69 years, the second elderly persons aged from 70 to 79 years and the last group patients aged from 80 to 89 years. Patients were also classified as male or female. In terms of origin, the city of Passo Fundo was considered the referential center and patients from other cities were classified as from "other localities" due to the influence exerted by Passo Fundo in the region in terms of health care.

The etiological agents were divided into six groups: aggression, falls, traffic accidents, sports accidents, work accidents and others. Injury by firearm, domestic violence, assault and physical fights were included under aggression. Being knocked down and motorcycle, bicycle and car accidents were considered under the item traffic accidents. The others group includes accidents with animals and removal of teeth. This study was submitted to and approved by the Research Ethics Committee of the Universidade de Passo Fundo (the University of Passo Fundo) (UPF) under number 342/2011.

The chi-square test was chosen for statistical analysis, with significance set at $p<0.05$, and the variables Gender and Age Group were crossed with each of the other variables.

RESULTS

Of a total of 1,385 medical records of patients with facial trauma analyzed at the Hospital São Vicente de Paulo in the city of Passo Fundo, Rio Grande do Sul, 86 were aged 60-89 years, representing about 6.2% of the medical records. Of these 86 records of geriatric patients, 57 were male and 29 were female.

Fifty patients were aged 60-69 years, 26 were aged 70-79, and ten were aged 80-89 years. In general, the group aged 60-69 years was the most affected, representing 58.1% of the cases evaluated. Men predominated in all the age groups.

In the 60-69 years age group, 68% of the cases were male and 32% were female, while the 70-79 years group consisted of 65.3% men and 34.6% women, and the 80-89 years group comprised 60% men and 40% women of the total number of cases evaluated. There was a higher prevalence of men, independent of age (Table 1).

Of the fracture sites distributed according to age group, the zygomatic was the most affected location in the 60-69 years group, affecting 15 patients, there was a predominance of mandible fractures in the 70-79 years age group, occurring in 11 patients, and the nose was the most fractured site in the 80-89 years age group, with four patients affected. There was a significant difference between age and nose and maxilla trauma (Table 2).

In the 60-69 years age-group traffic accidents accounted for 32% of cases, while in the same group falls represented 26%. In the 70-79 years age group falls represented 50% of cases. In the 80-89 years age group, falls were the etiological agent in 60% of cases. Only the etiological agent differed significantly between the age groups (Table 3).

Table 1. Distribution of cases according to age group and gender. Rio Grande do Sul, 2011.

Gender	Age range (years) 60-69 n (%)	70-79 n (%)	80-89 n (%)
Male	34 (68)	17 (65.3)	6 (60)
Female	16 (32)	9 (34.6)	4 (40)

Table 2. Location of trauma according to age range. Rio Grande do Sul, 2011.

Trauma	Age range (years) 60-69 n(%)	70-79 n(%)	80-89 n(%)	*p*
Zygomatic	15 (25.8)	6 (18.1)	2 (20)	0.711
Jaw	10 (17.2)	11 (33.3)	2 (20)	0.145
Orbit	8 (13.7)	8 (24.2)	1 (10)	0.219
Nose	11(18.9)	2 (6)	4 (40)	0.019*
Jaw	2 (3.4)	0 (0)	1 (10)	0.036*
Le Fort	9 (15.5)	4 (12.1)	0 (0)	0.797
NOE	1 (1.7)	2 (6)	0 (0)	0.769
Dentoalveolar	2 (3.4)	0 (0)	0 (0)	0.478

* Significant

Table 3. Etiological agent according to age group. Rio Grande do Sul, 2011.

Etiological Agent	Age range (years) 60- 69 n (%)	70- 79 n (%)	80-89 n (%)	*p*
Traffic Accident	16 (32)	6 (23.1)	2 (20)	0.598
Aggression	9 (18)	2 (7.7)	1 (10)	0.436
Falls	13 (26)	13 (50)	6 (60)	0.035*
Accident at Work	1 (2)	2 (7.7)	0 (0)	0.358
Others	3 (6)%	1 (3.8)	1 (10)	0.776
Not described	8 (16)	2 (7.7)	0 (0)	0.267

* Significant

Ten medical records of the 86 patients were classified as *not-described,* representing 11.6% of cases.

The most common injuries in all three age groups were excoriations, followed by injuries associated with the skull, of which there were four in the 60-69 years age group, five in the 70-79 years age group and one in the 80-89 years age group. The age group with the highest number of associated injuries was the 60-69 years group (58.14%), followed by the 70-79 years group (30.23%) and the 80-89 years age group (11.62%). No abdominal trauma was recorded in any of the three age groups. Age did not significantly influence the type of associated injury (Table 4).

Table 4. Distribution of cases according to age group and injury. Rio Grande do Sul, 2011.

Injury	Age group (years) 60-69 (%)	70-79 (%)	80-89 (%)	*p*
Upper Limb	1 (2)	1 (3.8)	0 (0)	0.311
Lower Limb	0 (0)	1 (3.8)	0 (0)	-
Skull	4 (8)	5 (19.2)	1 (10)	0.345
Chest	0 (0)	0 (0)	1 (10)	-
Spine	1 (2)	0 (0)	0 (0)	-
Excoriation	9 (18)	6 (23.1)	2 (20)	0.870
Absent	35 (70)	13 (50)	6 (60)	0.170
Abdomen	0 (0)	0 (0)	0 (0)	-

DISCUSSION

The maxillofacial surgeon should be prepared to treat elderly patients, who have specific systemic conditions that require identification. Cardiovascular diseases and pulmonary disorders are common and may alter or limit treatment to less invasive therapy. Another condition frequently found among the elderly, especially in elderly women, is osteoporosis, which impairs the healing of fractures due to inadequate bone matrix formation. The elderly also suffer anatomical alterations that can change the modality of treatment, such as edentulism[5].

The present study found out that facial trauma occurred more frequently in men in the three age groups analyzed, a finding which agrees with other authors[6,8]. This suggests that there is a greater occurrence of facial trauma in males among all mechanisms of cause.

The age group most affected by facial trauma was 60-69 years. This can be explained by the greater number of elderly people in this age group than in other age groups,[1] in addition to the fact that patients in this age group are generally more active and so are exposed to many of the same risk factors as the active adult population. These specific characteristics of this age group explain the differences found in relation to the traumatic agent and the location of fractures in this group. The most common cause of facial injuries among the elderly was falls, which agreed with other studies[2,6,9-12], although traffic accidents were the most frequent cause of facial traumas among the 60-69 years age group.

Lifestyle and age-related habits predispose the elderly, as they grow older, to domestic accidents and lower kinetic energy traumas, while reducing the chances of trauma due to interpersonal violence and sports accidents. Due to the elderly spending more time in the home, most falls are household accidents[13]. Characteristics inherent to the aging process, such as decreased proprioception, changes in motor response, tremors, and decreased visual and auditory acuity predisposes to the elderly to a greater number of falls and stumbles[2,11,14]. Cardiovascular problems may also be related to falls, and many elderly people are particularly vulnerable to strokes[10]. There is also a decrease in both bone mass and muscle strength due to osteoporosis and other changes in bone metabolism, increasing the susceptibility of the elderly to bone fractures[14-16].

Of the fracture sites distributed according to age group, the zygomatic bones were the most affected. The anatomical location of these bones in the facial skeleton predisposes them to trauma, due to their lateral projection[3]. The higher incidence of fractures in the middle third in elderly patients is in agreement with other studies[7,10,16,17]. The low incidence of mandibular fractures seems to be related to the etiological agents of the trauma, and only two cases of dentoalveolar fractures were found, a fact that is explained by the high incidence of edentulism among elderly patients[6,10]. Because this traumatic agent involves lower kinetic energy, facial fractures in the elderly tend to present less displacement, with a greater predisposition to non-surgical treatments[7,16] .

These specific epidemiological characteristics of the elderly, with a reduced number of mandibular fractures and a higher incidence of middle third fractures, also help to explain the lower number of surgical interventions, with non-surgical treatment methods often preferred[16]. The elderly also tend to have less aesthetic concerns, and value functional issues more[8]. The presence of physiological co-morbidities inherent to aging interferes with the choice of treatment of facial fractures[16]. The decrease in the physiological reserves of these patients results in a reduced ability to compensate for the stress associated with anesthesia and surgery[6,8].

The surgeon should be aware of the anatomical and physiological changes inherent in aging when planning surgical procedures. The significant presence of systemic diseases in the elderly population interferes with the healing process of wounds, increasing morbidity rates, complications and leading to longer hospital stays[6,8]. Surgical treatment should seek to restore function and aesthetics, but in some cases the comorbidities present will only allow the treatment of emergencies, and definitive treatment should be considered after the stabilization of the condition of such patients[13].

Among the associated injuries, skin excoriations were the most frequent in the present study, followed by injuries to the skull. There was a greater prevalence of associated injuries as age increased. According to Toivari et al., associated injuries are more common in elderly patients than in young adult patients, with more frequent cerebral concussions and higher mortality rates[17].

The low number of elderly patients treated for facial trauma during the period analyzed is a limitation of the present study.

CONCLUSION

Patients aged 60-69 years were the most affected by facial trauma, which occurred more frequently in males. The zygomatic bones were the most frequently fractured among all the age groups of the study. In terms of etiological factors, traffic accidents were the most frequent factor in the 60-69 years age group. For patients aged over 70, falls were the main etiological factor.

The tendency is that the elderly population will increase in coming years. Combined with the more active profile that this group are assuming in society, they will be more exposed to risk factors for facial trauma and require specific management. Special attention should be given to the 60-69 years age group, as while they undergo the physiological changes inherent to advancing age, they remain active in society and more susceptible to trauma.

Knowing that complications, surgical morbidity, cost of treatment and hospitalization time may be higher in this group, health care teams should be properly prepared to provide care and to guide the elderly and caregivers in the prevention of trauma.

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Supplementary Health and aging after 19 years of regulation: where are we now?

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Abstract

The present article aims to analyze the changes in supplementary health and their effects on the adherence to and maintenance within health plans of the elderly, to demonstrate the current state of the care model offered, and to begin the debate regarding the importance of changing care models and remuneration in the sector. It was observed that turnover in health plans was lower among the elderly than among the non-elderly population, with greater adherence to individual and pre-regulation plans and a very low adherence to dental plans. The elderly were also more representative over the previous year, demonstrating a greater need for permanence in times of economic crisis. Care and cost data point to the urgent need to reformulate the care practice, supported by structures that are practically non-existent in Brazilian supplemental health care today and are not funded in the sector (such as palliative care and care management physicians, among others).

Keywords: Old Age Assistence. Supplemental Health. Delivery of Health Care. Health Services for the Aged.

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INTRODUCTION

In the 1970s the development of the Brazilian supplementary health sector paralleled the development of the formal labor market, most notably through contracts with large companies. It was only in the second half of the 1980s that the expansion of health plans shifted towards individual contractual relationships[1]. With the publication of the Consumer Protection Code, sanctioned by Law No. 8,078/1990, the first guidelines to regulate health plans in Brazil were established.

Political and social pressure on the sector resulted in the approval of Law No. 9,656 in June 1998, which covered private health plans and insurance. In 2000, the Agência Nacional de Saúde Suplementar (the National Supplementary Health Agency) (ANS) was created by Law 9.961, with the purpose of regulating a sector which had expanded in a disorganized fashion.

For health plans regulated by or adapted to Law 9656/98 (known as new plans), important legal guarantees were ensured, such as: coverage of health procedures, in order to cover all the pathologies of the International Classification of Diseases (ICD-10); guarantees for beneficiaries in case of dismissal from work or retirement; rules for urgent and emergency care; guarantee of access to the supplementary system for patients with preexisting diseases or injuries, and establishment of parameters aimed at the economic and financial sustainability of health plan providers through technical reserves and financial provisions. Many of these "new guarantees" directly affected the elderly population, which has a greater burden of preexisting diseases and injuries, and is no longer directly linked to formal employment.

Health plans represent a large part of the Brazilian health system, involving about 68 million client contracts, of which 48 million are health care plans, whether with or without dental care provision (the other 20 million contracts are exclusively dental plans). The care provided to this population is provided by more than 800 beneficiary based health plan providers. The twenty-five percent of the Brazilian population with access to health care plans is unevenly distributed throughout the country, as health care coverage tends to be higher among urban residents and those from states with higher incomes, more formal and informal employment, and wider reaching health services[2].

In the first half of 2016, the revenue from health plan payments was approximately R$77 billion, while the cost of care was around R$65 billion, registering an average payout ratio of around 85% to the medical-hospital operators[3]. The average payment to medical-hospital providers is estimated at around R$260,00 per month for each beneficiary.

Analyzing the Brazilian health system as a whole, health expenditures in the country totaled R$448 billion in 2014, according to Levi and Mendes[4]. Of these, 48.3% were undertaken by the State/Union, states and municipalities, and 51.7% were carried out by the private sector. Of the R$232 billion of private health expenditures in 2014, R$127 billion were carried out through health plans. Other private health expenditures relate to medicines and direct disbursement to health professionals and services.

Figure 1 shows a comparison between health expenditure *per capita* in Brazil (US$) and other countries and life expectancy at birth. It can be seen that with *per capita* health expenditures close to those observed for Brazil, other countries achieve much more significant results in terms of life expectancy at birth, which can be understood as a proxy for identifying the quality of care in countries, in terms of the health care model and health system management.

There are other countries with higher *per capita* spending (such as the United States) and inferior life expectancy outcomes than countries with lower spending, reinforcing the need for a more efficient management and health care model.

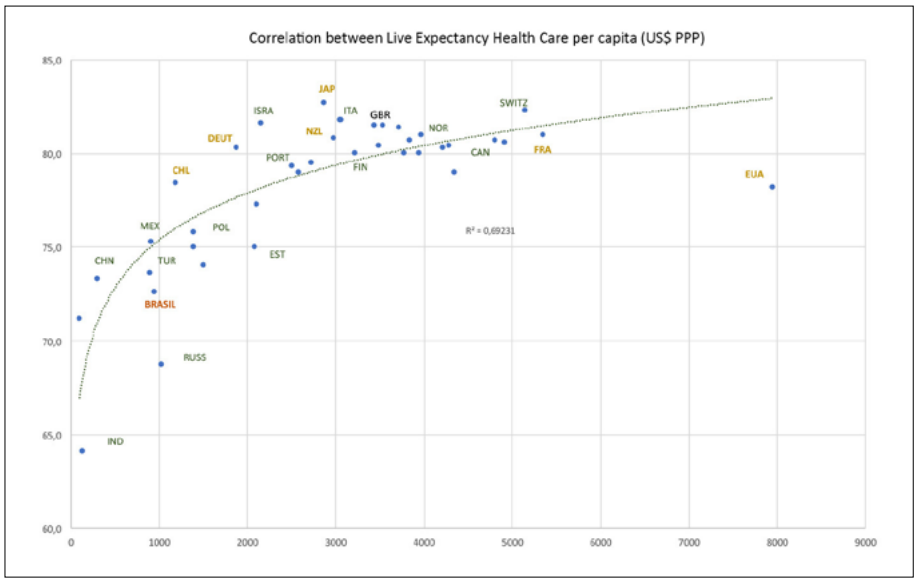

Figure 1. Life expectancy at birth v *per capita* health spending. Various countries, 2013.

Source: World Bank (accessed September 3, 2015).

Against this backdrop, the implementation of the supplementary health regulations in 1998 introduced a number of rules which required operators to control their costs more efficiently, based on the belief that it was inappropriate to apply measures prejudicial to health care, in an abusive manner, to beneficiaries. In addition, greater control of costs can be achieved through actions aimed at increasing the number of beneficiaries, dilution of risks, reduction of moral hazard, among others.

The use of regulatory mechanisms by providers seeks to prevent beneficiaries from indiscriminately using health services, reducing the burden of expenses from the provision of care in such circumstances. This can help to maintain the economic-financial sustainability of the health sector, considering a history of rising costs due to increased demand for medical care and the incorporation of new technologies. This type of action, if well organized, with coherent and well-defined guidelines, can improve the use of health services in the private sector and, consequently, the health conditions of its target population. Risks involved in the use of these mechanisms include delays in the treatment of diseases, increased cases of hospitalization and a reduction in the use of preventive procedures.

There is a tendency for elderly persons to use the health system more often, resulting in a greater financial burden when the moderating factors are applied. It is therefore important to have rules for this population, such as limits of financial exposure (payment limits) and procedures in which coparticipation does not impair but favors preventive and chronic treatment.

When individuals seek health care, what they are looking for is to a large extent the knowledge and information of health care providers. This is a relationship based almost exclusively on the patients' confidence that practitioners will treat them as best they can, based on existing pharmacology, surgical interventions, and other procedures in the area of health. The individual/patient does not have sufficient knowledge of the subject to question the expertise of the health professional. This phenomenon, which the economy calls "information asymmetry", is also true for health plan providers, who depend on the information provided by health services and by the beneficiaries themselves, in the last instance.

Another issue relating to information problems in the supplementary health sector is adverse selection. Higher values mean that individuals with lower

chances of getting sick will decide that it is not worth paying a higher value for their health insurance. As a result, as health insurance prices rise, there is an effect called "adverse selection", where "better" risks (in this case, healthier individuals) do not pay for plans. When such individuals leave the market, however, they increase the value of health insurance plans, since only those who are more likely to need health care remain as customers. Equilibrium in the market is obtained when the value of the health plan is equal to what individuals expect to spend.

The contractual modalities in the Brazilian supplementary health sector reveal the existence of three products with distinct characteristics: individual plans, collective adhesion-based plans, and collective company plans. Some aspects of regulation focus only on individual health plans, as this modality is understood to be the most fragile in terms of the balance of contractual bargaining power.

In recent years there has been a trend towards the greater participation of health plan providers in the area of collective plans, to the detriment of the individual plans market. Data analyzed in the study by Viegas[5], when comparing two moments in time, showed that there were practically no major changes in the individual plans market, whereas in the collective plan area the competition became fiercer.

METHODS AND RESULTS

The process of population aging is, as pointed out by Beltrão, Camarano and Kanso[6], composed of two distinct and complementary phases. Initially, it is based on the narrowing of the population pyramid due to the reduction of the fertility rate and, consequently, the lower number of births; combined with aging at the top of the population pyramid, due to the reduction of mortality, reflecting increased life expectancy. If the increase in life expectancy in Brazil was initially due to the remarkable reduction of infant mortality, the reduction in the mortality of the elderly population can also be considered one of the factors for this increase, or in other words the elderly are getting older, on average.

Although the population of supplementary health beneficiaries has its own nuances, largely due to the strong interrelation between labor market participation and access to health plans, there is a significant aging of the group of elderly beneficiaries of health care plans in the supplementary sector.

Of the approximately 48 million contractual health care relationships in the Brazilian supplementary health sector, 12.6% serve the population aged 60 years or over. Of the elderly with access to the supplementary health system, 59.6% are women and 17% are 80 years of age or older, according to ANS data.

Figure 2 shows the age pyramid of the Brazilian population compared to the age pyramid of the subgroup of the population with a health plan. It can be seen that the participation of the elderly in supplementary health is significant, especially among women, who present a relative participation superior to that observed for the total population.

The age variable also defines the period when plans are contracted, with a greater trend of turnover among beneficiaries of health plans in adulthood or among those who are active in the labor market. Thus, while at the time of the creation of the ANS - and two years after the publication of Law 9,656/98, which regulated the sector - the proportion of elderly and non-elderly people linked to medical-care based health plans was similar, virtually all non-elderly beneficiaries (more than 90%) were linked to new plans, while a quarter of elderly beneficiaries (25%) were still linked to contracts from prior to the law.

Another specific feature related to the elderly population within the supplementary health sector refers to the type of health insurance plan contract. While collective contracts prevail among the non-elderly population (80.4%), regardless of the gender of the beneficiaries, among the elderly the percentage of beneficiaries with individual contracts is 36% (45% among women aged 80 or over), which also reinforces the lower mobility and turnover of contracts among the older population.

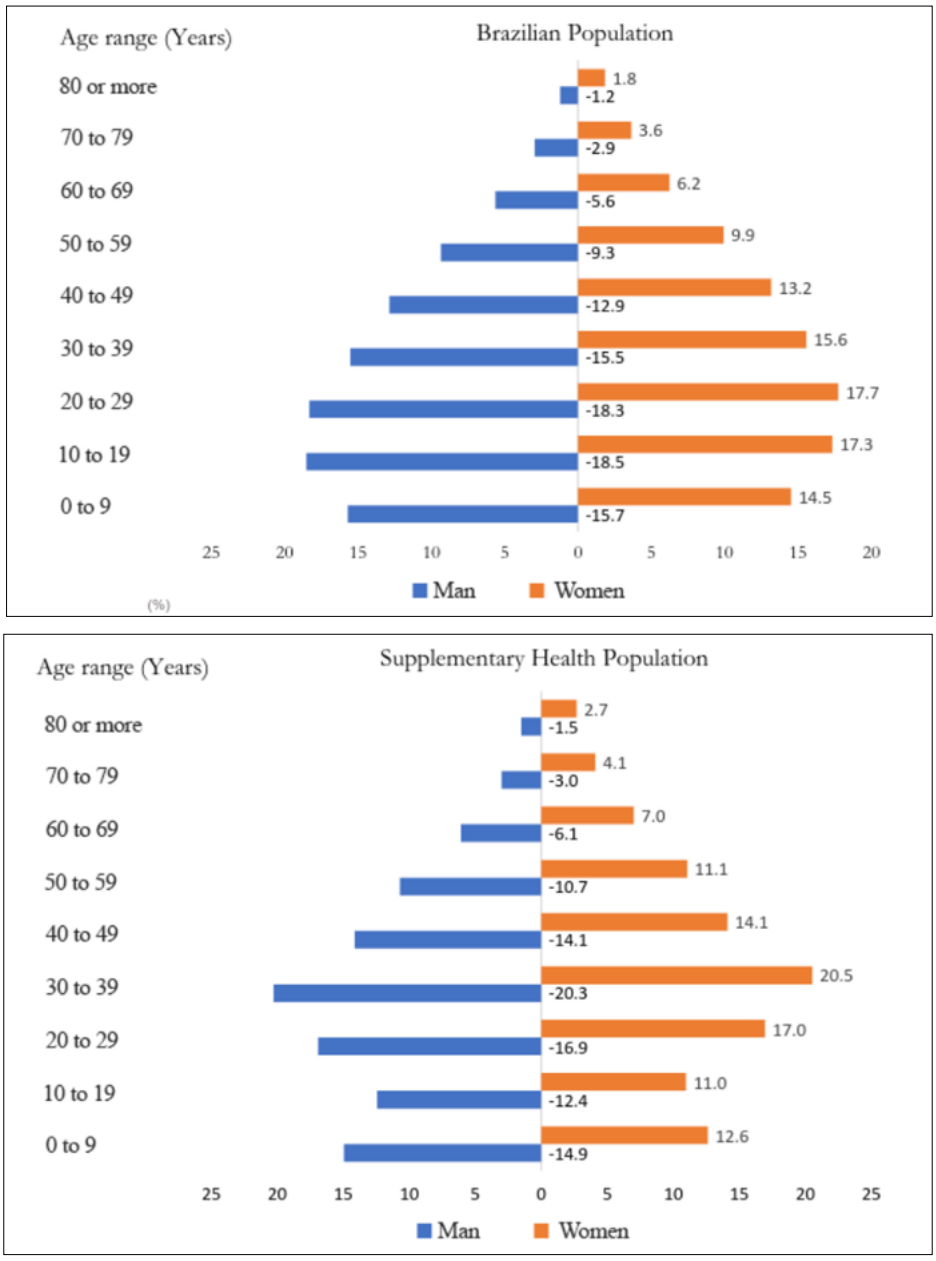

Figure 2. Age Pyramids Brazil and Supplementary Health.

Source: ANS.

With regard to exclusively dental plans, of the more than 21 million contractual relationships, only 5.5% were related to individuals over 60.

In terms of the presence of the elderly population in the client portfolios of health care providers categorized by type of provider, an expressive aging of client bases in the individual or self-management sector can be observed. These plans, which are linked to a closed population, usually composed of active or inactive employees of the same company, tend to be more affected by the aging process of the Brazilian population, as well as by human resources policies that reduce the effect of turnover of beneficiaries between plans. Among the other modalities, the presence of the elderly tends to be stable, with health insurers identifying a reduced elderly participation.

When analyzing the number of elderly beneficiaries distributed among the over 800 health

care plan providers, there is significant concentration in just a few operators: half of the elderly beneficiaries are distributed among only 30 operators; while 90% of the elderly are found in 289 providers, equivalent to approximately one third of the providers with beneficiaries.

The efforts of the elderly population to maintain their health plans can be seen over time. This is partially explained by the lower turnover and a greater concentration in individual plans, and is influenced by the perception of an increased risk of becoming ill. It is demonstrated by the decrease in the total number of beneficiaries in supplementary health, and the increased presence of the elderly in recent years.

Supplementary health accounted for 40.9% of hospitalizations in Brazil (7,833,282 hospitalizations) in 2016, according to data from ANS and the Ministry of Health (MH). In an approximate calculation, the average cost of a hospitalization in supplementary health was R$6,011.00.

According to data from the Observatório Anahp (Anahp Observatory) 2016[7], the average expenditure on hospitalizations in those aged over 60 years was 2.6 times greater than the 0 to 14-year-old age group in the year 2014.

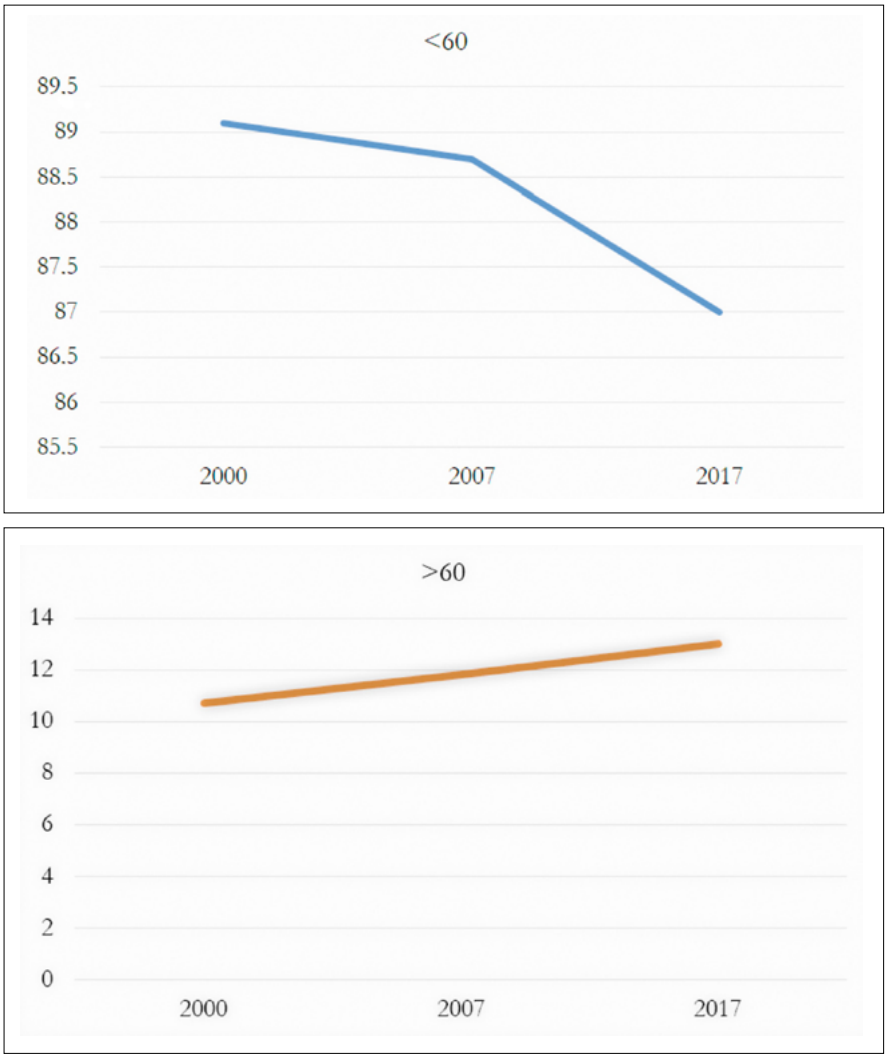

Figure 3. Evolution in number of non-elderly and elderly persons with health plan contracts. 2000-2017.

Source: SIB/ANS.

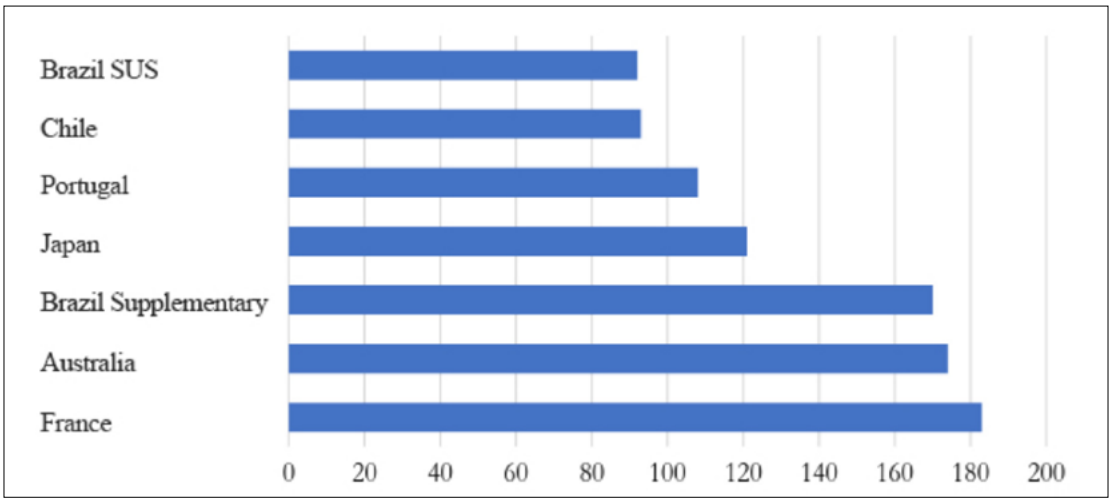

Figure 4. Hospitalizations per thousand OECD and Brazil, 2015-2106.

Source: OECD, MS, ANS.

The exchange of supplementary health information (TISS/ANS) was established as a mandatory standard for the electronic exchange of health care data for the beneficiaries of plans, among supplementary health agents. The objective is to standardize administrative actions, subsidize actions of economic, financial and care monitoring and evaluation among private health care plan providers and to create an Electronic Health Record.

Despite its limitations as a new database with a reputation for underreporting, the TISS/ANS database, which is available from 2015, allows certain important inferences about the use of procedures in supplementary health care for the elderly. The TISS Data Detail database (D-Tiss) is available at www.ans.gov.br in an updated June 2017 version and was analyzed using Tableau software.

Of hospitalizations performed between June 2015 and December 2016 among the population aged over 60 years, the mean age was 75 years (25th percentile =66 years and 75th percentile =82 years) and 54% of such hospitalizations involved women. The mean age of hospitalizations in those under 59 years was 31.5 years (P25: 21 years and P75: 45 years). In supplementary health, 30% of hospitalized patients were over 60 years of age, while in the Sistema Único de Saúde (the Unified Health System) (SUS) this percentage was 25%.

When analyzing the distribution of hospitalizations according to the International Classification of Diseases (ICD), and according to the procedures performed during hospitalization (Figure 5), what is most striking is the number of diseases that are not identified. How can planning, organization, training, and the management of a population with new characteristics be carried out without information as basic as the reason for hospitalization? This finding is a reflection of the current care model, which is disorganized and random, with very little health management. How can a model be designed for this new demographic-epidemiological configuration without detailed knowledge of this population?

A review of the culture of some institutions is also required, such as the Medical Council itself (in this case, Rio de Janeiro-CREMERJ), which filed a lawsuit against the mandatory completion of this information (ICD), preventing better health management in the Brazilian supplementary health system.

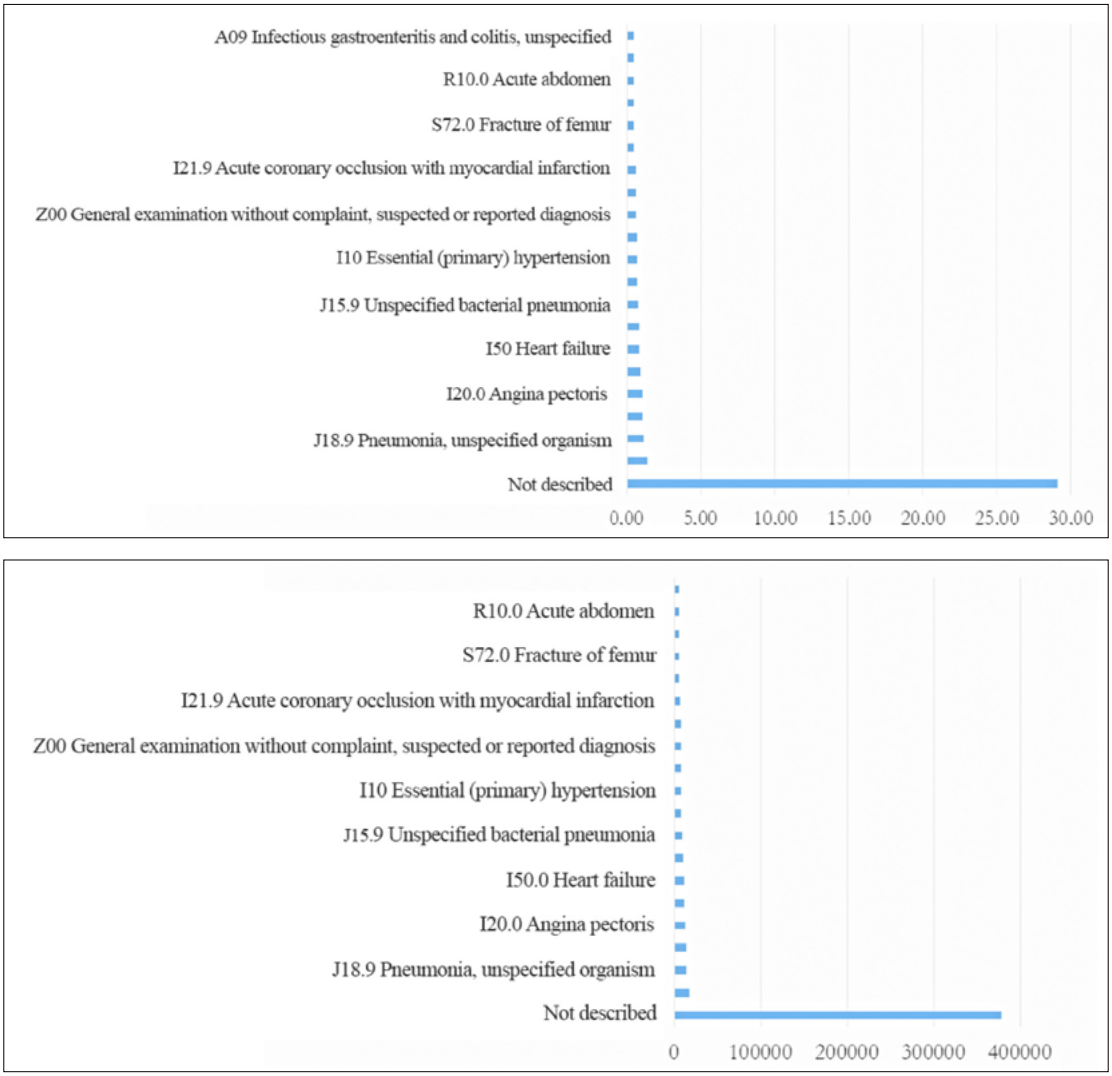

Figure 5. Distribution of ICDs and procedures in elderly hospitalizations in supplementary health.

Source: DTISS database.

DISCUSSION

The relationship between health plan providers and elderly consumers has always been one of great mistrust. The policy of most providers is to try to reduce the "weight" of this segment in their client portfolios. The elderly, on the other hand, complain of the cost, difficulties in receiving care and a refusal to cover many of the tests requested - there is no other commercial relationship in which the seller and customers have such antagonistic positions[8].

One of the most important points for discussion, and an issue that must be tackled urgently is how is care provided to the elderly in supplementary health care? Is it appropriate? Is it quality care? Is it effective? Can costs be reduced?

The health system in Brazil must adjust to the different demographic and epidemiological profiles resulting from the increase in the elderly population. The magnitude of the increase in health expenditures on the elderly population will depend, above all,

on whether these additional years are healthy and free from illness and dependence[9]. Prevention and maintenance of health, independence and autonomy, as well as the slowing of diseases and frailties in the older population, will be the major health-related challenge of an aging population. Thus, any social and health policy for the elderly must take into account the promotion of health and the maintenance of functional capacity[10].

We grow old. This is an achievement. We have changed our epidemiological profile, but we have not changed our health practices. We are still organized as we were in the 1970s, for the treatment of acute infectious contagious diseases. The elderly are not a problem for the health system if such a system is organized in the right way. The care and remuneration models must change. How to deal with population aging without structures such as transitional care, palliative care, long-stay beds and day care centers for the elderly?

How to tackle this change in epidemiological profile without proper professional training (the search for medical specialists and other health professionals is obviously shaped by the offer of better remuneration) and without further training for the professionals who are already qualified? How to carry out follow-up treatment of chronic diseases through episodic and punctual visits to emergency units, without sufficient organization for the continuity of care?

How to grow old, and subsequently die from chronic conditions, without a societal debate about dignified death? Do all elderly people wish to die in the ICU, isolated from family life, with mechanical breathing apparatus and undergoing chemotherapy in the last days of life, as is the reality today? Not to mention the inefficiency generated by this model, which is obviously extremely costly and unsustainable.

As a first step, it would be easier to try to avoid the "problem" by maintaining things as they are. But this will not be possible for long, since aging is a reality and we are not preparing ourselves in a timely manner or as a society.

Two simple indicators that have been followed by the ANS since October 2016 go some way to summarizing this reality and the changes that need to be made. One of these is the ratio of consultations with specialists/generalists. This indicator demonstrates the serious disorganization in elderly care in supplemental health. The elderly, more than anyone, need centralized, hierarchical care, which is oriented or navigated by a generalist (general practitioner, family doctor or geriatrician). In supplementary health today this indicator is distorted: where more consultations with generalists than with specialists are expected, there are many more visits to specialists - more than 50:1, in the first surveys, while in the British National Health System this same ratio is 1:1511. Another indicator is cases of emergency care treatment, which is one of the first sectors to undergo change when establishing a more appropriate organization of the health system.

CONCLUSION

It can be seen that it is possible to have more suitable care for the elderly, which is both more effective and cheaper. But for this we need to change the way we structure our care model from the outset, something that must be accompanied by changes in the remuneration model (which today is fee-for-service, which reinforces production by volume, not by quality or necessity). We want a more generous health model in which everyone wins, including the health professional (efficient performance needs to be encouraged). We can wait no longer.

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Multimorbidity associated with polypharmacy and negative self-perception of health

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Abstract

Objective: to verify the association between the multimorbidity of the elderly and sociodemographic variables, self-perception of health and polypharmacy. *Method:* a cross-sectional study was performed. The research data was collected using the Health, Well-Being and Aging questionnaire. The sample was composed of 676 people aged 60 years or more, who were residents of small towns in the north of the state of Rio Grande do Sul, Brazil. The dependent variable was multimorbidity, that is, the occurrence of two or more chronic non-communicable diseases in the same person. The independent variables were demographic, socioeconomic and health-related characteristics. Poisson's raw and robust regression model was used to analyze the effect of the independent variables in relation to the outcome and *p* was considered significant when <0.05. *Result:* among the elderly interviewed, 45% presented multimorbidity, 51.1% reported a self-perception of poor/very poor health and 37.1% used polypharmacy. After the analysis was adjusted to the occurrence of multimorbidity, association with the following variables was found: health perception (regular/poor/very poor) PR=1.15 (CI95%; 1.09 – 1.22) and use of polypharmacy PR=1.29 (CI95%; 1.22 – 1.35). *Conclusion:* Multimorbidity may interfere negatively in the self-perception of health of the elderly contributing to increased medicine consumption.

Keywords: Elderly. Comorbidity. Chronic Disease. Health of the Elderly. Polypharmacy. Self-Perception of Health.

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INTRODUCTION

Aging can lead to the emergence of chronic noncommunicable diseases (CNCDs), and while the process is not directly related to chronic diseases and disabilities, such conditions are more frequent among the elderly[1].

Among the CNCDs that affect the elderly, the main illnesses are related to the cardiovascular system, such as Systemic Arterial Hypertension, Cerebrovascular Accidents, and increased glucose rates, which can result in Diabetes Mellitus or cancer[2]. There is also an increased frequency of multiple chronic diseases among such individuals, leading to the presence of multimorbidity among the elderly.

Literature[3-6] considers multimorbidity the simultaneous occurrence of two or more morbidities, chronic physical or mental diseases in an individual. Individuals with multimorbidity, especially the elderly, tend to experience a greater number of hospitalizations, use multiple medications simultaneously and thereby increase their susceptibility to adverse effects. Thus, the presence of multimorbidity increases the risk of mortality, generates physical and mental problems[3-5] and negatively influences quality of life[7-9]. It therefore results in greater demands on health care, representing a major challenge for health systems around the world[10,11], especially as the care involved is more complex[12].

The complex and challenging[11] condition of multimorbidity has a major impact on society through the burden it places on the health system and by reducing the productivity of individuals in the labor market and raising the costs of disability[13]. Such data are fundamental to demonstrating the importance of government policies to the health of the elderly. The prevalence of multimorbidity among elderly persons is high (50 to 98%)[10,11] and its occurrence is associated with advanced age, the female gender, a low socioeconomic level and an unhealthy lifestyle[14,15]. In addition, studies indicate that self-perception of health is often described as negative, due to the occurrence of social, physical or mental disabilities, thus impairing quality of life[8,9,16,17].

The topic is highly relevant, as clinical studies of the elderly often include comorbidity[11] and information on multimorbidity provides support for the improvement of therapeutic strategies. The present study therefore aimed to verify the association between multimorbidity in the elderly and sociodemographic variables, self-perception of health and polypharmacy.

METHOD

A cross-sectional population-based study was performed with elderly residents in small municipal regions in the north of the state of Rio Grande do Sul, Brazil. The inclusion criteria were individuals aged 60 and over, of both genders, who had lived in rural or urban areas in the municipal regions of Coxilha and Estação for at least six months, and had, at the time of the interview, cognitive conditions to respond to the questionnaire, and/or the presence of a relative or caregiver to assist them or provide answers. Elderly persons hospitalized at the time of the interview were excluded.

A prevalence of the outcome (multimorbidity) of 45%[18], a sample error of 5%, a confidence interval of 95% and a power of 80% were used to calculate the sample size, and provided a result of 381 elderly persons. This total was multiplied by 1.5 for the design effect, resulting in 571 elderly persons. A total of 10% was then added to the total to allow for possible losses (refusals and non-eligibility, among other factors), giving a total of 628 elderly persons. However, as there were other outcomes with a larger sample, the decision was taken to include 676 elderly persons.

All the elderly persons in the municipal region of Coxilha (352) were included in the study. There was a loss of 6% (21), giving a total of 331 individuals. To make up the sample, 345 of the 992 elderly persons living in the municipality of Estação were randomly added. These individuals were initially listed by area of residence and gender, and were subsequently selected by simple random sampling, maintaining the proportions of gender and area of residence in the total elderly population (Figure 1).

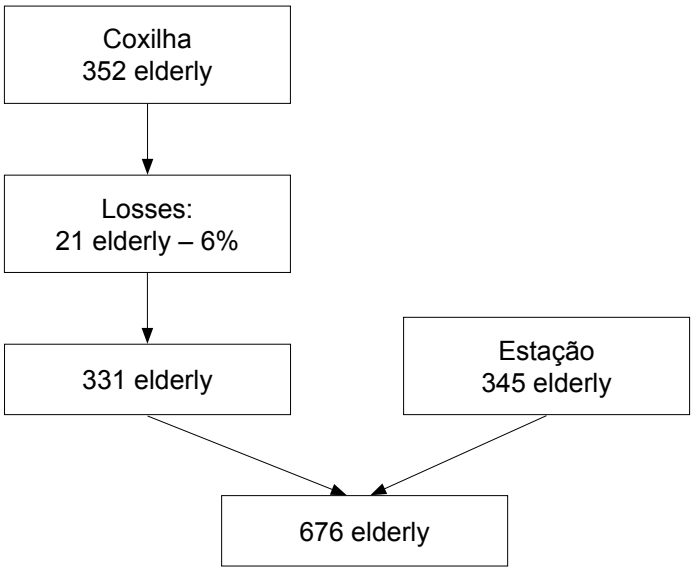

Figure 1. Flowchart of sample selection. Coxilha, Estação, Rio Grande do Sul, Brazil. 2010, 2011.

Data collection was carried out from 2010 to 2011 through a household survey, using the Pesquisa, Saúde, Bem Estar e Envelhecimento (Research, Health, Well-being and Aging) (SABE) structured questionnaire. Although this instrument has seven sections, only the following parts were used in the present study: a) Personal and family information, c) Housing conditions, d) Health conditions and living habits, and f) Use and access to health services.

Multimorbidity, defined as two or more chronic diseases occurring simultaneously in an individual, was considered the dependent variable. As the list of morbidities included in this definition has not yet been established in literature, those measured in SABE Section D (Health conditions and living habits) were included, with the following diseases considered: systemic arterial hypertension, diabetes mellitus, rheumatism, asthma or bronchitis and pulmonary emphysema, stroke/cerebral ischemia, arthritis/osteoporosis, heart problems (coronary disease, angina, congestive disease, others) and depression.

The following variables were considered: gender (female and male), age group (60-79 and 80 years or older), schooling (attended school and did not attend school), skin color/ethnicity (white and non-white), marital status (with spouse (married or lives with partner) or without spouse (widowed, single, separated and divorced), family income (≤1 minimum wage or >1 minimum wage), place of residence (urban or rural) and engages in physical activity (yes or no).

For the variable physical activity, the elderly persons were asked if they engaged in some kind of physical activity in their day to day lives (domestic, work and/or leisure activities), with the question explained and exemplified so that they could understand and classify whether or not they practiced physical activity. Polypharmacy (yes or no) was defined as elderly persons who said they took five or more medications a day.

For alcohol ingestion (yes and no), the elderly persons were asked on how many days per week, on average, they had drunk alcohol over the last three months. Individuals who responded "one or two days a week", "three or four days a week", or "every day of the week" were categorized as “yes”. Habit of Smoking was classified as yes or no, while Perception of Health was divided into good/very good or fair/poor/very poor).

Categorical variables (nominal and ordinal) were presented as absolute and relative frequency distributions. Quantitative variables were described by measures of central tendency and variability. Bivariate analysis using the chi-squared test was used evaluate the association between multimorbidity and the independent variables, with a significance level of 5%. Prevalence ratios and 95% confidence intervals were used in the crude and adjusted analysis, both of which used Poisson regression. Variables with a *p* value less than 0.20 in bivariate analysis were considered in the multiple model, while those with $p<0.05$ remained in the model.

The study was approved by the Ethics Research Committee of the Universidade de Passo Fundo (the University of Passo Fundo) under opinion numbers 148/2010 (Coxilha) and 017/2011 (Estação), in accordance with the guidelines of Resolution nº 196/96 of the National Health Council.

RESULTS

A total of 676 elderly people, who were predominantly female (54.6%), participated in the study. The mean age was 70 years (±7.63), and of the sample 78.4% described themselves as white; 15% had attended school; 71.4% had a spouse, 88.9% had an income greater than or equal to one minimum wage and 69.4% lived in the urban area. In terms of health, 45% presented multimorbidity, 49.4% did not engage in physical activity; 27.1% used polypharmacy; 67.6% ingested alcoholic beverages; 14.4% were smokers, 47.2% described their self-perceived health as poor/very poor; and the majority (98%) had access to health services, as shown in Table 1.

The prevalence of multimorbidity in the elderly was 45%. Of those affected by this outcome 50.9% were female, 60% were over 80 years old, 47.9% were non-white, 48% went to school, 51.8% had no spouse, 45.5% had an income of more one minimum wage, 69.4% lived in urban areas, 53.3% did not engage in physical activity, 86% used polypharmacy, 52.9% drank alcohol, 45.8% did not smoke and 63.7% perceived their health as regular/poor/very poor (Table 2).

In crude analysis multimorbidity was associated with the following variables: gender ($p=0.001$), age range ($p=0.002$), marital status ($p=0.033$), family income ($p<0.001$), polypharmacy ($p\leq0.001$), alcohol intake ($p\leq0.001$) and health perception ($p\leq0.001$). In the adjusted analysis of multimorbidity among the elderly, the outcome remained associated with polypharmacy ($p\leq0.001$) and health perception ($p\leq0.001$) (Table 2).

Table 1. Sociodemographic and behavioral characteristics of elderly persons. Rio Grande do Sul, 2010/2011.

Variable	n	Prevalence (%)	CI 95%
Gender			
Female	369	54.6	50.6 - 58.3
Male	307	45.4	41.7 - 49.4
Age range (years)			
60 – 79	596	88.2	85.7 - 90.8
80 or older	80	11.8	9.2 - 14.3
Skin color			
White	530	78.4	75.1 - 81.2
Non-White	146	21.6	18.8 - 24.9
Level of schooling			
Did not attend school	573	85.0	12.3 - 17.8
Attended school	101	15.0	82.2 - 87.7
Marital status			
With spouse	193	28.6	25.1 - 32.2
Without spouse	483	71.4	67.8 - 74.9
Family income (minimum salary)			
≤ 1	73	11.1	8.8 - 13.7
> 1.01	584	88.9	86.3 - 91.2
Engages in physical activity			
Yes	341	50.5	45.8 - 53.0
No	334	49.5	47.0 - 54.2
Polypharmacy			
Yes	164	27.8	24.4 - 31.6
No	425	72.2	68.4 - 75.6
Consumes alcohol			
Yes	456	67.6	64.1 - 71.1
No	219	32.4	28.9 - 35.9
Smokes			
Yes	97	14.4	11.9 - 17.1
No	577	85.6	82.9 - 88.1
Multimorbidity			
Yes	304	45.0	51.3 - 58.8
No	371	55.0	41.2 - 48.7
Perception of health			
Good/very good	356	52.8	49.1 - 56.4
Fair/poor/very poor	318	47.2	43.6 - 50.9
Area of residence			
Urban	469	69.4	65.8 - 73.1
Rural	207	30.6	26.9 - 34.2

Table 2. Prevalence of multimorbidity and associated factors among the elderly. Rio Grande do Sul, 2010/2011.

Variable	N	Prevalence (%)	p	PR (CI 95%)	*PR (CI 95%)
Gender			0.001		
Female	369	50.9		1.09 (0.87 – 0.96)	---
Male	307	37.9			
Age range (years)			0.002		
80 or older	80	60.0		1.20 (1.04 - 1.20)	---
60 – 79	596	43.0			
Skin color			0.423		
White	530	44.2		1.03(0.96 - 1.09)	---
Non-White	146	47.9			
Level of schooling			0.494		
Attended school	573	48.0		1.02(0.95 - 1.10)	---
Did not attend school	101	44.3			
Marital status			0.033		
With spouse	193	51.8		1.06 (1.00 - 1.12)	---
Without spouse	483	42.3			
Family income (minimum salary)			0.194		
≤1	584	37.5			
>1,01	73	45.5		1.06 (0.97 –1.15)	---
Area of residence					
Urban	469	69.4	0.226	1.03 (0.98-1.10)	---
Rural	207	30.6			
Engages in physical activity			<0.001		
No	334	53.3		1.12 (1.06 - 1.17)	---
Yes	341	37.0			
Polypharmacy			<0.001		
Yes	164	86.0		1.36 (1.30 -1.42)	1.29 (1.22-1.35)
No	425	36.7			
Consumes alcohol			<0.001		
Yes	456	52.9		1.15 (1.08 - 1.23)	---
No	219	28.8			
Smokes			0.231		
Yes	97	40.2		0.95 (0.88 - 1.03)	---
No	577	45.8			
Perception of health			<0.001		
Fair/poor/very poor	318	63.7		1.24 (1.17 - 1.30)	1.15 (1.09-1.21)
Good/very good	356	28.1			

PR: prevalence ratio; *PR adjusted prevalence ratio; CI: 95% confidence interval; *p*: Pearson's chi-squared test.

The prevalence ratio of elderly persons with multimorbidity who reported their health as regular/poor/very poor was 1.15 times higher than that of the elderly who reported their health as good/very good. Furthermore, the prevalence ratio of elderly individuals with multimorbidity who used polypharmacy was 1.29 times higher than those who did not use polypharmacy.

DISCUSSION

The prevalence of multimorbidity found in the elderly population was 45%, a rate lower than that found in systematic review studies in which the prevalence was between 50 and 98%[1,19]. These differences can be explained by the different forms of analyzing the prevalence of multimorbidity of the studies, making evaluation of the outcome difficult, mainly due to the lack of a standard in relation to the number of diseases to be considered. While the occurrence of two or more chronic diseases is frequently used[20], the number of chronic conditions evaluated in studies ranges from 5 to 335, with a subsequent variation in the prevalence of multimorbidity[19].

The location where the studies were conducted may also have influenced the results, as the main surveys were often performed in large urban centers[21]. The outcome of multimorbidity was not associated with the place of residence in systematic analysis, however[19].

Similarly, the method used for the analysis of the association of multimorbidity may have interfered with the results. Poisson logistic regression analysis was employed in the present study, which demonstrated significant differences with results found in literature, where multimorbidity was frequently related to female gender, advanced age, low socioeconomic level and physical inactivity, as well as mental disorders[7]. This test was performed using both crude and adjusted models, and the variables highlighted in literature were found to be associated in the crude model. However, polypharmacy and self-perception of health remained associated with the outcome in the adjusted analysis.

A self-perception of health as regular/poor/very poor was reported by most of the elderly with multimorbidity, and was associated with the outcome. Other studies found the same results[9,17]. This finding can be explained by studies that show that elderly people with multimorbidity have a poorer quality of life, a deficit in self-care of health, and a greater degree of dependence in daily life, with negative repercussions on functional capacity[22]. As the number of diseases increases, physical, social and mental complications occur in the elderly, resulting in a worsening of self-perception of health[23].

The use of polypharmacy was also associated with multimorbidity. This association can be understood by the frequent need among the elderly to take medications for the treatment of diseases. The seeking out of medical care due to the clinical manifestations of disease, the fragmented care of elderly persons with multimorbidity, the health protocols aimed at a single disease[11], and the difficulty of deciding treatment in a shared manner among health professionals and in providing patient-centered care[24] may be elements that contribute to the frequent use of medications by the elderly.

This uncontrolled consumption may also cause clinical alterations, or even drug interactions which have adverse effects on the elderly[22,25]. Understanding how morbidities interact with one another has a greater clinical relevance than simply counting the number of diseases. From this knowledge, it is possible to determine the possible drug interactions to which elderly persons are exposed[11]. Studies on medications often exclude elderly patients with multimorbidity, making it difficult for medical professionals to determine appropriate treatment[26]. However, the geriatrician, when participating in treatment with a multidisciplinary team, can maintain or decrease the number of medications used by patients[27]. Additionally, the use of methods described in literature, such as that proposed by BEERS (which allows the evaluation of the suitability of drugs used by the elderly), avoids the use of potentially inappropriate medications[28].

CONCLUSION

It can be concluded that multimorbidity is associated with a negative self-perception of health and polypharmacy. Faced with the progressive aging of the population, special attention should be given to elderly persons with multimorbidity, with a focus on health interventions aimed not just at treating chronic diseases but also the promotion of an improved quality of life.

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The work and the health of elderly butchers: case reports from a municipal market

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Abstract

The present study aimed to verify the health and work conditions of seven elderly workers carrying out informal labor activities in a municipal market and to describe the accidents they suffered at work. A qualitative case study was carried out with seven elderly butcher workers from a municipal market in Bahia, Brazil. The participants were men and women with limited schooling (up to high school level in one case), who lived with others at home and had worked for an average of 31 years in the butcher business. Despite the stress involved, such as uncomfortable physical positioning and few days off, all the participants said they were satisfied with their jobs. They were affected by chronic diseases, especially arterial hypertension, and said they were aware of the risks involved in their work. They had suffered accidents at work from finger cuts to amputation. Such workers require activities that promote health and protection from work-related accidents and injuries to avoid the problems that transform the process of senescence into senility.

Keyworks: Elderly. Comorbidity. Chronic Disease. Health of the Elderly. Polypharmacy. Self-Perception of Health.

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INTRODUCTION

Changes in demographic patterns in Brazil, including an increase in life expectancy, have influenced the labor market, with an increasing number of elderly people continuing to work.

Discussions about the relationship between work and aging are most often the result of a significant proportional increase of the elderly in the population, which has generated changes in ways of living and working[1].

Article 26 of the Statute of the Elderly deals with the right of the elderly person to perform professional activities, respecting their physical, intellectual and psychological conditions[2]. However, the realities in which these processes are constructed reveal that the minimum conditions of permanence are not always guaranteed for the elderly population, which often results in the insertion or continuation of these subjects in the informal market of the economy[1].

Work plays an important role in people's lives, especially as a source of guaranteed social reproduction. The form of the organization and type of work are fundamental for evaluating the processes of damage and deterioration to the health of workers[3].

The new socioeconomic model, which encompasses the informal sector, is due, among other reasons, to the influence of globalization, which has led to structural changes resulting from capitalist practices, resulting in a restructuring of the labor market, employment and the labor force to adapt to this new world[4]. In this context of changes, the availability of the workforce may encompass, in a broader sense, less permanence or reinsertion as employees, but more entry or permanence in both self-employment and as small business owners, in a world of heterogeneous work that houses a greater contingent of "old" workers[5].

The informal sector encompasses a diversity of jobs, including retail. In this type of activity, the workplace is often the city streets or in specific buildings, such as supply centers or the municipal market. This scenario includes butchery workers.

According to a study carried out with informal butchery workers, such individuals have a risk of work accidents almost three times higher than market workers who sell ready-made foods and beverages[6].

In this context, elderly butchers, in addition to the natural wear and tear of the body, may suffer from external factors arising from the labor process, especially when it is informal, leading to the occurrence of occupational accidents. It is therefore interesting to study elderly persons who continue to actively perform their work activities, especially in butcher shops and stalls, as they are exposed to a greater risk of suffering work accidents, in order to reveal the complexity of the health and labor conditions of these workers.

The aim of the present study was to verify the health and labor conditions of seven elderly workers performing informal activities in a municipal market in Bahia, Brazil, and to describe the work accidents they suffered.

METHODS

An exploratory, qualitative, field-based case-study was carried out in which one or a number of individuals with the same disease or event are sought and, from the description of the respective cases, a profile of its main characteristics is drawn[7], allowing the understanding of a set of phenomena that reveal a degree of comparability between one another and which relate in a given context[8].

Seven workers aged 60 or older (considered an elderly person in Brazil)[2] working as informal butchers in a municipal market in the interior of Bahia, Brazil, participated in the study. These workers were included as they all reported having suffered at least one work related accident in the previous 12 months.

Work accidents were considered to be any reports of sudden events occurring in the exercise of work activities, which resulted in damage to health, potential or immediate, causing bodily injury or functional disturbance[9].

Data were collected in the months of January and February 2015 through the application of a form with questions related to sociodemographic characteristics, work in the market, aspects of health and work accidents suffered. One of the evaluated aspects regarding work related to job satisfaction. This was investigated by means of a Likert-type scale ranging from *not at all satisfied* to *very satisfied*. Those who reported being *satisfied* or *very satisfied* with work were considered as labor satisfied. A field diary was also used to record the impressions of the researchers.

For the analysis of data, three categories were previously established to be presented and discussed, relating to sociodemographic aspects, work at the market and the health-illness-work process.

The present study is part of the umbrella research project entitled Labor Conditions and Health of Market Butchers in a Medium-Sized City in the State of Bahia, approved by the Ethics Research Committee of Universidade do Estado da Bahia (Bahia State University), under CAAE n. 44126515.5.0000.0057. All the workers interviewed agreed to participate in the study by signing a free and informed consent form.

Case studies

The Guanambi municipal market began in the 17th century, due to the gathering of people and troops for the exchange of merchandise. The *bruaqueiros* or drovers, as the first users of the market were known, gathered around an *umbuzeiro* tree in the region where the square lies today to exchange goods. Years later, in 1951, a covered building was built for the municipal market. In 1988 the facilities were renovated and the market was expanded, and some of the pavilions where goods are still sold today were built. The Guanambi market is considered one of the most important of the Bahian *sertão* (drylands region)[10].

The butchery area occupies two pavilions of the Municipal Market, and comprises approximately 97 workers, according to the accounting taken by researchers in 2015, of whom 12 are elderly. Elderly persons who described having suffered a work accident in the last 12 months, were studied, which included seven cases (five men and two women).

Ages ranged from 62 to 78 years. The women were aged 62 and 69 years and of the men two were 69 and the others were 75 and 78. Five of the workers interviewed lived with a partner; two were divorced/separated; all were fathers or mothers, with an average of five children each, varying between two and 11. None lived alone at home, but resided with between two and six persons in the same house.

They had little or no schooling (one never attended school, four described up to six years of study, one had completed elementary school, or in other words had nine years of schooling, and another had completed high school, or had 12 years of schooling).

Describing the characteristics of the work performed by elderly butchers is important for understanding the life and work trajectory of these individuals and its interconnection with the health-disease-work process.

The interviewees had worked for on average 31 years at the market, ranging from 13 to 50 years. All were owners of the butcher shops/ stands. Four (three men and one woman) had previously worked as farmers, one had been a teacher, one had always worked as a butcher and the other had been a military police officer. Everyone started working between the ages of five and 15. They wake up between 2:00 a.m. and 6:00 a.m. to get to the market, thus beginning their day's work. One man and one woman worked every day of the week, with no breaks or days off.

They performed a variety of activities in the butcher shop: cutting, deboning or serving customers at the counter. Four women also described slaughtering animals. One man and one woman, in addition to these functions, also cleaned the work area and described using chemical products, such as chlorine, but did not use protective equipment. In non-participant observation it was noticed how the work of cutting, weighing and pack the product is done quickly, attending to the customers' needs.

Both data collection and observation showed how exhausting work at the market can be. Three workers described carrying heavy weights all the time; five performed a lot of repetitive movement; the butchers worked on foot almost all the time; and four said

that work is very stressful. Only two (both men) reported using personal protective equipment. The non-use of PPE, especially gloves suitable for cutting and deboning and goggles, was also noted during observation and later recorded in the field diary.

Despite the stress described, caused by uncomfortable positions and a lack of days off, everyone agreed that they are satisfied with the work.

In order to better understand the health-disease-work process, it is necessary to analyze general and specific information about illness and accidents at work, whether the same are related to work or not, since the existence of pathologies or pathological processes can influence labor activities, as well as leading to the development of diseases and occurrence of accidents.

In terms of the health characteristics of the studied workers, two reported feeling constant pain in their backs and having a medical diagnosis of arthrosis. Five had a medical diagnosis of arterial hypertension (two women and three men), one had hearing problems and used an appliance, and another had diabetes mellitus. Some also reported respiratory problems such as rhinitis, asthma and chronic bronchitis.

When questioned about the health problems that affect her and how these can impede the correct performance of her work, one butcher believed that she was unable to work but needed the income to survive and support her family. This same worker said that she does not believe, from a health perspective, that she will be able to perform her labor activities at the market in two years' time. Two workers said they had suffered no impairment of their duties. The others said that they sometimes needed to slow their work down, that is, their health affected the work process and vice versa. Four workers, all men, had not visited any health services in the last year.

One notable factor that was described in the field diary was the difficulty the workers had leaving the butcher shop, especially in those establishments where only the owner was present and which did not have employees. They stated that when leaving or closing the establishment they stop selling and are therefore denied income.

All interviewees reported perceiving health risk factors in the performance of their work: electric shocks, finger and hand cuts when handling knives, chainsaws and meat mincers/grinders, temperature changes, stress at work, traffic accidents on their way to or from the market and robberies.

As for work-related accidents, one of the workers reported an average of 50 physical injuries in the last 12 months. Two others reported one accident, while the others reported two, three, four and five, respectively. One accident did not cause evident physical injury as it was an electric shock from using butchery machinery.

In order to obtain information about such accidents, the individuals were questioned about the characteristics of the last event suffered. These were: upper limb fracture, an accident that caused loss of mobility as it affected the nerve endings and required hospitalization; a cut with finger amputation; leg fracture and cuts on hands/fingers.

The workers descriptions of the accidents were worthy of note, as all considered themselves to blame and described a lack of care and/or haste to perform the job as the reasons for the event.

DISCUSSION

Throughout his existence man has been driven to work continuously in order to guarantee his and his family's subsistence. It is through work that man, as an effective social being, performs the act of producing and reproducing. In this context, to be outside the labor market is to be outside of life, excluded from the conditions of social reproduction[11]. The elderly therefore remain in the labor market, even in the informal capacity in which they have always performed due to a lack of opportunity in the formal market, most likely due to their low levels of schooling.

The aging process must not only be associated with loss, since elderly persons can experience an active aging[12], a process which includes continuing in the labor market.

Individuals aged 60 years and over are often able to continue to exercise their professional activities as

they have the physical and intellectual capacity for new ventures and possess accumulated knowledge and experience that cannot be overlooked[13].

This reinsertion or continuation in the market may also occur because in many cases the elderly worker is still considered the support for his or her family. In most cases, the low value of pensions does not meet the basic needs of the retired worker, such as health, food, medicines, housing and leisure. Based on this assumption, elderly persons seek to return or remain in the informal labor market to increase family income[14]. In this context, from the reports of the cases, two reasons were verified as to why elderly person still work: the need for income and the need for personal satisfaction.

In a study carried out with elderly informal street workers[14], it was found that such individuals considered themselves to be doubly excluded from the formal labor market, due to age, as they are already retired in many cases (therefore, retirement also functions as an element of exclusion) and not being qualified for the current job market. The study also showed that work represents a source of income, distraction and domestic power for the elderly. Work was also considered a source of pride[14].

However, labor activities directly affect the health of elderly butchery workers. The individuals do the work; it is from them that the commitment is demanded; it is they who analyze the conditions they possess to carry it out; it is they who suffer physical, mental and emotional exhaustion; it is they who, in the end, fall ill, suffer accidents and die[15].

The above quote sums up the experiences revealed from studying the seven cases of elderly butchery workers. They have dedicated themselves to many years of work at the market, they have little or no schooling, they often still need to work to supplement the income of their family or to assert themselves as social beings. However, they have chronic non-communicable diseases or painful spinal injuries and their health is even more affected when they suffer accidents when carrying out their work.

Among the occupational groups vulnerable to chronic diseases such as arterial hypertension, market workers are at particular risk because they perform their work in direct contact with different people and products, during a work day of ten hours a day or more, often without holidays or weekly days off, while undergoing financial instability due to a variable monthly income, the exposure to physical risks, and limited time available for health care. Such living and working conditions may increase the likelihood of harm to human health[16].

In this sense, the work process is directly related to the health-disease process, as adverse working conditions can lead to diseases and injuries. The daily life of the market is permeated by difficulties and challenges, which require changes in life habits[17]. According to researchers[18], health problems reduce productivity and work performance and increase the occurrence of accidents and injuries.

One of the tasks performed by workers who sell meat and poultry involves the carving and cutting of goods with the use of both motorized and manual tools, which can lead to the risk of injuries to the hands and fingers. Another factor that must be addressed is the pressure of productivity, as most commercial sellers are the owners of the commercial unit where they work and their monthly income is based on the quantity of merchandise sold, that is, it depends on the value of sales/revenues. This variation in income based on productivity can lead to physical and psychological exhaustion, increasing the chances of accidents and the development of work-related diseases[19].

Despite suffering from chronic noncommunicable diseases and reporting the occurrence of work accidents, including an amputation, all the workers reported satisfaction with work.

Job satisfaction is a difficult term to conceptualize as it is a subjective state and so varies from individual to individual. The most commonly used concept concerns emotion, that is, satisfaction at work is a pleasant feeling that results from the perception that work achieves or allows the realization of important values relative to the work itself[20].

Satisfaction is based on perception of the current situation in relation to values. Perceptions may not reflect objective reality with complete precision, and when they do not, one must value the individual's perception of the situation and not the situation itself[20]. In this sense it is inferred that workers may

expect no more from their work than what it is, so that the results are expected, which in turn leads to satisfaction with work.

It is important to note the attribution of the responsibility for accidents at work to the victims themselves, since all the interviewees pointed out haste and lack of care as possible causes for these events, which leads us to consider social acceptability and the workers' own "unsafe acts". However, from a scientific point of view, and in particular from the state of the art of research in the field of the analysis of disasters and accidents at work, the persistence of the use of the notion of unsafe acts is unacceptable[21,22]. A visualization of the whole work process is necessary so that the causes are more evident.

CONCLUSION

Elderly persons often remain in the labor market, albeit informally, for reasons of personal satisfaction or to supplement family income. The butchers in the present study had worked for a time at another job or had a family tradition of working in the trade. However, they are exposed to risks present in the labor process which can lead to the occurrence of accidents at work and/or the development and aggravation of pathological processes. Many already suffer from illnesses such as chronic non-transmissible diseases.

Even with the occurrence of accidents, the interviewees studied continue to be satisfied with their work and propagate the idea of the unsafe act as the cause of the accidents.

In view of the process of population aging and the consequent increase of the elderly workforce in Brazil, there is a clear need to strengthen policies for active and healthy aging that encompass the work process with regard to the promotion of health and the prevention of diseases and injuries arising from or aggravated by work.

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Perception of oral health in home care of caregivers of the elderly

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Abstract

Objective: to analyze the perception of caregivers of elderly persons regarding their own oral health care and that of the elderly individuals. *Method:* a descriptive-exploratory study with a qualitative approach was carried out. Semi-structured interviews with 13 caregivers were conducted, recorded and transcribed, and the Content Analysis technique was applied. *Results:* All respondents were informal caregivers, most of whom were female, aged over 50, married, had some degree of kinship with those receiving care, an incomplete elementary school education and no other occupation or job. After analyzing the interviews, the data were grouped into the following categories: a) home visits and health professionals; b) caregiver experience and care of the elderly; and c) the caregiver and their self-care. *Conclusion:* knowledge of caregivers' perception of their own oral health and that of dependent/semi-dependent elderly persons assists in planning, promotion, prevention and health recovery. The work of a multi-professional team is therefore essential in the seeking out and instruction of these individuals.

Keywords: Oral Health. Primary Health Care. Elderly. Caregivers.

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INTRODUCTION

Human aging is accompanied by cognitive and functional disorders such as decreased muscle tone, joint stiffening and a reduction in visual acuity, which can lead to the frailty of the elderly[1-3]. These changes are collectively known as senescence and can lead to limitations in the everyday life of individuals, leaving them unable to perform their daily activities independently[4,5].

The performance of common activities of daily living (ADL) are fundamental for quality of life, such as the autonomy to walk, bathe, eat and pick out one's own clothes.

Elderly persons with total or partial dependence in performing these activities need to be assisted by a caregiver[3]. Such individuals should have undergone professional training and be hired by the family. Caregivers are often informal, meaning care is informally performed by a family member who resides with the elderly person, such as a father, mother, wife, or child[6,7]. In both cases, caregivers should assist the elderly individual and provide a healthy and positive quality of life[4].

In Brazil a large number of elderly persons use the Sistema de Único de Saúde (the Unified Health System) (SUS)[8], whose priority strategy for the management of primary health care is the Family Health Strategy (FHS)[9]. The FHS is a model of health care that relies on multiprofessional teams which are responsible for the accompaniment and care of people and families in a defined territory. One of the activities of such teams is carrying out home visits, which enables professionals to identify the health and life needs of families[9]. According to the National Policy on Elderly Health[10], a dentist is integrated within the minimum FHS team and has responsibilities such as home care, oral hygiene guidance and the clinical examination, diagnosis and treatment of dependent elderly persons.

The oral health care provided by caregivers may impair the quality of hygiene of the oral cavity, due to limited knowledge of the mouth and repulsion towards cavity and denture hygiene[11]. The practices of oral health care that caregivers perform on themselves are the same as those they use with the dependent elderly person[5]. Understanding their perceptions contributes to the development of oral health promotion and prevention actions[12].

In view of such assumptions, the objective of the present study was to analyze the perception of informal caregivers of the elderly about their oral self-care and the oral health care of the elderly.-

METHODS

A descriptive study with a qualitative methodological approach was performed, based on the participation of informal caregivers of dependent/semi-dependent elderly persons enrolled in the family health strategy of the municipal region of Ribeirão Preto. Through a partnership between the Ribeirão Preto Municipal Health Department and the Faculty of Medicine of Ribeirão Preto six family health units were created, known as Núcleos de Saúde da Família (Family Health Nuclei) (FHN). The FHN represent teaching and research areas for undergraduate and postgraduate students from the Universidade de São Paulo (the University of São Paulo). They have a minimal family health team and do not provide for the inclusion of oral health staff[13]. The participants were caregivers of the elderly registered with a FHN with a multiprofessional team. Although this unit does not have a dental health team in the mold of the Ministry of Health, it does include oral health professionals.

The caregivers were accessed through the registration of the elderly from the area covered by and under the responsibility of the FHN. In the period from May to September 2016, 20 elderly individuals aged 60 years or more and registered in the aforementioned Center, who potentially needed caregivers, were randomly selected. This was the initial process of sample construction. During home visits, the presence of caregivers and the frailties of these elderly persons were identified through the Katz-modified index[14,15] for the evaluation of ADL, in order to classify these individuals as dependent, semi-dependent and independent. Of these, 18 were eligible and their caregivers were invited to participate in the study. The researcher followed a guiding script of subjects and questions that dealt with: home care, home visits from dentistry professionals; needs of

caregivers regarding the oral health of the elderly; self-care in oral health; and oral health care practices.

With this initial number of participants, data was collected following the construction of an intentional sample by theoretical saturation. This sample is described as intentional due to the seeking out of actors that correspond to the established criteria, and based on theoretical saturation in relation to the object of study in the context of the oral health care of the elderly[16,17]. The conclusion of data collection occurred when the researcher believed, following a reading of the interviews, that the richness of the data collected was sufficient to achieve consensus on the research object in question, together with the theoretical contexts surrounding the same. As this saturation point was based on the cut-off point in relation to the object of the research, combined with the level of depth required and the homogeneity of the studied population, the number of caregivers interviewed was 13.

The interviews were audio recorded and transcribed. For ethical reasons, the identity of the individuals was preserved, with the nomenclature of Caregiver 1-13 adopted.

The process of data analysis began when the researcher came into contact with the reality being studied during the verbal production of the data in the researcher and researched interaction. Then, the systematization and analysis of the data was performed through the Content Analysis Technique, based on all the textual production. Analysis was performed in three stages, which were: the pre-analysis and exploration of the material; the treatment of data through the construction of thematic categories; and the inference and interpretation of the categories[18].

In pre-analysis, a general reading of the interviews was carried out to make first contact with the content and to organize the data. In this exploration of the empirical material the units of register and of context were identified, aiming to reach the nucleus of the general comprehension of the texts[18]. In data treatment, the data were transformed into categories according to emerging themes in the discourse of the caregivers. Through the inferences made by the researcher, based on their experiences in relation to the research object, the thematic categories were interpreted according the guidelines of the National Oral Health Policy[19].

The present study was approved by the Ethics Committee under number 51370815.8.0000.5414. All participants were invited to participate of their own free will and signed the necessary free and informed consent forms. The confidentiality of information that could identify any participant was respected.

RESULTS AND DISCUSSION

Charts 1 and 2 present the results of the socioeconomic variables of the 13 caregivers of the elderly, obtained through the completion of a questionnaire to determine the socioeconomic profile of each caregiver.

Chart 1 shows that all 13 caregivers were informal, while most were female, aged between 30 and 82 years and married. In relation to kinship, the majority were daughters or spouses of the elderly person. Two people were hired to serve as domestic staff and informal caretakers, and did not live in the same household as the elderly.

Chart 2 shows the socioeconomic data of each caregiver. Incomplete elementary school was the most cited level of schooling, with only one caregiver declaring themselves illiterate. It was observed that the majority did not have another occupation/job, while others worked as: domestic staff, day worker, laundry worker and cook temporarily absent from work.

Chart 1. Profile of caregivers according to the categories: demographic, social, kinship and formality of care. Ribeirão Preto, São Paulo, 2016.

Research participant	Age	Gender	Color/ Ethnicity	Marital status	Informal caregiver	Kinship	Live together
Caregiver 1	72	Female	White	Married	Yes	Wife	Yes
Caregiver 2	63	Female	White	Married	Yes	Daughter	Yes
Caregiver 3	57	Female	White	Single	Yes	Daughter	Yes
Caregiver 4	52	Female	White	Married	Yes	Daughter	Yes
Caregiver 5	58	Female	Black	Single	Yes	Domestic worker/Caregiver	No
Caregiver 6	30	Female	Black	Single	Yes	Daughter	Yes
Caregiver 7	82	Male	White	Married	Yes	Husband	Yes
Caregiver 8	68	Female	White	Married	Yes	Wife	Yes
Caregiver 9	46	Female	White	Married	Yes	Daughter in law	No
Caregiver 10	70	Female	White	Married	Yes	Wife	Yes
Caregiver 11	68	Female	White	Married	Yes	Domestic worker/Caregiver	No
Caregiver 12	56	Female	White	Divorced	Yes	Daughter	Yes
Caregiver 13	28	Female	White	Single	Yes	Daughter	Yes

Chart 2. Profile of caregivers according to categories: schooling, occupation/work, working day, time spent as caregiver and income. Ribeirão Preto, São Paulo, 2016.

Research participant	Schooling			Other occupation/job			Working day (hours)	Time spent as caregiver (years)	Income (Minimum salary)
	Illit.	Incomp Element.	Comp High.	Yes	No	Which?			
Caregiver 1		Yes			No		24	6	1
Caregiver 2			Yes		No		24	10	
Caregiver 3		Yes		Yes		Cook (off work)	24	2	2
Caregiver 4		Yes			No		24	1	<1
Caregiver 5		Yes			No	Domestic worker	8	3	Did not say
Caregiver 6	Yes			Yes		Day worker	9	2	< 1
Caregiver 7		Yes			No		24	10	2
Caregiver 8		Yes			No		24	1	1
Caregiver 9			Yes		No		10	1	None
Caregiver 10		Yes			No		24	2	1
Caregiver 11		Yes		Yes		Domestic worker	8	2	Did not say

The daily working time was 24 hours (69.23%) and eight to ten hours (30.76%). All those who reported working all day had some degree of kinship. The time spent working in the profession of caregiver ranged from one to three years (30.76%), four to six years (7.69%) and seven to ten years (23.07%).

The majority of caregivers had an individual income of at least one minimum salary from their pensions, while the others did not provide this information.

The profile of caregivers found in literature is similar to that obtained in this study, with mainly female informal caregivers, in the age group of 30 to 80 years, who are daughters or wives, have a low level of schooling and no other occupation/work[20-22].

From the data analyzed in the interviews, three categories of analysis emerged: a) home visits and health professionals; b) caregiver experience and care of the dependent/semi-dependent elderly; and c) the caregiver and his/her self-care.

Home visits and health professionals

The caregivers believed that home visits and greater commitment on the part of the FHN team to the health care of the elderly was important, despite limited knowledge about the role of the professional dentist. According to the National Oral Health Policy[19], oral health actions are home visits to people who are bedridden or have difficulty walking, for the follow-up, treatment and evaluation of possible health risks[19].

Some caregivers reported receiving a home visit from FHN professionals, especially community health agents and doctors. They also said that they had never been visited by a dentist or were not aware of the role of this professional in the FHN territory. Although the caregivers were unaware of the dental surgeon, home visits by such professionals are fundamental for assessing oral health status and providing care guidelines[23].

> "because they always come, don't they [...] like the other day the (family doctor) came [...], the community health agent came [...], they always come and see how we are..." (Caregiver 2).

> "Yes, the doctor comes" (Caregiver 8).

Other caregivers, meanwhile, received frequent visits from the dentist (undergraduate student, resident or preceptor):

> "yes... I'd always go... it was... in February (the student visit)" (Caregiver 1).

> "Ah, the (preceptor dentist) always comes" (Caregiver 12).

The professionals who performed oral health activities in the FHN are residents of the Multiprofessional Residency Program in Integral Health Care in Dentistry, 5th year students of the School of Dentistry of Ribeirão Preto of the University of São Paulo and a professional contracted by the respective college to acta as a preceptor to the students and residents.

The absence of oral health professionals who perform visits can be observed in the reports, as there is no oral health team hired for the FHN. The inclusion of a dentist in the team would allow planning of risks, the need for treatment and longitudinal follow-up[3,24].

It is stated in the National Oral Health Policy Guidelines[19] that health education should be performed by a dental surgeon, dental hygiene technician and/or dental assistant, and consider cultural differences, food, hygiene instruction and attention to care to the body itself. These activities may involve professionals from other health areas[3], especially during home visits.

Some caregivers described their views of the dentist in relation to the care model. They described dental treatment as the main activity to be performed with the elderly:

> "Interviewer: For your husband. What can the dentist do to help care for your husband?
>
> Interviewee: His teeth aren't good. If it was up to me I'd pull them all out" (Caregiver 10).

The lack of guidance regarding oral health may be associated with the perception of the need for the total extraction of the teeth of the elderly. This negative view regarding the health of the elderly involves aspects such as the difficulty of hygiene, greater ease in preparation of paste-based foods or difficulty of locomotion to visit the clinic (in this case the elderly person is semi-dependent and uses a wheelchair). The lack of instruction on techniques of bed-based oral hygiene with facilitating instruments was also a factor[25].

As the caregiver does not report pain or discomfort, the caregiver's perception may be associated with not knowing about the actions that the dentist can perform by relating the role of the dentist to curative practices. According to Dutra and Sanchez,[24] the care model is an active presence in the life of the elderly and interferes with their oral health, as they have experience of curative and invasive dentistry.

Two actions that contribute to care for the elderly perceived by caregivers were oral hygiene orientation and home visits by the dentist or the FHS team.

> "Guidance, for example, we need more, the more we learn the better we can deal with people, I think the most difficult thing is when the person has bad breath, it bothers people" (Caregiver 3).

> "I think so, brushing instructions should be written, not manual. This is oral hygiene for those who are bedridden, and it would help a lot" (Caregiver 11).

In contrast to the care model, actions should be created to promote oral health aimed at the elderly population[26], especially those directed at caregivers, as these individuals are mainly responsible for the oral health care of dependent/semi-dependent elderly persons[24].

The analyses performed in this category reveal the need for home visits by FHS oral health professionals, as the bonding, orientation and exchange of information and knowledge of these professionals with caregivers can contribute to the care of the elderly and their quality of life.

Caregiver experience and care of the elderly.

The adaptation of the activities carried out by caregivers to provide better oral health care and an improved diet for the elderly were described as part of their care routine. According to caregivers, most dependent/semi-dependent elderly persons use some type of dentures and pain or discomfort leads them to less frequent use or non-use.

According to caregivers, totally edentulous elderly persons who do not use dentures are fed with paste-based food. Tooth loss leads to changes in eating habits and food preparation by the caregiver. Some caregivers perceive the eating difficulties of dependent elderly and prepare paste-based foods so that they can feed themselves and have a better quality of life. On the other hand, in the perception of the caregivers, the absence of teeth makes it easier to clean the oral cavity and avoids complaints of pain and the need for transportation to the dental clinic.

One of the caregivers has worked for 40 hours a week for two years as the domestic staff and caregiver of a dependent elderly woman. She said that this elderly woman said that her dentures were causing pain and so has adopted new ways of preparing food:

> "She has to chew, for example, she can't chew apples. Even beef or other meat I prepare in the pressure cooker" (Caregiver 11).

Another difficulty reported by a caregiver to a health professional (speech therapist) was the length of time the elderly person took to eat. In this case, the elderly person could not put food in their mouth, depending on the caregiver, leading to physical and mental fatigue.

Changes in the oral cavity of the elderly may affect physiology, social interaction and the exercise of masticatory function and speech[4,11]. The preparation of food can lead to a good or bad diet and influence digestion. These authors also state that the lack of instruction on how to perform the oral health care of the elderly, their physical limitations and the excessive time devoted to this task generates poor care among caregivers.

Caregivers perceived aspects related to speech and aesthetics as important in the quality of life of the elderly. Chewing and swallowing were reported as difficulties in a study of elderly people with some type of dependence, as well as dissatisfaction with dental aesthetics[3]. In addition, a good physiognomy and suitable oral health care raise self-esteem, provide well-being and quality of life[11].

The majority of caregivers described examining the oral cavity of the elderly, but without the guidance of an oral health professional. The examination of the mouth is important when evaluating alterations such as spots or lesions, and the caregiver requires training and the guidance of a dentist to perform this task[27].-

The appearance of herpes-like wounds in the oral cavity of a dependent elderly woman was noticed by her caregiver, who used baking soda as a form of treatment, based on her beliefs and knowledge.

Another form of care provided was that related to the oral hygiene of the elderly, which is performed in different ways:

> "Ah, I brush the teeth with toothpaste, then I use dental floss to clean his teeth" (Caregiver 1).

> "In the shower I brush her teeth and tongue and inside the cheeks, and tell her to rinse and I wash the dentures in the sink" (Caregiver 11).

Another caregiver described not cleaning her mother's oral cavity as she had never received any instruction in this matter. A lack of confidence and the skills to perform this function were also mentioned[26].

It can be seen from this category that most caregivers were not instructed to perform essential actions in oral health care, such as the oral examination and hygiene of the elderly. There is therefore a need for planning and follow-up care by a multiprofessional team, including a dental surgeon.

The caregiver and his/her self-care

In order to better understand the care given to the elderly it is important to know the caregivers' perception of their oral health related self-care.

In the present study, most of the caregivers were older than 50 years, used some type of denture and did not feel pain or discomfort in the oral cavity. Some presented dissatisfactions such as difficulty with adaptation to dentures or the fracturing of the same, the non-use of dentures in one of the arches or non-use for financial reasons.

When the caregiver is older, the workload is greater, which can also influence their health conditions and self-care actions[4]. This age group seems to have experience of the invasive care model, which may explain the high rate of denture use. The oral health status of the caregiver is related to their perception of health and conception of oral health, socioeconomic conditions, insufficient income and limited schooling, which reduces the demand for dental services[12,24].

Few caregivers reported experiencing pain or discomfort in the oral cavity, cited tooth sensitivity to cold water, tooth remains or the sensation of a raised tooth. When they experienced any of these problems in the oral cavity, however, their self-perception of oral health was negative, affecting their quality of life[28].

One of the caregivers, who takes care of her mother and works as a day worker, said that she performed oral hygiene correctly and complained about having had teeth removed, but noticed that a piece of the tooth remained in her mouth and that there was gingival bleeding in this region. She also said she sometimes felt pain.

Most caregivers expressed no masticatory, speech or aesthetic difficulties. Those who had complaints described problems relating to the use of orthodontic appliances, greater dental loss in a quadrant of the oral cavity or dislike of their smile:

> "Ah I can't eat properly, especially on the side where I have more missing teeth, on the left side" (Caregiver 5).

> "I miss my smile. Because your smile is everything" (Caregiver 3).

In general in this study the self-perception of the oral health of the caregivers indicated an absence of discomfort or pain or masticatory, communication or aesthetic difficulty. The caregivers described, however, a desire to undergo some type of dental treatment. A retired caregiver who cared for her husband reported general health issues such as scoliosis and Chagas' disease and, dissatisfied with her mouth, seemed concerned about her oral health and revealed that she wanted dental treatment and new dentures.

Another caregiver reported problems with denture teeth. A younger woman, however, described dissatisfaction with having stopped her orthodontic treatment. She had completed high school but had no individual income and dedicated herself to the care of her mother 24 hours a day.

The willingness of caregivers to undergo dental treatment and inability to do so may be related to the time they dedicate to their roles, with little time to take care of themselves and a low income, resulting in mental and physical alterations and interfering with their well-being and role in society [4,22].

Maintaining good oral health is important for well-being and aging and the avoidance of oral and extra-oral diseases[11]. Some caregivers believe that an unsatisfactory oral cavity leads to changes in the body[29]. In addition, the constitutional principles of the SUS recognize that the oral health component is inherent to general health[30].

Most of the caregivers reported carrying out an oral self-examination, with some describing undergoing such an examination at the annual public dental clinic event or in their own home. FHS health professionals should provide guidance on how to perform oral self-examination and explain the importance of preserving the teeth in the oral cavity to consume foods essential for the functioning of the body[3]. Some authors have related oral self-examination to the positive or negative self-evaluation of oral health[12]. The interference of oral health on general health was discussed with caregivers. The absence of the lower teeth of the caregiver makes it difficult to chew, meaning that she feels that she does not have the same capacity to chew food, interfering with her diet.

In contrast to the findings regarding care for the elderly, most caregivers received instruction from the dentist on how to care for their mouths, said they did not experience difficulties during oral hygiene, and used toothpaste and a toothbrush. Some used dental floss and mouthwash, effervescent tablets and baking soda or vinegar for cleaning the prosthesis. Many performed their hygiene procedures according to their life experience.

> "Ah, I wash every day, after lunch too, once I went to the dentist and she gave me some pebbles (effervescent tablets) that you put in the glass with water and put the dentures in to clean them, so I do this". (Caregiver 12).

> "Interviewer: And how do you use baking soda?
> Interviewee: Ah ... we put it in the lemon and spread it.
> Interviewer: squeeze the lemon in the baking soda?
> Interviewee: yeah" (Caregiver 1).

> "I rinse, brush first with the toothbrush and toothpaste, then after I put on the toothpaste, I clean the dentures. I leave the dentures once a week in baking soda with water, or vinegar" (Caregiver 8).

Oral health care is complex and involves prior knowledge and life experience[11], as described in the accounts of the caregivers. Therefore, the principles, experiences and beliefs of the caregiver and the elderly person must be respected in order to align their cultural practices with the guidelines[27].

It can be seen that the caregivers have a positive self-perception of their oral health and perform self-care actions. They also show an interest in dental treatment due to aesthetic and/or functional issues. However, in addition to restricted knowledge about the role of the FHS dental surgeon, they have difficulties seeking out dental care.

The study presents limitations in that only informal caregivers of elderly people receiving care through the FHS were studied. As it is a study of the content of the textual material and the perception of the subjects, it cannot be said that such findings reflect phenomena, oral health care cultures or even theories about the object of the research.

CONCLUSION

The present study provides important results on the issue of oral health from the perspective of caregivers of the elderly. These results are relevant for the reality of the care to be adopted in relation to caregivers, so that they can provide adequate care for the oral health of the dependent elderly.

Understanding the perceptions of caregivers regarding oral health is essential for the planning of oral health promotion and prevention actions aimed at such caregivers and the elderly. The presence of a dental health team in family health units is essential to meet these needs, which will increase in coming years due to the growth of the elderly population.

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Relationship between strength and muscle mass in middle-aged and elderly women: a cross-sectional study

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Abstract

Objective: to analyze the relationship between handgrip strength and lower limb strength and the amount of segmental skeletal muscle mass in middle-aged and elderly women. *Methods:* an observational, cross-sectional, observational study of 540 women aged between 40 and 80 years in the cities of Parnamirim and Santa Cruz, Rio Grande do Norte, was performed. Sociodemographic data, anthropometric measurements, handgrip dynamometry, knee flexors and extensors of the dominant limbs, as well as the segmental muscle mass of the limbs were evaluated. Data were analyzed using Student's t-Test, Chi-square test, Effect Size and Pearson's Correlation (CI 95%). *Results:* there were statistically significant weak and moderate correlations between handgrip strength and upper limb muscle mass, knee flexion strength and lower limb muscle mass, and between knee extension strength and lower limb muscle mass for the age groups 40-59 years and 60 years or more (p<0.05). *Conclusions:* muscle strength correlates with skeletal muscle mass. It could therefore be an indicator of the decrease in strength. It is not the only such indicator, however, as correlations were weak and moderate, which suggests the need for more studies on this theme to elucidate which components may also influence the loss of strength with aging.

Keywords: Muscle Strength. Women. Aging. Body Composition.

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INTRODUCTION

Aging generates many health challenges that cover psychological, social, biological and functional issues[1]. Both in Brazil and around the world population aging has been marked by feminization, a process in which women achieve greater rates of longevity than men[2].

The aging process is associated with a progressive reduction in skeletal muscle mass, related to a change in body composition and known as sarcopenia[3]. There is therefore a decrease in muscle strength, with a consequent increase in the risk of health problems and a decline in physical and functional abilities[4,5].

Loss of strength occurs more rapidly in women at around the age of 50 (the average age of the onset of menopause) while it is observed in men at around 60 years of age[6].

During the menopausal transition hormonal changes occur which are the result of the low number of functioning ovarian follicles[7]. Evidence suggests that changes in the hormonal state, especially a reduction in estradiol, lead to an increase in fat mass, a decline in lean and bone mass[8], and contribute, directly or indirectly, to a reduction in functionality[9].

Decreased muscle strength is mainly associated with loss of skeletal muscle mass, however, the reduction of muscle strength may also occur due to other factors such as increased non-contractile tissue[10], reductions in neural recruitment capacity and changes in muscle contraction properties[11].

It is assumed that a decrease in skeletal muscle mass occurs after the age of 50 and that this loss is more evident in the lower limbs[10]. Almeida & Greguol[7] suggest that there is a decrease in muscle mass of approximately 2.5% per decade, which can lead to changes in balance, proprioception and the ability to walk, resulting in a higher risk of falls, bed restrictions and increased functional dependence[5].

In terms of hand grip strength, which is recognized as a method of predicting body muscular-skeletal functioning[12], it has been demonstrated that low grip strength may result in a greater probability of functional limitations and consequently death[13,14]. In addition, elderly persons with a history of frequent falls have lower levels of hand grip strength and, consequently, lower limb strength levels, than elderly individuals without a history of falls[13].

Focusing on understanding female aging is relevant given the feminization of the elderly population. Studying the changes in muscle mass associated with menopause is important, given the high number of women going through this period and the risks associated with the physical incapacity it can create.

Therefore, the objective of the present study was to analyze the relationship between hand grip strength and lower limb strength and the amount of segmental skeletal muscle mass in middle-aged and elderly women in the municipalities of Parnamirim and Santa Cruz, in the state of Rio Grande do Norte, Brazil.

METHODS

An observational, cross-sectional analytical study was performed. The population was made up of women living in the municipal regions of Parnamirim and Santa Cruz, both cities located in Rio Grande do Norte, Brazil. In the city of Parnamirim women between 40 and 65 years were selected, while in Santa Cruz those between 40 and 80 years were included. The sample was convenience based and occurred after the disclosure of the project in basic health units of the cities.

Sample size calculation took into account the hand grip strength variable and considered a 95% confidence level, a mean difference between age groups of 2.0 kgf and an average standard deviation of 5.0 kgf, with a power of 95%, giving a minimum sample of 134 subjects in each group. Considering the sample availability, an additional 134 subjects were added to this total.

Participants who were present at the research site, met the inclusion criteria and signed a Free and Informed Consent Form (FICF) made up the sample of the present study, giving a total of 540 women, 406 of whom were aged between 40 and 59 years and 134 of whom were aged 60 to 80 years. The data of the present study were collected in Parnamirim in 2014 and Santa Cruz in 2016.

The inclusion criteria of the study were age between 40 and 80 years, an absence of diseases that would impair the measurement of limb dynamometry, such as degenerative and neurological diseases, limb fractures and pain. The project was submitted for evaluation by the local Ethics Research Committee and was approved under opinion no. 1,178,143, in accordance with the provisions of the Declaration of Helsinki and Resolution No. 466/12 of the National Health Council. Upon arrival at the evaluation, the objectives and procedures of the study were explained to the women and they were asked to sign the FICF.

Data collection was performed by interviewers previously trained in the collection procedures and a structured questionnaire was used to record identification data, sociodemographic information, and anthropometric measures such as weight and height. Body mass index (BMI) was also calculated.

An evaluation of hand grip strength of the dominant upper limb was initially performed, measured by the Saehan® 15 dynamometer calibrated by the manufacturers and never previously used. This measuring units used were kilograms/force(Kgf). The participants were placed in a sitting position, with the shoulder adducted and in a neutral rotation, the elbow positioned at 90º flexion, and the forearm and wrist, which could be moved to up to 30º of extension, in neutral positions, and the contralateral limb relaxed on the thigh. The participants were instructed and verbally encouraged to exert the greatest possible voluntary isometric force, with the dynamometer in the second position, referring to the size of the grip, according to the recommendations of the American Society of Hand Therapists[16]. Three sustained contractions of five seconds were performed, with a one-minute interval between measurements, and the arithmetic mean of the three measurements was considered[17].

Next, the muscle strength (MS) of the knee extensors and flexors of the dominant lower limb was evaluated with a MicroFET2® portable dynamometer model (West Jordan, UT, USA), duly calibrated by the manufacturers. Muscle strength was recorded in units of kilograms/force (Kgf).

To evaluate the strength of the knee extensors, the volunteer was placed on the evaluation table with the legs dangling, knees positioned at 90 degrees and hands on the thighs[18], with the dynamometer distal and anterior to the dominant leg. To dynamometric evaluation of the knee flexors, the volunteer was positioned in a unipedal orthostatic position, knees fully extended (0º), with the support of both upper limbs on the evaluation table and the dynamometer fixed to the distal surface of the dominant leg, near to the malleolus line[19].

To measure knee flexor and extensor strength, three maximum voluntary isometric contractions were requested, each with a duration of five seconds and an interval of one minute between each. The arithmetic mean of the three measures was considered[19].

To obtain muscle mass values, body composition was evaluated on a previously scheduled day with the InBody R20 electrical bioimpedance device, which automatically calculates muscle mass based on the manufacturer's prediction equations. The device uses eight electrodes, two in each foot and two in each hand and performs measurements in a segmented manner and in two frequencies, 20 kHz and 100 kHz, through an applied current of 250μA[20]. The bioimpedance evaluation correlates closely with the predictions made using dual energy radiological absorptiometry (DXA)[21] and is considered a reliable and useful alternative for the evaluation of skeletal muscle mass in middle-aged women[22]. Prior to the test, the volunteer received instructions and was asked to wear light clothing, to not eat or exercise at least two hours prior to the exam, and to go to the toilet to empty the bladder[20]. During the test, which lasts from 40 seconds to 1 minute, the women were position on the foot electrodes on the surface of the digital scale of the device, and instructed to hold the other electrodes that are attached to a bar. They were asked to remain in the same posture and to not move or speak[20].

Data analysis was performed using descriptive statistics by means of central tendency (arithmetic mean), dispersion (standard deviation) for the quantitative variables weight, height, BMI and dynamometry and muscle mass, and absolute and relative frequencies for the variable ethnicity. The findings were summarized according to the age groups (40 to 59 years, 60 years or more).

The Kolmogorov-Smirnov test was used to verify the normality of the data. The Student's t-test and the chi-square test were then performed to compare the quantitative and categorical variables in relation to the age groups. In addition, the Effect Size of the sample was calculated using Cohen's *d* to verify the magnitude of these associations. Finally, the Pearson correlation test was applied to evaluate the correlation between the strength measurements and the skeletal muscle mass of the upper and lower limbs measurements. Throughout the analysis, a 95% confidence interval (CI) and $p<0.05$ were considered.

RESULTS

The present study evaluated a total of 540 women. Table 1 shows the results of the characterization of the sample, summarized according to age group. The mean age of the 40-59 age group was 50.3 (4.6) years, while in the age group of 60 or over it was 67.2 (5.9) years. The group composed of elderly women had a lower mean number of years of study and a higher percentage of women who declared themselves to be mixed-race than in the younger group. In addition, the means of mass and muscle strength in the younger group were higher than those found in the group aged 60 years or older. The other characteristics of the sample related to anthropometric, mean strength and muscle mass measurements and effect size are shown in Table 01.

Table 2 shows the data related to the correlation between upper limb muscle mass and grip strength, lower limb muscle mass and knee flexor and extensor strength. It also shows data on muscle mass and upper and lower limb strength in relation to age. All correlations were weak and moderate.

Table 1. Characterization of sample study based on age ranges (n=540). Natal, Rio Grande do Norte, 2017.

Variables	Age range (years)				Total		Effect size (Cohen's d)	*p* value
	40-59		60 or over		n (%)			
	n (%)	Mean (±sd)	n (%)	Mean (±sd)		Mean (±sd)		
Years of schooling	8.74 (4.21)		5.00 (4.29)		7.81 (4.53)		0.87	<0.001[a]
Color/Ethnicity								
White/Caucasian		158 (38.90)		36 (26.90)		194 (35.90)	3.64	0.02[b]
Black/Afro-Brazilian		23 (5.70)		6 (4.50)		29 (5.40)	3.31	
Brown/Mixed-Race		255 (55.40)		92 (68.70)		317 (58.70)	2.13	
Body Mass Index	28.99 (4.67)		28.62 (4.75)		28.90 (4.69)		0.07	0.42[a]
Hand grip strength (Kgf)	26.81 (5.21)		24.07 (4.68)		26.13 (5.21)		0.55	<0.001[a]
Knee flexor strength (Kgf)	14.80 (5.54)		12.25 (4.19)		14.16 (5.35)		0.51	<0.001[a]
Knee extensor strength (Kgf)	22.77 (7.77)		18.73 (6.51)		21.77 (7.67)		0.56	<0.001[a]
Upper limb skeletal muscle strength (Kg)	2.37 (0.98)		2.09 (0.46)		2.30 (0.89)		0.36	0.002[a]
Lower limb skeletal muscle strength (Kg)	5.77 (0.97)		5.16 (1.09)		5.61 (1.03)		0.59	<0.001[a]

a- *p* value for Student's T-test; b- *p* value for Chi-squared test

Table 2. Correlation between mean segment muscle mass and upper and lower limb strength and age of middle-aged and elderly women (N=540). Natal, Rio Grande do Norte, 2017.

	Age range					
	40 - 59 years		≥60 years		Total	
Variables	r	*p*	r	*p*	r	*p*
Upper limb muscle mass and Hand grip strength	0.135	0.006[a]	0.460	<0.001[a]	0.195	<0.001[a]
Lower limb muscle mass and Knee flexor strength	0.280	<0.001[a]	0.217	0.01[a]	0.302	<0.001[a]
Lower limb muscle mass and Knee extensor strength	0.265	<0.001[a]	0.299	<0.001[a]	0.313	<0.001[a]
Upper limb muscle mass and Age	-0.009	0.85[a]	-0.291	0.001[a]	-0.140	0.001[a]
Lower limb muscle mass and Age	-0.070	0.15[a]	-0.343	<0.001[a]	-0.294	<0.001[a]
Upper limb muscle strength and age	-0.167	0.001[a]	-0.327	<0.001[a]	-0.302	<0.001[a]
Knee flexor strength and age	-0.081	0.10[a]	-0.127	0.14[a]	-0.220	<0.001[a]
Knee extensor strength and Age	-0.092	0.06[a]	-0.261	0.002[a]	-0.261	<0.001[a]

a – *p*: value for Pearson Correlation Coefficient.

DISCUSSION

The present study evaluated the relationship between muscular manual grip and knee flexor and extensor strength with the amount of skeletal muscle mass present in the dominant segments of the upper and lower limbs in middle-aged and elderly women. When the data was analyzed, a significant and positive correlation was observed regarding the variables segmental muscle mass and manual grip and knee flexor and extensor muscle strength in the two age groups. These findings agree with the studies by Alizadehkhaiyat et al.[23] and Charlier et al.[24], which state that muscle strength generation capacity is directly proportional to the skeletal muscle mass of these segments.

However, the correlations between upper limb muscle mass and hand grip strength and lower limb muscle strength and knee extensor and flexor strength in the age group of 40 to 59 years were weak in the present study. Throughout the aging process, there is a reduction in the number of motor units[25], which can influence the generation of muscle strength in middle-aged women, together with muscle mass, neural factors and characteristics related to muscle quality, such as fiber type, fat infiltration or the extracellular matrix[25,26]. These factors may justify the weak correlation between strength and muscle mass in this age group.

In older women (60 years of age or older), there was a moderate correlation between upper limb muscle mass and hand grip strength. With aging, the aforementioned factors related to muscle strength appear to diminish, resulting in a decline in muscle strength that occurs more markedly than the decline in muscle mass[27]. Thus, in this age group, muscle mass is more strongly correlated with skeletal muscle strength in the upper limbs.

In terms of knee extensor and flexor strength, the correlation between mass and muscle strength remained weak. Samuel et al.[28] found that the strength of the lower limbs declines more severely than that of the superior limbs during aging. This finding is due to the upper limbs being constantly used in all stages of life, while the use of the lower limbs diminishes with age[29].

Although muscle mass reduction has been found to be associated with loss of strength and performance over the years[6], Legrand et al.[30] suggested that poor physical performance is associated with low strength generation, even after considering other risk factors for sarcopenia in the elderly, thus supporting the hypothesis that muscle strength is a better indicator of physical performance than muscle mass[30].

It is therefore important to consider that although the amount of muscle mass may be a major contributor

to strength generation, muscle strength tends to decrease faster than muscle mass, thus suggesting a decline in muscle quality[10,30].

Muscle strength results from a combination of muscle mass and muscle quality[26]. Variations in muscle quality[26] and factors such as low physical activity and protein intake, biological factors, oxidative stress, inflammation, estrogen deficiency[6], among other predictors of sarcopenia, may explain why muscle mass is a relatively weak indicator of functional capacity.

Thus, loss of muscle mass alone does not have such significant clinical implications, since muscle strength or performance does not depend exclusively on muscle mass, but also other factors involved in the generation of strength, such as neural and hormonal components[31].

The present study reveals the importance of the careful study and clinical evaluation of muscle strength, which can identify important aspects of the aging process. Low muscle strength in elderly individuals is an important marker of the risk of mortality in this population, with the amount of muscle mass presented by the individual of little relevance[4].

Also from the data obtained in this study, a negative result was found when correlating age with muscle mass and muscle strength. Although the values obtained show weak and moderate correlations for the two age groups, they indicate a reduction in muscle mass and muscle strength with advancing age. This finding is consensual in scientific research[4,31].

The main consequences of the loss of strength that occurs with advancing age are physical limitations, the mobility deficit and incapacity, which increase the risk of falls, fractures, hospitalizations, dependency, fragility and mortality[32,5].

This quantitative decline coupled with the qualitative decline in the functionality and structure of the muscular system results in significant implications for the functional capacity of the elderly[33]. These modifications that occur in the muscular system due to the aging process impair the performance of motor skills, directly altering the ability of elderly individuals to perform instrumental and basic activities of daily living and making it difficult to adapt to the environment in which they live[27].

Thus, for the population of this study, this evaluation may indicate important aspects relating to the physical performance, health and quality of life of women. Although women live longer, they have worse health outcomes throughout the aging process[34], especially regarding to the deficit of strength and muscle mass, which seems to occur at an earlier age than men at around the time of menopause[6].

Considering that satisfactory muscle strength is necessary for the accomplishment of functional activities, studies that investigate the relationship between the quantitative and qualitative aspects of skeletal muscle more closely, establishing the relationship between these aspects and corporal composition and other factors that influence muscle function, are important for identifying clinical parameters that are easy to access and interpret for health professionals.

From this perspective, effective diagnosis enables the development of effective strategies and interventions for prevention, such as physical activity and the treatment and rehabilitation of disabilities, optimizing functional independence, which will have repercussions on the health, longevity and quality of life of this population.

In terms of limitations, as a cross-sectional study the present study did not allow the exploration of the relationship between skeletal muscle mass and muscle strength over time, and a cause-effect relationship cannot be established, limiting research into factors that influence the correlation found in this study. Another possible limitation of the study was the sample formation process, which occurred in a non-random manner (for convenience). However, considering that the socioeconomic characteristics are similar to those found in another study in this area[34,35], and the consistency and robustness of the results, we believe that this limitation had a limited impact on the established inferences.

CONCLUSIONS

The results of the present study suggest that the grip strength and knee flexor and extensor strength of women aged between 40 and 80 years correlated positively with the skeletal muscle mass of the respective segment. The correlations were weak for grip strength in women aged 40 to 59 years and also for knee flexor and extensor strength in both age groups. In addition, a moderate correlation between grip strength and muscle mass was verified in women aged 60 years or older. These findings support the hypothesis that muscle mass is one of the aspects that determine the ability of muscles to produce strength. However, muscle mass does not fully explain the decrease in muscle strength, suggesting a decline in muscle quality which is also determined by other factors that were not addressed in the present study.

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Assessment of hemodynamic and vascular parameters in Alzheimer's disease, vascular dementia and mild cognitive abnormalities: a pilot study

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Abstract

Objectives: this pilot study correlated cardiovascular parameters such as atherosclerosis and arterial stiffness in patients with aged-related dementia and sought to identify hemodynamic differences that can help in differential diagnosis. *Method:* a longitudinal prospective study was performed of 46 patients aged 60 to 80 years in the city of Belo Horizonte, Minas Gerais, Brazil. The patients were classified into three groups: those with Alzheimer's disease (AD), vascular dementia (VD) or mild cognitive impairment (MCI). The groups were classified by clinical examination and CT or magnetic resonance imaging tests of the encephalon. The arterial stiffness and other hemodynamic parameters of the patients were measured using the Mobil-O-Graph device and carotid artery ultrasound scanning. Data analysis was performed by descriptive statistics, multinomial logistic regression and analysis of variance. *Results:* 18 patients (39.1%) had MCI, 18 (39.1%) AD and 10 (21.8%) VD. Image exams revealed greater obstructive microangiopathy in the AD group than the MCI group ($p<0.05$), which in turn exhibited greater normality in such tests than the AD group ($p<0.05$). There were no significant differences among the groups for the hemodynamic variables. The carotid artery ultrasound examinations identified a greater degree of normality in the MCI group than the AD group ($p<0.05$). *Conclusion:* the results do not support the idea of using noninvasive hemodynamic evaluation methods as additional exams in the differential diagnosis of these pathologies.

Keywords: Dementia, Vascular. Alzheimer Disease. Pulse Wave Analysis. Vascular Stiffness.

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INTRODUCTION

The increased risk of cognitive decline that comes with aging constitutes a public health problem due to its strong association with disability and morbidity and mortality. The prevalence of dementia increases with age, affecting about 7% of individuals aged over 65 years and 30% of those over 80[1].

The role of the vascular component in cognitive decline has been increasingly investigated. Several studies have shown that individuals with cardiovascular risk factors and vascular disorders have an increased chance of developing cognitive disorders, including not only vascular dementia (VD), but also Alzheimer's disease (AD)[2-4]. In a recent study, cardiovascular risk factors and risk factors for strokes demonstrated a significant predictive value in cognitive decline in 10 years [5].

VD and AD are two main types of irreversible dementias and represent respectively 60% and 20% of all conditions. Dementias are also represented, to a lesser extent, by Parkinson's disease, frontotemporal dementia and Lewy body dementia. When the clinical manifestations include characteristics of AD and VD, it is known as mixed dementia[6,7].

Literature on the subject reveals that the etiopathogenesis of dementias is defined by multiple factors involving genetic and metabolic causes and the aging of the brain itself. Some studies have shown that vascular disease worsens with advancing age and that there may be a relationship between vascular pathologies and increased risk of denentias[2,4]. Vascular disorders in AD and altered blood flow in the brain suggest that dementia may be a vascular disorder with neurodegenerative consequences[8].

Better knowledge about the vascular alterations present in individuals with AD and VD can help to provide earlier diagnosis and change the perspectives of cognitive decline.

We therefore sought to establish a relationship between the results of central nervous system images, ultrasound examinations of the carotid arteries and measurement of pulse wave velocities in the peripheral arteries in individuals with dementia related to age and to verify if the same can be used in the differential diagnosis of AD and VD or mild cognitive impairment (MCI), in the city of Belo Horizonte, in the state of Minas Gerais, Brazil.

METHODS

A prospective and longitudinal pilot study was performed of elderly people of both genders, aged 60 to 80 years, with complaints of cognitive decline, who received care from a private practice in the city of Belo Horizonte, Minas Gerais, Brazil, between April 2015 and May 2016. The sample consisted of 46 individuals and was based on convenience by recruiting patients who sought the clinic with complaints of cognitive decline and who met the inclusion criteria during the study period.

The patients were classified into three groups based on clinical tests and images used routinely in the diagnosis of age related dementia (AD, VD and MCI). Once the groups were classified, we performed noninvasive assessments of the vascular condition of these patients and searched for differences between these parameters in the different groups to verify if these parameters could serve as a diagnostic tool to help identify the different dementias related to age. The subjects admitted to the study underwent clinical evaluation and neuroimaging laboratory tests such as computed tomography (CT) or magnetic resonance imaging (MRI) of the brain and the application of biochemical tests (Chart 1), with the objective of detecting disorders associated with the subject of the study and to exclude conditions or diseases related to profiles that may be characterized as non-MCI, VD or AD cognitive disorders, such as depressive disorders, neurological diseases, dementias related to Parkinson's disease, Lewy bodies, frontal lobe, mixed, metabolic or infectious causes.

Chart 1. Biochemical tests and imaging exams used in the clinical evaluation of patients. Belo Horizonte, 2016.

Biochemical Tests	Hemoglobin, glucose, total cholesterol and fractions, triglycerides, thyroid stimulating hormone, sodium, potassium, urea, creatinine, ionic calcium, transaminases, vitamin B12, folic acid and VDRL
Imaging Exams	Nuclear magnetic resonance of the encephalon or computed tomography of the encephalon.
Ultrasound examination of the carotid arteries	Duplex scan of the carotid arteries

VDRL: *Venereal Disease Research Laboratory* (test for diagnosis of syphilis).

The subjects selected for the survey underwent the following clinical tests for classification purposes: Geriatric Depression Scale (GDS-15)[9]; Mini Mental State Exam[10]; Clock Drawing Test[11]; Image recognition test[12]; Language test (animals and fruit)[13]; Clinical Dementia Rating (CDR)[14]; Evaluation of Activities of Daily Living and Instrumental Activities of Daily Living.

The examinations and tests used to classify the patients into the different groups are part of the overall geriatric assessment of people who present memory disorders or other cognitive alterations and therefore did not entail additional costs for the participants. The patients fasted for 10 to 12 hours prior to the biochemical exams and no previous preparation was necessary for the clinical imaging and evaluation exams by cognitive tests.

Elderly patients with cognitive disorders without impairment of activities of daily living (ADLs) and instrumental activities of daily living (IADLs) and who had scores within normal values adjusted for level of schooling according to the methodology proposed by Pfeffer[15] were defined as having MCI. Mild to moderate dementia was defined when the tests showed disorders in the cognitive tests and impairment for ADLs and IADLs. Mild dementia was when there was impairment of an ADL or IADL and moderate impairment of more than one ADL or IADL[15].

After screening, study participants were organized into three groups. The description of each study group is given in Chart 2.

All patients underwent brain imaging (CT or MRI) with the purpose of evidencing cortex or vascular lesions that could aid in the diagnosis and classification of the groups. If the imaging tests indicated an uncertain classification the subject was excluded from the study. It should be emphasized that both CT and MRI scans can be used as a tool to diagnose different types of dementia related to age[7]. Some patients involved in the study had been referred by other physicians or had the results of a previous MRI or CT exam with them. In such cases the existing examinations were used so the patients did not have to undergo the exam again. If the patient had not undergone an imaging test a CT was requested.

Chart 2. Description of three groups of patients. Belo Horizonte, MG, 2016.

Control Group Mild cognitive impairment	AD Group Alzheimer's Disease	VD Group Vascular Dementia
Individuals aged between 60 and 80. Mild cognitive impairment with no evidence of dementias.	Individuals aged between 60 and 80. Alzheimer's Disease, with mild to moderate cognitive impairment, and no neurological impairment that prevented the individual from undergoing cognitive tests and laboratory evaluations.	Individuals aged between 60 and 80. Vascular Dementia, with mild to moderate cognitive deficits, and no neurological impairment that prevented the individual from undergoing cognitive tests and laboratory evaluations.

After being classified in one of the three groups all the patients were submitted to an ultrasound scan by carotid artery duplex scan to assess the degree of impairment of these vessels. Duplex Scan or vascular ultrasound consists of the use of a multi-frequential linear transducer placed in the territory of the vessel to be studied (carotid and vertebral arteries), in the anterolateral region of the neck. A gel is applied to the base of the device that forms a column that facilitates the propagation of the ultrasound for the study of the vessels. The examination provides information on the anatomical-functional nature of the arteries, which allows the evaluation of intima-media thickness, atherosclerotic impairment, and the presence of plaques and obstructive processes that may compromise blood flow. No preparation is required for the exam. The inherent risks of the procedure are minimal, and are associated with the amount of time the patient spends in the decubitus position, which may result in dizziness when rising. This passes after a few minutes in the supine position, however.

Measurement of arterial stiffness in the brachial artery was performed automatically using the Mobil-O-Graph noninvasive equipment, by means of oscillometric measurements in the upper limb. This equipment uses a classic MAPA device for measuring long-term blood pressure and offers the option of calculating arterial stiffness through Pulse Wave Analysis (PWA). The device involves placing a sensor-coupled cuff on the right upper limb of the patient, after measurement of the perimeter of the limb and choice of the appropriate cuff. No previous patient preparation is necessary and the examination takes about eight minutes.

The Mobil-O-Graph device used to obtain the hemodynamic data can provide a series of useful results in the evaluation of the vascular condition of patients[17]. Using a specific software program (HMS Client-Server data management software) the equipment correlates the measurements of BP and PWA with data provided, such as weight, height, age, and performs several mathematical calculations involving algorithms that provide indicators of the vascular condition of the individual. The present study mainly used the PWA results, which has been recommended as an indicator of arterial stiffness in several studies, and has been used as an auxiliary tool to diagnose conditions related to vascular pathologies[17,18]. In addition to the hemodynamic indicators, the software coupled to the device also provides body mass index (BMI) and body surface area data, which were also used in this study. All the data presented in Table 3 were obtained from the report prepared for each patient issued by the HMS Client-Server data management software.

The Mobil-O-Graph measurements are rated by the instrument into signal strength levels ranging from 1 (best signal level) to 5 (worst signal level). For each patient, three measures were considered, all which had level 1, 2 or 3 signal strength levels. The level 4 and 5 measurements were discarded as recommended by the validation study[17].

The results of all the variables determined by the Mobil-O-Graph were organized and the three groups of individuals were compared.

All the examiners in the present study underwent training to calibrate the results. The clinical evaluation of the patients was carried out by a geriatrician, the measurements of the hemodynamic parameters were taken by two students of the medicine course accompanied by a cardiologist, and the imaging examinations were performed by a specialist in this area.

The inclusion criteria of the study were patients aged 60 to 80 years diagnosed as having AD or VD or MCI according to the clinical and imaging tests cited throughout the methodology of this study. The exclusion criteria included patients who did not undergo all the clinical or imaging or biochemical examinations essential for group classification studied, those aged over 70 without a companion, and patients with uncertain classifications or mixed dementias.

The qualitative variables were presented as absolute and relative frequencies and the quantitative data as mean ± SD. The quantitative variables were submitted to the Shapiro-Wilk normality test. The association between categorical variables was assessed through multinomial logistic regression. Single factor variance was used for the comparison of the means of the three groups. The analyzes were developed in software R version 3.2.2 and a level of significance of 5% was applied.

The elderly with mild cognitive impairment and those under the age of 70 signed a Free and Informed Consent Form (FICF) after clarification of any questions about the study. Patients with moderate dementia or aged over 70, regardless of the degree of cognitive impairment, had the FICF signed by their accompanying legal guardian.

The present study was submitted to the Minas Gerais Medical Science Research Ethics Committee (CAAE: 36417014.4.0000.5134) and approved (approval number: 875.058).

RESULTS

The sample of the present study consisted of 46 individuals of whom 25 were women and 21 were men. Of the subjects participating in the study, 18 (39.1%) belonged to the MCI group, 18 (39.1%) to the AD group and 10 (21.8%) to the VD group. The mean age, BMI and body surface area of the participants were 74.07±5.03 years, 26.06±4.46 kg/m^2 and 1.73±0.19 m^2, respectively.

There was a higher proportion of individuals with normal echographic findings in the MCI group (44%) than in the AD group (6%, *p*-value 0.025). We did not find a direct association between large lesions of the carotid arteries and dementia. There was a greater predominance of atheromatosis in the carotid artery in AD (72%) and VD (80%) patients than in individuals with MCI (38%). These data were not statistically significant for the sample of the present study, however. (Table 1).

A higher proportion of individuals with normal brain imaging findings was found in the MCI group (44%) than in the AD group (0%, *p*-value 0.020). Obstructive microangiopathy was more prevalent in the AD group (72%) than the MCI group (17%, *p*-value 0.008) (Table 2).

No significant differences were found in the cardiovascular indicators of arterial stiffness measured in the brachial artery by the indirect PWA method for any of the variables studied, as can be seen in Table 3.

Table 1. Ultrasound findings assessed by duplex carotid artery scan with numerical and percentage representation for each group. Belo Horizonte, Minas Gerais, 2016.

Ultrasound findings	Groups			
	MCI n (%)	AD n (%)	VD n (%)	Total n (%)
Normal	8 (44)*	1 (06)*	0 (00)	9 (19)
Stenosis lower than 60%	1 (06)	1 (06)	2 (20)	4 (09)
Atheromatosis	7 (38)	13 (72)	8 (80)	28 (61)
Increase in intima-media thickness	2 (12)	3 (16)	0 (00)	5 (11)
Total	18 (100)	18 (100)	10 (100)	46 (100)

MCI: mild cognitive impairment; AD: Alzheimer's disease; VD: vascular dementia; *Significant differences between pairs (p<0.05) evaluated through multinomial logistic regression.

Table 2. Imaging findings from computed tomography of the encephalon or magnetic resonance of the encephalon. Belo Horizonte, Minas Gerais, 2016.

Encephalon image finding	Groups			
	MCI	AD	VD	Total
	n(%)	n(%)	n (%)	n (%)
Normal	8 (44)*	0 (00)*	0 (00)	8 (17)
Age-compatible atrophy	7 (39)	2 (11)	0 (00)	9 (20)
Obstructive microangiopathy	3 (17)*	13 (72)*	0 (00)	16 (35)
Atrophy in the hippocampus	0 (00)	2 (11)	0 (00)	2 (04)
Lacunar infarcts	0 (00)	0 (00)	7 (70)	7 (15)
Ischemic injuries	0 (00)	1 (06)	3 (30)	4 (09)
Total	18 (100)	18 (100)	10 (100)	46 (100)

MCI: mild cognitive impairment; AD: Alzheimer's disease; VD: vascular dementia; *Significant differences between pairs ($p<0.05$) evaluated through multinomial logistic regression.

Table 3. Comparison of data obtained for groups studied from Software HMS Client-Server data management reports. Belo Horizonte, MG, 2016.

Variables	MCI Mean ± sd	AD Mean ± sd	VD Mean ± sd	*p*-valor
Age (years)	72.89 ± 4.57	75.83 ± 4.45	72.89 ± 6.39	0.158
BMI (kg/m^2)	26.17 ± 3.61	26.46 ± 5.44	25.12 ± 4.19	0.749
Body surface (m^2)	1.76 ± 0.21	1.71 ± 0.18	1.72 ± 0.13	0.708
Peripheral systole (mmHg)	125.84 ± 18.31	127.74 ± 20.99	132.84 ± 16.69	0.649
Peripheral diastole (mmHg)	77.19 ± 10.05	74.10 ± 14.25	79.66 ± 15.33	0.540
Mean blood pressure (mmHg)	99.49 ± 13.21	98.67 ± 16.44	103.96 ± 14.75	0.650
Pulse pressure (mmHg)	48.71 ± 11.88	53.64 ± 12.75	53.17 ± 12.44	0.446
Heart rate (bps)	76.48 ± 12.11	71.38 ± 10.21	67.57 ± 9.91	0.112
Central systole (mmHg)	114.82 ± 16.90	115.71 ± 18.91	118.67 ± 16.43	0.855
Central diastole (mmHg)	78.06 ± 10.91	75.4 ± 14.38	82.09 ± 15.28	0.451
Central pulse pressure (mmHg)	36.39 ± 9.90	40.13 ± 9.62	36.58 ± 5.76	0.414
Pulse Width Amplification	1.38 ± 0.17	1.34 ± 0.09	1.46 ± 0.24	0.180
Systolic volume (ml)	71.32 ± 14.24	67.91 ± 11.09	74.29 ± 11.01	0.416
Cardiac output (l/min)	5.29 ± 0.73	4.76 ± 0.60	5.23 ± 0.79	0.065
Total vascular resistance (mmHg/ml)	1.14 ± 0.12	1.26 ± 0.27	1.24 ± 0.29	0.262
Cardiac output	3.03 ± 0.43	2.86 ± 0.58	3.07 ± 0.51	0.485
Pressure augmentation (mmHg)	7.44 ± 3.06	12.30 ± 8.10	9.33 ± 5.47	0.061
Reflection coefficient (%)	68.64 ± 9.81	68.29 ± 9.01	61.68 ± 9.47	0.143
Augmentation index (L/min/m^2)	19.99 ± 9.59	25.09 ± 9.82	20.57 ± 9.28	0.251
Pulse wave velocity (m/s)	10.48 ± 1.13	11.14 ± 1.18	10.83 ± 1.34	0.258

MCI: mild cognitive impairment; AD: Alzheimer's disease; VD: vascular dementia; BMI: body mass index; Comparison between groups in relation to the measurements (mean ± sd). *P*-values refer to single-factor analysis of variance.

DISCUSSION

Since 1955, dementias related to aging have been classified into two types: VD, caused by focal atrophic ischemic lesions, and AD, caused by cortical neurodegenerative process[19]. Differentiation between the two types of dementias is often difficult and involves a number of clinical tests and imaging exams. Identifying the type of dementia is extremely important as treatment depends on the correct diagnosis[7,19].

Based on imaging and cognitive tests, the 46 patients evaluated in this study were classified into three groups (AD, VD and MCI). As recorded in Table 3, the sample was largely homogeneous and there was no statistical difference in the BMI, ages or body surface areas of the three groups evaluated.

In the present study, ultrasonographic findings assessed by carotid artery duplex scanning (Table 1) were not directly associated with large lesions of the carotid arteries and dementia. Some works in literature have stated that stenosis of the large cranial vessels and atherosclerosis are risk factors for the development of dementia[20,21]. The Barcelona-Asia study (2013) involving 714 Caucasian subjects failed to find an independent association between stenosis of the large intracranial vessels and a decline in cognitive performance[22], which corroborates the findings of the present study and also the results obtained by Suemoto et al.[20] which failed to correlate an increase in intima-media thickness with a higher prevalence of cognitive decline. However, some studies still suggest that such damage may be an indicator of the evolution of these profiles to cognitive decline[23, 24].

The neuroimaging examinations (Table 2) were used to exclude expansive lesions such as subdural hematomas, hydrocephalus, tumors, granulomas or other images that might be associated with non-dementia profiles. DA. Wiederkehr et al.[25] demonstrated that no neuropathological marker exists that can be widely used for the diagnosis of VD. In this study, the findings of lacunar infarcts and well-defined ischemic lesions, when combined with clinical evaluation, cognitive decline and Hakinski scale scores greater than 4, were classified as VD[25,26].

It was noted that there was a predominance of obstructive microangiopathy in the AD group (Table 2). This finding reinforces the theory that vascular pathogenesis is more present in the small vessels in neurodegenerative disorders associated with cognitive deficits classified as AD[27, 28].

The sample of the present study was similar to that of other works in literature that evaluated similar parameters in the same population[29]. However, the present study was not able to identify any significant differences in the hemodynamic parameters between the different groups evaluated, unlike the study by Dhoat et al.[29], which showed, for example, a much higher pulse pressure and augmentation rate among patients with VD than in individuals with AD and controls. However, as observed in the present study, Dhoat et al.[29] did not find differences in PWA among the different groups. Three similar studies found higher PWA values in VD patients than in AD groups[18,30,31]. Scuteri et al., meanwhile, using a larger sample (41 patients with VD, 24 with AD and 19 controls) found a small difference in PWA between the VD and AD groups, with the PWA value higher among patients with VD. This differs to the findings of other studies, which identified higher PWA values for patients with AD than those with VD[18, 30,31].

Studies that have found an increase in PWA among VD patients in comparison to AD patients mostly propose the use of this parameter as a diagnostic aid for the differentiation between the two types of dementia[18,30,31]. PWA measurement can now be easily obtained using simple equipment in a non-invasive manner and at a relatively low cost. These new devices allow the correlation of PWA with other parameters such as BP and heart rate, making it possible to calculate other variables that may be useful in the prediction of cardiovascular comorbidities[17,32]. Some studies have shown that both VD and AD are strongly associated with cardiovascular risk factors such as hypertension, diabetes and dyslipidemia[3,4,33]. Parameters such as PWA may also be highly influenced by miscellaneous medicinal products such as the antihypertensive vasodilator agents frequently used by elderly people with cognitive impairment[34,35]. Thus, the use of parameters such as PWA in the differential diagnosis of AD and VD still requires further evaluation. The present study further strengthens

this idea, as significant differences in noninvasive hemodynamic parameters were not found among patients with VD and AD.

The present study is considered a pilot study and has limitations such as the relatively small number of elderly participants. These parameters can be further studied, in works with larger samples and involving several health services.

CONCLUSION

The hemodynamic parameters evaluated in this work by noninvasive methods such as pulse wave velocity, central pulse pressure, mean arterial pressure and other measurements related to arterial stiffness did not differ among individuals with vascular dementia, Alzheimer's dementia or mild cognitive impairment. The results obtained do not support the possibility that these methods can be used in the differential diagnosis of the two pathologies. Studies involving a greater number of research subjects and the involvement of several health services are necessary to confirm these observations.

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Medication use by the elderly: analysis of prescribing, dispensing, and use in a medium-sized city in the state of São Paulo

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Abstract

Objective: To describe the prescribing, dispensing, use, adhesion, and storage of medicines to and by the elderly. *Method:* A descriptive cross-sectional study was performed in Estratégia Saúde da Família (Family Health Strategy) health centers (ESF), in Marília in the state of São Paulo, Brazil, based on the records of and interviews with 114 individuals seven to ten days after a medical consultation. A descriptive analysis was carried out. *Results:* The mean number of prescribed drugs was 4.98 per elderly patient. Of the total number of prescribed drugs, 81.5% were supplied by public services, with the nutrient (50%); antilipemic (62.1%); analgesic (30.7%); dermo-protector (66.6%); herbal (40%) and parasite and antifungal (37.5%) classes dispensed the least. A total of 83.8% of the prescribed drugs were used, while the drugs dispensed at the lowest rates were not used by the elderly, except for analgesics. A total of 40.3% of the respondents exhibited low adherence. Most stored their medicines in a suitable place. *Conclusion:* The prescribing, dispensing, use and storage of medications to and by the elderly can be considered effective, but adherence remains low, requiring new strategies and interventions.

Keywords: Elderly. Drug Utilization. Drug Prescriptions Family Health Strategy.

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INTRODUCTION

The use of medication is a frequent occurrence among the elderly, and while it contributes to prolonging and improving life, it can also generate serious health problems, especially when it is inadequate, either due to the prescription, dispensation or taking of the drugs[1]. The indiscriminate use of medicines has a clinical and economic impact, and is considered a key indicator of patient safety[2].

In Brazil, approximately 80% of elderly persons living in the community use at least one type of medication[2,3]. The use of more than one drug is also a common practice among this group, and may lead to complications arising from adverse reactions[4].

The World Health Organization (WHO) considers that more than 50% of drugs are prescribed or dispensed inadequately and that 50% of patients use medicines incorrectly. The most common targets of inadequate drug use are individuals who use polypharmacy, the inappropriate use of antibiotics and injectable drugs, self-medication, and prescription that disagrees with best practices[5]. There are also shortcomings in the selection, supply and quality control processes and a lack of treatment guidance, which results in low adherence, misuse and ineffective treatment[5].

Policies have been proposed aimed at achieving more adequate medication use in Brazil. At the national level, the National Medication Policy[6] is the main instrument for guiding health actions related to the use of drugs. Its main objective is to guarantee the safety, efficacy and quality of medicines, to promote their rational use and to ensure the access of the population to those drugs that are considered essential. Among the priorities are the promotion of the rational use of medicines, which includes appropriate prescription, timely availability and affordable prices; adequate dispensing and the consumption of effective, safe and high-quality medicinal products at the recommended doses at defined intervals and within the suggested period of time[6].

Another important aspect to consider is the timing of dispensation. Law No. 5991, dated December 17, 1973, which regulates the "sanitary control of the commercialization of drugs, medicines, pharmaceutical supplies and related products" in Brazil, adopts the following guidelines for dispensing: "the supply of drugs, pharmaceuticals, pharmaceutical supplies and related items, whether remunerated or otherwise"[7].

In the context of the adequate use of medication, adherence is an even more complex condition, as it is a multifactorial process, encompassing physical, psychological, social, cultural, economic and behavioral aspects that require shared decisions and co-responsibility between the sick person, the health team and the social network[8].

The present study aims to characterize and describe the practice of prescribing, dispensing, using, adhering to and storing medications by elderly users of the Estratégia Saúde da Família (the Family Health Strategy) (ESF) in the city of Marília, a city in the state of São Paulo, with the aim of supporting policies and actions that encourage their proper use.

METHODS

A descriptive and cross-sectional study was carried out in ESF units in a city located in the central-west of the state of São Paulo, with a population of approximately 220,000 inhabitants. Of these, 28,600 are elderly, representing 13% of the total population (Instituto Brasileiro de Geografia e Estatística Brazilian) (Institute of Geography and Statistics) (IBGE)[9].

The basic health care network of the city is composed of 12 Unidades Básicas de Saúde (Basic Health Units) (UBS) and 34 Family Health Strategy (ESF) units, which are the gateway to the health system. The ESF units serve approximately 54% of the total population of the city. The supply of medicines in each of the Basic Health Units occurs through a monthly request which falls under the responsibility of the nursing team.

In addition, the city also has a Unidade Central da Assistência Farmacêutica (Central Pharmaceutical Assistance Unit) (UCAF), which meets requirements

derived mainly from hospital and outpatient care units, as well as from long-term care institutions. It is important to note that standardized and available drugs are provided, where the prescription uses the generic name, in accordance with current legislation. The city also has two Farmácia Popular do Brasil (Brazil Popular Pharmacy) units, a federal government program that provides medicines at cost price via prescriptions. In 2005, the Farmácia Municipal de Manipulação (Municipal Compounding Pharmacy) (Fitosaúde) was established, which dispenses medicines for the prescriptions of patients receiving care through the Sistema Único de Saúde (Unified Health System) (SUS) of the city of Marília and, in 2009, the Farmácia de Medicamentos Excepcionais (Exceptional Medicines Pharmacy) (Medex) of the Marília Health Region was created, which provides rare and costly drugs for some specific pathologies[10].

For data collection, two ESF units from each region of the city (north, south, east and west) were drawn, giving a total of eight. For the sample calculation, the estimated population of elderly people included in the ESF was considered. Among the 28,600 elderly persons, the prevalence of medication use was 80%, with a margin of error of 10% and a confidence level of 99%. A value of 10% was added to the total to cover possible losses or refusals, resulting in a sample of 114 elderly persons.

A total of 30 elderly people from the eastern region, 25 from the southern region, 33 from the north region and 26 from the western region were interviewed, considering the proportion of the population by area of coverage, giving a total of 114 elderly people. Included in the study were elderly people who could communicate clearly or who were accompanied by a caregiver, while those who were not at home on three visits or who could not communicate clearly and were alone at home at the time of the visit were excluded. The study was carried out from July to December 2013 and was supported by Community Health Agents who took the researcher to the homes and introduced the same to the elderly persons and their relatives.

Data collection was performed by one of the authors. Initially, medical records were consulted to obtain information about the prescribed drugs and the address of the elderly, soon after they had attended a medical consultation. Seven to ten days after the medical consultation, home visits were carried out and all those who agreed to participate in the study were interviewed using a previously prepared instrument. When the elderly person was unable to provide the information, it was supplied by the caregiver or family members.

Sociodemographic and epidemiological data were collected, such as skin color/ethnicity, schooling, occupation, family income, health plan, reported diseases, hospitalization in the previous year, and the economic status of each elderly person using the Brazilian economic classification scale. In order to evaluate social class, the Critério de Classificação Econômica Brasil (Brazilian Economic Classification Criterion) (CCEB) was applied, divided into six classes (A1, A2, B1, B2, C and D)[11]. In addition, the following items were verified: the form of acquisition of the medicines prescribed at the last consultation (whether through purchase in private pharmacies or through dispensing via public and/or private services); which medications prescribed at the last visit were currently being used; if other continuous use drugs had been prescribed, and also adherence to regular medications.

In order to verify adherence, a question was asked about the correct use of medication, as proposed by Haynes et al.: *Most people have trouble taking pills, in the last 30 days have you had some difficulty taking yours?* If the answer is affirmative it indicates that the individual is non-adherent[12,13]. To identify the degree of adherence to drug treatment, the Morisky test was employed, which is widely used by Brazilian studies in this area due to its reliability.

In this test, the patient is classified as belonging to the high degree of adherence group when all the answers are negative, while when at least one of the answers is affirmative, the patient is classified as belonging to the low adherence group. The Morisky test also allows us to discriminate whether low-adherence behavior is unintentional or intentional[12,13].

Another evaluated item was the form and storage conditions of the medications, at which point the

participant was asked to show where the medicines were stored.

The drugs were classified according to the Anatomical Therapeutic Chemical (ATC) Classification System[14], with information about the class and the active principle according to the anatomical group or system in which it acts also included. A descriptive analysis of the data was carried out.

To comply with the ethical concepts of research involving human beings, the present study received the authorization of the Municipal Health Department and was approved by the Ethics Committee on Research involving Human Beings of the Faculdade de Medicina de Marília (Marília Medicine School), under Opinion Nº 303.105 dated 13/06/2013. The participants were advised of the procedures of the study and when in agreement signed a Free and Informed Consent Form.

RESULTS

A total of 114 elderly people participated in the study. In terms of the main demographic characteristics, 62.3% (n=71) were women, 53.5% (n=61) were aged 60-69 years, 92.1% (n=105) had little or no schooling; 78.9% (n=90) were retired or pensioners; 14.9% (n=17) lived alone; 98.2% (n=102) belonged to social classes D and C; and 6.1% (n=7) had a Private Health Plan (Table 1).

Table 2 shows the diseases reported by the elderly persons interviewed, grouped according to the ICD 10. Of the interviewees, 85.0% (n=97) reported diseases of the Cardiovascular System, with SAH the most frequently mentioned. Endocrine, nutritional and metabolic diseases were reported by 46.5% (n=53) of the elderly, with a predominance of Diabetes Mellitus; followed by infectious and osteoarticular diseases, mainly chronic pain. The average was two diseases described per elderly person.

Table 1. Sociodemographic variables of 114 elderly persons resident in the area covered by the eight family health units. Marília, São Paulo, 2014.

Age (years)	Number (%)
60-69	61(53.5)
70-79	39(34.2)
≥80	14(12.3)
Gender	
Female	71(62.3)
Male	43(37.7)
Marital Status	
Lives alone (single, widowed, separated, divorced)	58(50.9)
Married/common-law-marriage	56(49.1)
Schooling (years)	
None	39(34.2)
≤4	66(57.9)
+ 4	09(07.9)
B2	02(01.8)
C	50(45.0)
D	59(53.2)
Health Plan	
No	107(93.9)
Yes	07(06.1)

Table 2. Diseases described by 114 elderly persons interviewed based on International Classification of Diseases (ICD-10). Marília, São Paulo, 2014.

Diseases reported	Number (%)
Cardiovascular disease	97 (85.0)
Systemic Arterial Hypertension	79 (69.3)
Cardiac insufficiency	2 (01.7)
Coronary insufficiency	4 (03.5)
Others	5 (04.4)
Heart Arrhythmia	7 (06.1)
Endocrinopathy	53 (46.5)
Type 2 Diabetes Mellitus	35 (30.7)
Hypothyroidism	9 (07.9)
Dyslipidemia	9 (07.9)
Osteoarticular	19 (16.7)
Osteoarthrosis	7 (06.1)
Chronic Pain	12 (10.6)
Intestinal Gastrointestinal Tract	3 (02.6)
Gastritis	2 (01.7)
Cholecystitis	1 (00.9)
Central Nervous System	7 (06.1)
Headache, Dementia, Stroke Sequela	4 (03.5)
Epilepsy	3 (02.6)
Psychiatric	5 (04.4)
Depression	5 (04.4)
Genito-Urinary	9 (07.8)
Urinary Incontinence, Urinary Tract Infection	6 (05.2)
Pelvic Inflammatory Disease	3 (02.6)
Respiratory Tract	6 (05.2)
Chronic bronchitis	2 (01.7)
Asthma	1 (00.9)
Emphysema	3 (02.6)
Infectious diseases	17 (14.9)
Respiratory Tract (Cold / Flu)	16 (14.0)
Pneumonia	1 (00.9)
Hematologic System	5 (04.4)
Anemia	5 (04.4)
Other (Chronic Ulcers, Pressure Ulcers)	3 (02.6)
Total	224 (100)*

*Some of the 114 elderly persons described more than one disease.

According to the medical records of the 114 elderly people who had attended a medical consultation, 568 medications were prescribed, with an average of 4.98 medications per elderly person. The most prescribed drugs were those of the Cardiovascular Apparatus (38%) (n=216), followed by drugs that work in the Digestive System (10.9%) (n=62), especially antacids; and those of the Endocrine (10.6%) (n=60) and the Central Nervous Systems (10.2%) (n=58), mainly antidepressants (Table 3).

Table 3. Classes of Medications prescribed and dispensed in the Health Unit and used by patients. Marília, São Paulo, 2014.

	Prescribed	Dispensed	%*	Used	%**
Central Nervous System	58	54	93.1	54	93.1
Antidepressants (Fluoxetine, Amitriptyline)	29	26	89.6	26	89.6
Anxiolytics and Hypnotics (Diazepam, nitrazepam, clonazepam)	16	16	100	16	100
Antipsychotics, Neuropiletics and Anti-Parkinson (chlorpromazine, Clonazepam, Benzerazide, Lithium Carbonate)	8	8	100	8	100
Anticonvulsants (Phenobarbital)	5	4	80.0	4	80.6
Cardiovascular system	216	172	79.6	179	82.8
Antihypertensives (Atenolol, Propranolol, Enalapril, Losartan)	127	115	90.5	115	90.5
Antiplatelet Agents and Antithrombotics (ASA)	43	42	97.6	42	97.6
5Antilipemic (Simvastatin, Ciprofibrate)	37	14	37.8	14	37.8
Other (Flunarizine, Warfarin, Diosmin, Mon. Isosorbide)	9	1	11.1	8	88.8
Urinary system	52	49	94.2	45	86.5
Loop and Thiazide Diuretics (Furosemide, Hydrochlorothiazide, Spironolactone)	52	49	94.2	45	86.5
Digestive System	60	43	71.6	43	71.6
Antacid and Inhib. Gastric Sections (Omeprazole)	31	29	93.5	29	93.5
Nutrients (Ferrous Sulfate, Complex B)	20	10	50.0	10	50.0
Others (Buscopan, mineral oil, Saccharomyces Boulardil)	9	4	44.4	4	44.4
Muscular and Skeletal System	30	25	83.3	29	96.7
Non-steroidal Anti-inflammatory, Steroid	15	14	93.3	14	93.3
Non-Opoid Analgesics, antipyretics	13	9	69.2	13	100
Sodium alendronate)	2	2	100	2	100
Respiratory system	23	23	100	23	100
Bronchodilators and antiasthmatics (aminophylline, bamiphyline, formoterol fumarate, budenosine)	18	18	100	18	100
Expectorant (Carbocysteine)	5	5	100	5	100
Endocrine system	60	56	93.3	57	95.0
Insulin and Other Diabetic Agents (Metformin, NPH Insulin)	48	44	91.7	45	93.8
Thyroid Hormone (Levothyroxine)	12	12	100	12	100
Herbal Medicines or Medicinal Herbs	25	15	60	18	72.0
Dermoprotector	9	3	33.3	9	100
Antiparasitics and Antifungals	8	5	62.5	6	75.0
Antimycotics and Antifungals (Ketoconazole, Fluconazole)	8	5	62.5	6	75.0
Antimicrobials (Amoxilin, Cyprofloxaxin, etc.)	14	11	78.6	11	78.6
Other (Antihypertensive, Anti Glaucomatous)	13	7	53.8	2	15.4
Total	568	463	81.5	476	83.8

* Percentage of times the medication was prescribed; ** Percentage of the time the prescribed medication was used by the patient.

Of the drugs prescribed by the ESF, 75.5% (n=429) were dispensed by the unit itself, 4.4% (n=25), by Medex and 1.58% (n=9) were acquired from the Farmácia Popular, meaning that 81.5% of the medicines were dispensed by the public service.

Among the drugs prescribed, it is worth noting some classes were dispensed in smaller quantities by public health services, mainly nutrients (50%); antilipemics (62.1%); analgesics (30.8%); dermoprotectors (66.6%); phytotherapics (40%) and antiparasitics and antifungals (37.5%).

Among the drugs prescribed, some classes were used less, such as antilipemics (62.1%), nutrients (50%), herbal remedies or medicinal herbs (28%), antimycotics and antifungal drugs (25%) and antimicrobials (21.4%). Analgesics, even when not dispensed by public health services, were used by almost all the elderly.

Table 4 shows the Degree of Adherence to the treatment. Of the interviewees, 59.6% (n=68), were classified as adherent. The other 40.3% (n=46) presented moderate to low adherence, of which 22.8% (n=26) were classified as intentionally non-adherent, while in 6.14% (n=7) the low adherence was characterized as unintentional. Of the elderly persons interviewed, 11.4% (n=13) presented both types of behavior. Moderate or low adherence was also verified in 28.9% (n = 33) and 11.4% (n=13) of the elderly, respectively.

In terms of the storage of the medications, 655 drugs were found in the homes of the elderly, representing those that were prescribed at the last medical consultation and other non-prescribed drugs in use.

According to Table 5, the majority of the elderly, 68.4% (n=448), stored their medications in the kitchen cabinet or drawer. Medicines exposed to sunlight, humidity or excessive heat were not found. It was noted, however, that 9.6% of the patients (n=11) kept their medications without their packaging (blister pack or box), making it difficult to identify them at the time of use.

Table 4. Degree of Adherence of patients according to Morisky Green Test. Marília, São Paulo, 2014.

Degree of Adherence (positive response)	Number (%)
Adherent (none)	68 (59.6)
Moderate adhesion (1 or 2)	33 (28.9)
Low adhesion (3 to 4)	13 (11.4)
Total	114 (100)

Table 5. Storage location of medications used by patients. Marília, São Paulo, 2014.

Storage location	Number (%)
Kitchen Cabinet or Drawer	448 (68.4)
Bedroom Cabinet or Drawer	134 (20.4)
Bathroom Cabinet or Drawer	37 (5.6)
Next to Water Filter	12 (1.8)
On top of refrigerator	5 (0.7)
Other	19 (2.9)
Total	655(100)

DISCUSSION

The present study evaluates the prescription, dispensing and use of medications by 114 elderly people. These individuals were mostly female, lived without a partner, had a low level of schooling and lived off their pensions, as other studies of the elderly population have shown[15].

In terms of reported medical diagnosis, diseases of the Cardiovascular System (Hypertension), the Endocrine System (Type 2 Diabetes Mellitus and Hypothyroidism) and Infectious (Cold/Flu) and Osteoarticular diseases (chronic joint pain) were the most prevalent, data that reinforces the findings of other studies[16,17]. These conditions require constant monitoring by health teams and proper monitoring and control, as well as the regular dispensing of medications.

A finding of polypharmacy was expected for this segment of the population. The explanation for this condition is multifactorial, as it is mainly influenced by the accumulation of multiple chronic diseases and clinical manifestations resulting from aging, as well as a lack of preparation among health professionals to provide rational pharmacological interventions for patients who require them. A more thorough and systematic approach is therefore needed for elderly persons who genuinely require drug interventions[18].

The groups of medications most used by the elderly were those that relate to the Cardiovascular and Endocrine Systems and which work in the Central Nervous, Urinary and Digestive systems. These results corroborate the morbidity profile found and the results obtained in the study carried out in Goiânia (Goias)[16]. They are also linear to the prevalence and accumulation of pathologies of these systems which, in this age group, often require pharmacological interventions for their control. Compensatory pharmacological intervention occurs in the digestive system in order to correct dysfunctions or to protect the system against aggressions derived from polymedication[19,20].

Such diseases clearly require constant investment in strategies that promote health, support their control and the prevention of complications, and focus on maintaining independence, so preventing and delaying potential illnesses and disabilities, as well as in the timely provision of treatment[16].-

When analyzing adherence to drug treatment, it was found that 22.8% exhibited non-adhesive behavior, numbers slightly greater than a study carried out in Belo Horizonte (Minas Gerais), where non-adherents represented 22.5% of the sample[21].

In the evaluation of degree of adherence to treatment, it was observed that 40.3% of the patients presented low adherence, a result consistent with that of several studies in Brazil and other developed countries[22]. The percentage of drug treatment adherence ranged from 26.7% in Teresina (Piaui)[23] to 43.3% in Santa Catarina (Santa Catarina)[24].

Adherence problems are found in all situations where there is self-administration of treatment, regardless of the type of disease or the quality of and/or accessibility to health resources. The belief that patients are solely responsible for adherence is a misconception as several factors affect their behavior and adherence. These include social, economic and cultural factors and those related to the functioning of services, health professionals, basic diseases, comorbidities; treatment and, finally, the behavior of the patients themselves[25].

In the present study, forgetfulness and the delayed taking of medications were described as the main causes for non-adherence to correct treatment. These are involuntary and unintentional behaviors and are similar to the problems related to non-adherence to treatment described in other Brazilian cities. They can potentially be improved by staff education and guidance strategies, in comparison with intentional non-compliance attitudes[24,25].

Another variable associated with adherence is the patient's access to drug treatment. For the majority the drugs they did not use were those that were not dispensed, except for analgesics, which, even when not provided were used regularly. The results of another study carried out in the southern and northeastern regions of Brazil revealed inequity in health as a relevant factor, reinforcing the need for policies to increase access for poor and disadvantaged populations[26].

In the present study, 81.5% of the prescribed drugs were dispensed by public services, 83.8% of which were used by the elderly. A similar result was found in the municipality of Florianopolis (Santa Catarina)[27]. This result is also in line with the WHO reference value, which considers access to medicines above 80% desirable[28].

The common causes for the difficulty of access of the elderly to medication refer to the ignorance of where and how to acquire such drugs and the difficulty of movement of the elderly population. Approximately 25% of the medicines were not dispensed by the health unit where the elderly individuals had their medical consultation and of these, only 6% were acquired in other public services, which suggests that this population may have encountered difficulty accessing their medication, even when available in another public service. Although this condition was not the subject of the present study, the fact that waiting times and the location for the delivery of medicines, especially of exceptional medicines, may have caused suffering for those who need them and can lead to the abandonment of treatment[29]. It should be noted that a large percentage of the prescription drugs are included in the REMUME list, which should be a motivation for administrators to ensure their supply on a regular basis, as well as making them available in a location that is easily accessible to the elderly.

Despite this, it was noted that the majority of the drugs of continuous use such as antihypertensives and antidiabetics were dispensed to approximately 90% of the elderly.

A study that also analyzed the access of the population to drugs prescribed by public services, based on the 2008 Household Sample Survey, found that only 45.3% were dispensed[30].

Given the expansion of this age group, the complexity of the management of Pharmaceutical Care in Brazil has grown, as the budget provided for the acquisition of drugs prescribed in the SUS tends to become increasingly significant and costly.

It was found that anti-lipemic drugs were not dispensed and were not being used by 62.1% of the elderly persons to whom they were prescribed. This data should be of concern, since a study that accompanied elderly patients with dyslipidemia treated with drug therapy and dietary control for one year found a clinically relevant reduction in lipid levels. Failure to control these levels increases cardiovascular risks[31].

The low use of antilipemics suggests the existence of a management problem, since, for the most part, these medications are included in the list of high cost drugs distributed by Medex.

In terms of nutrients, it was found that these were not widely dispensed or used. It is important to consider that, in the presence of nutritional changes, the actions of some medications may be modified. The deficiency of proteins and micronutrients, for example, can lead to the production of alkaline urine and the reabsorption of alkaline compounds, prolonging their half-life in the body[32].

In contrast, the present study found that the elderly used the analgesics prescribed, even though most of them were not dispensed. The prescribing of analgesics, as it occurs where conditions and quality of life are significantly affected, may lead the elderly to acquire such drugs themselves. The occurrence of pain and the use of analgesics has increased in recent decades due to the prolonged life of individuals and the reduced tolerance to pain and suffering that is often observed[33].

It should be emphasized that the prescription of analgesics is appropriate conduct on the part of the prescribing health professional, as the prolonged use of non-hormonal anti-inflammatory drugs or hormones by the elderly to control chronic pain would be inappropriate, except under very particular conditions and when closely controlled, considering the significant metabolic, hemodynamic and gastrointestinal complications that result from such interventions[34]. As for the use of herbal remedies and medicinal herbs that were dispensed to a lesser extent by the public services, it was found that these were not used by the elderly.

Regarding suitable storage locations for the medicines, it was observed that the great majority of the elderly population kept the medicines away from the light or excessive heat, usually in the kitchen,

facilitating access and serving as a reminder to take them. However, the fact that some elderly persons keep their medicines without their packaging makes their recognition and proper use difficult, potentially leading to medication swapping and over-dosage. The absence of primary packaging was found in most of the households visited. The average number of drugs stored was 7.3 per household and the most common classes were antihypertensive, oral hypoglycemic agents and diuretics[35].

The present study has many limitations due to its descriptive nature. The objective of the study was not the identification of the clinical aspects of the patients or the morbidities and comorbidities associated with drug intervention. Nevertheless, the prevalence of the morbidities identified was similar to those found in other recent Brazilian publications, which corroborates its external validity, or in other words, the patients studied have characteristics very similar to the average for the Brazilian population in this age group. In addition, it is not common to concomitantly and simultaneously evaluate aspects related to pharmacological intervention in the elderly, such as the prescription, dispensing, use and storage of the drugs recommended to them, which is one of the contributions of this study.

CONCLUSIONS

The classes of drugs available in the municipality account for 81.5% of the required drugs prescribed for the elderly. It is undeniable that the availability of free drugs, offered by the municipal, state and federal governments, has facilitated access to the prescribed drug treatment, which may mean greater control of diseases. The prescription, use and adequate home storage of medications, despite some problems being observed, gives the elderly a new opportunity to control acute and mainly chronic diseases, contributing to their longevity.

Adherence to therapy, a complex and multifactorial problem, also faces difficulties similar to those identified in other national and international studies.

The results obtained in the present study reveal a local health system that works, at least in terms of the prescription, dispensation and use of medication, in a concatenated, consecutive and consequential manner, with surprisingly little discontinuity, given the disparities of access and complexity of the population in relation to health care.

However, the fact that approximately 20% of medicines were not dispensed by public services indicates that these obstacles should be evaluated and overcome in order to facilitate access. The results also reveal the need for organization of the flow of medication distribution and/or the inclusion of new drugs, such as antilipemics and nutrients, facilitating access to such medications and helping to better control the diseases for which they are risk factors.

The importance of an organized system within an interconnected and integrated network of pharmaceutical care, with established guidelines, flows, routines and protocols, that aims to facilitate the access and movement of elderly persons to medication, reducing costs and providing greater quality in the care of this population, cannot be understated.

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Characteristics of falls in elderly persons residing in the community: a population-based study

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Abstract

Object: to examine the characteristics to the last fall of Brazilian elderly persons who experienced falls in 2008 and 2009, and to identify if there is a relationship with sociodemographic characteristics, physical health, comorbidities, clinical conditions and the circumstances of the falls. *Methods:* a cross-sectional, population based study was carried out with participants aged 65 and older from Barueri in the state of São Paulo and Cuiabá in the state of Mato Grosso, Brazil. Households were enrolled within each census region according to population density and the number of elderly persons living in each region. A multidimensional questionnaire composed of sociodemographic factors and data regarding falls was used. Associations were analyzed using contingency tables, and Fisher's Exact or Pearson's Chi-square test was used. *Results:* 774 elderly people were included in the study, 299 of whom reported falling in the previous year. Of these, 176 (58.9%) had fallen once and 123 (41.1%) reported having fallen twice or more. Among fallers the mean age was 72.53 (±6.12) years and 214 (71.6%) were female. About 107 (35.8%) of the elderly reported having fallen forwards, 79 (26.4%) fell to the side and 42(14%) fell backwards. Regarding the circumstances of the falls, 107 (35.8%) reported having lost their balance, 79 (26.4%) said they had stumbled and 42 (14%) said they had slipped. There was an association between the mechanism and circumstances of the falls and having fallen once or twice or more. There was an association between the circumstances of falls and the number of medications taken. *Conclusion:* The characteristics of falls were different among elderly persons who had fallen once or twice or more, which may guide health professionals, the elderly and their families in relation to specific fall prevention strategies.

Keyword: Elderly. Accidental Falls. Epidemiology.

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INTRODUCTION

Increased longevity and life expectancy have brought changes in the epidemiological profile of the population, with an increase in the prevalence of non-transmissible chronic degenerative diseases, falls, and functional disability, such as reduced muscle strength and body balance[1]. These changes have an impact on the health system, both in terms of costs and the need to develop health care strategies at all levels[2].

The incidence and the severity of falls increase considerably after the sixth decade of life, tripling the rates of hospitalization among the elderly after the age of 65[3]. It is estimated that 30% of 60-year-olds living in the community fall every year, of whom half fall on a recurring basis. This proportion increases to 42% in elderly persons aged 70 years[4]. The prevalence of falls in Brazil varies from 30% to 38.7%[5]. Falls are considered a major cause of injury and death among the elderly and represent a major public health concern[4]. They can lead to severe trauma in the elderly, such as hip fractures and head trauma, contributing to the decline of functional capacity and autonomy, institutionalization, and increased mortality[6]. In Brazil, the Unified Health System spends more than R$51 million each year on the treatment of fractures caused by falls[7].

Falls are multifactorial events and stem from intrinsic and extrinsic factors. The first refer to the physiological alterations resulting from aging and sensory, neuromuscular, psycho-cognitive dysfunctions related to diseases and clinical conditions, compromising balance and gait[8]. Extrinsic factors include environmental hazards such as poor lighting, slippery or uneven flooring, loose rugs, high or narrow steps[8] which are factors related to the circumstances of the fall. Some studies in literature indicate that 75% of the elderly suffer a fall in their own home compared to the elderly who fall outside the home[9]. The room where most falls occur is the bedroom (25.2%), followed by the kitchen (16.8%) and the bathroom (14.5%)[10]. This can be explained by the fact that older people spend much of their time in their homes because it is the safest and most familiar place for them. Possibly, at home the elderly reduce the attention they devote to locomotion due to greater self-confidence and familiarity when moving between rooms[11].

Considering the serious harm that falls can cause in the elderly population, identifying the characteristics of the most recent fall through a population-based study allows populations to be characterized and preventive measures to be designed that avoid the occurrence of further falls. The analysis of the history of a fall event is established by the guidelines of the American Geriatrics Society and the British Geriatrics Society (Clinical Practice Guideline for Prevention of Falls in Older Persons)[12]. The characteristics of falls, particularly mechanisms and circumstances, can help identify profiles of elderly fallers and trigger assessment and intervention strategies.

The objective of the present study was to explore the characteristics of the most recent falls of Brazilian elderly persons who had fallen in the last year (2008 and 2009) and to identify if there is a relationship with sociodemographic characteristics, physical health, comorbidities, clinical conditions and the circumstances of the falls

METHOD

This is a cross-sectional population-based study, with a sample of 774 community-dwelling elderly people living in the city of Barueri, São Paulo and Cuiabá, Mato Grosso, Brazil. The study is part of a multi-center research project, made up of a multidisciplinary research network, called the FIBRA Network (Rede de Estudo da Fragilidade em Idosos Brasileiros) (Study Network of Frailty in Brazilian Elderly People).

The sample of the present study was composed of elderly individuals aged 65 years or older, male and female, living in the community in the municipality of Barueri and Cuiabá, Brazil, from March 2009 to April 2010. The sample was collected according to the causal clustering by area sampling method. In order to calculate the sample of each city, the sample size required based on a population proportion of 50% of a given characteristic under study (the value in which the sample size obtained is the maximum possible (p=0.50, q=0.50), according to the elderly

population of each city). The level of significance was set at 5% (alpha =5%, Z =1.96). Based on these calculations, the sample size for locations with less than one million inhabitants was 385 elderly persons. For the number and location of the households to be visited, IBGE data were used to locate the elderly. The proportion of elderly people in each census area was calculated in relation to the total number of elderly people in each city. Then, in each census sector, the density of elderly persons per household was calculated. After that, the number of elderly people in each census tract was divided by the density of the elderly per household, to obtain the number of households to be visited. Maps were provided by the IBGE and the city councils were provided to draw the blocks, and those where homes were to be visited were identified, counted and drawn. In each census area, an additional and proportional number of blocks was selected to cover refusals and absences (10%) and to compensate for losses due to the exclusion criteria (20%).

The categorical refusal of the elderly persons to participate, their declaration of impossibility or intention to interrupt their participation was considered as refusal. The elderly were approached up to three times before being considered a "refusal". Absences were considered where there was no answer at a house on the days of the first and two further visits. Participants with the following characteristics were excluded: a) severe cognitive deficit suggestive of dementia, evaluated by the mini mental state examination, adjusted for schooling, minus one standard deviation[13], b) wheelchair-bound or restricted to bed, provisionally or definitively; c) severe stroke sequelae, with localized loss of strength; d) severe or unstable Parkinson's disease; e) terminal stage cancer and those in treatment for the disease, except skin cancer. The interviewers were physiotherapists and physical educators previously trained to apply the questionnaire and to perform functional physical tests.

The dependent variables of this study were based on the self-reports of falls in the last twelve months, a fall (any fall event) and a recurrent fall (two or more fall events). A fall was considered "an unexpected event in which the subject finds themselves on the ground or at a lower level than before"[14]. For the characterization of the fall, the elderly were asked about their most recent fall, location, mechanism, circumstances, lighting at the time of fall, activity at the time of fall, time of day, consequences, need for rest, need to seek medical attention. The circumstance of a fall event was understood as the way in which the elderly fell (e.g. stumbling, slipping, losing balance). The mechanism of the fall is related to the displacement of the center of mass of the body (e.g. forward, sideways, backward).

The sociodemographic variables used were: gender and age group (65 to 79 years and 80 years and over). The subjective evaluation of health of the elderly was their personal and subjective impression of their own health and how they cared for health. The question asked was *in general, you would say that your health* is followed by the following "very good", "good", "fair", "poor" and "very poor".

The presence of depressive symptoms was evaluated through the application of the Geriatric Depression Scale (GDS), (fifteen-item version), translated and validated into the Portuguese language[15]. The participants were classified according to number of depressive symptoms: those with ≥5 symptoms were considered positive for depression and those with <5 symptoms were considered without depression. The number of medications was identified by asking the elderly persons about the number of drugs that they had used regularly in the last three months. The number of diseases was evaluated through dichotomic responses and categorized as zero to one disease, two to three diseases and four or more diseases, based on the presence of diabetes, osteoporosis, arthritis/ rheumatism and urinary incontinence. The presence of the complaint of dizziness was identified through self-reporting in the last twelve months. Any feeling of spinning, turning, feeling light or heavy-headed, dizziness, wooziness or floating was considered dizziness.

The advanced activities of daily living[16] include voluntary social, occupational and recreational activities, and total 12 activities. The activities that the elderly failed to perform or never performed were added together and the median was used to classify each individual (below the median: 0 to 5 activities impaired and above the median> 5

activities impaired). Instrumental activities of daily living[17] involve practical tasks of daily life, identified through a questionnaire containing self-reported answers about the need for some help, total help or independence. Activities in which the elderly require partial or total help were added together and the median was calculated. Elderly with >1 impaired activity were categorized as above the median and elderly persons with 0 impaired activities as below the median.

A descriptive analysis was performed and contingency tables were generated to evaluate the association between falling once and falling twice or more and the variables of interest, and to evaluate the association between the circumstances of the falls and the variables of interest. We used Fischer's exact test for the 2x2 tables and the Pearson chi-squared test to verify if there was an association between the variables. The significance level adopted was $\alpha<0.05$.

The Free and Informed Consent Form signed by all the research participants was approved by the Ethics Research Committee of PUC-SP, under research protocol Nº 269/2007 for the FIBRA study in Barueri, and by the Ethics Research Committee of HCRP and FMRP-USP, under Nº 5018/2007.

RESULTS

Of the 774 elderly persons included in the study, 299 elderly persons (38.6%) reported a fall in the last year. Of these 176 (58.9%) fell once and 123 (41.1%) reported having fallen twice or more. The mean age of fallers was 72.53±6.12 years and 214 (71.6%) were female. Table 1 shows the characteristics of the elderly in relation to the number of falls, comparing the elderly who suffered a fall in the last year with the elderly who fell on a recurring basis (two or more falls). Among the elderly aged 80 and over, two or more falls were significantly more prevalent than one fall. There was a significant increase in comorbidities (four or more diseases) in elderly patients who suffered recurring falls, with an increase in the proportion of elderly people who reported having arthritis or rheumatism, osteoporosis, urinary incontinence, dizziness and depression. In addition, the elderly persons who fell recurrently presented more limitations in instrumental and advanced activities of daily living.

Around 107 (35.8%) of the elderly reported falling forward, 79 (26.4%) sideways and 42 (14%) backwards. Regarding the circumstances, 79 (26.4%) reported having stumbled, 42 (14%) slipped and 107 (35.8%) lost their balance. There was an association between the number of falls and the mechanism and circumstance of the fall. Elderly patients who fell recurrently reported falling sideways, forwards or into a sitting position more often. In terms of circumstances, these same elderly persons reported having stumbled or lost their balance. Interestingly, the elderly who fell once described slipping as the most frequent circumstance. About 45% of the elderly who fell twice or more reported having reduced their activities due to the falls (Table 2).

There was no association between the fall mechanism and the variables of interest. There was an association between the number of medications and the circumstances of falls losing balance and slipping (Table 3).

Table 1. Characterization of elderly persons with a history of one or two or more falls in relation to sociodemographic, physical and mental health and functionality variables among elderly persons living in the community (FIBRA Network; n=299). Baureri, São Paulo and Cuiabá, Mato Grosso, 2009-2010.

Variables	Fell once (n=176) n (%)	Fell twice or more (n=123) n (%)	*p*-value
Female	116 (65.9)	98 (79.7)	<0.001
Male	60 (34.1)	25 (20.3)	
Age Range (years)			
65 to 79	155 (88.1)	98 (79.7)	0.04
80 or over	21 (11.9)	25 (20.3)	
Perceived Health			
Good or Very Good	91 (51.7)	52 (42.3)	0.03
Fair	70 (41.5)	52 (42.3)	
Poor or Very Poor	12 (6.8)	19 (15.4)	
Number of Illnesses			
0 to 1	58 (33.3)	26 (21.1)	<0.001
2 to 3	82 (47.1)	50 (40.7)	
4 or more	34 (19.5)	17 (38.2)	
Diabetes			
Yes	132 (25.0)	30 (24.4)	0.50
Arthritis or Rheumatism			
Yes	59 (33.5)	66 (46.3)	0.02
Osteoporosis			
Yes	123 (30.1)	60 (44.7)	0.01
Urinary Incontinence			
Yes	32 (18.3)	83 (32.5)	<0.001
Number of Medications			
0 to 1	58 (33.0)	35 (28.5)	0.52
2 to 3	68 (38.6)	46 (37.4)	
4 or more	50 (28.4)	42 (34.1)	
Dizziness in last year			
Yes	79 (44.9)	78 63.4	<0.001
No	97 (55.1)	45 36.6	
GDS			
No depression	126 (71.6)	70 (56.9)	<0.001
Depression	50 (28.4)	53 (43.1)	
AADL by median			
Below median (0-5)	86 (49.1)	59 (48.0)	0.08
Above median (>5)	89 (50.9)	64 (52.0)	
IADL by median			
Below median (0)	106 (60.2)	59 (48.0)	0.03
Above median (>1)	70 (39.8)	64 (52.0)	

GDS: *Geriatric Depression Scale*; AADL: Advanced Activities of Daily Living; IADL: Instrumental Activities of Daily Living; Fisher's exact test or Pearson's chi-squared test for the value of *p*.

Table 2. Characterization of most recent fall in relation to place, mechanism, lighting, time of day, consequences and circumstances of fall among elderly living in the community (Network FIBRA; n=299). Barueri, São Paulo and Cuiabá, Mato Grosso, 2009- 2010.

Variables	Fell once (n=176) n (%)	Fell twice or more (n=123) n (%)	*p* value
In relation to most recent fall			
At home (outside)	61 (34.9)	45 (36.9)	0.82
At home (inside)	46 (26.3)	35 (28.7)	
Away from home (known place)	62 (35.4)	37 (30.3)	
Away from home (unknown place)	6 (3.4)	5 (4.1)	
Mechanism of Fall			
Fell sideways	44 (25.1)	35 (28.7)	0.03
Fell backwards	32 (18.3)	10 (8.2)	
Fell forwards	56 (32.0)	51 (41.8)	
Fell onto knees	28 (16.0)	12 (9.8)	
Fell into sitting position	15 (8.6)	14 (11.5)	
Lighting at time of fall			
Well lit	162 (92.6)	108 (89.3)	0.32
Poorly lit	13 (7.4)	13 (10.7)	
What time of day did the fall occur			
Morning (6-12h)	98 (56.0)	58 (47.9)	0.29
Afternoon (12-18h)	50 (28.6)	37 (30.6)	
Night (18-6h)	27 (15.4)	26 (21.5)	
Rest required after fall			
Yes	38 (21.8)	29 (23.8)	0.69
No	136 (78.2)	93 (76.2)	
Required emergency care after fall	51 (29.3)	32 (26.2)	0.57
Hospitalization	7 (4.0)	2 (1.6)	
Visit to doctor	15 (8.6)	10 (8.2)	
None required	51 (58.0)	78 (63.9)	
Reduced activity after fall			
Yes, social activities	15 (8.6)	14 (11.5)	0.01
Yes, activities at home	35 (20.1)	41 (33.6)	
No	124 (71.3)	67 (54.9)	
Circumstances of fall			
Stumbled	44 (25.1)	35 (28.5)	0.04
Slipped	32 (18.3)	10 (8.1)	
Lost balance	56 (32.0)	52 (42.3)	
Other	43 (24.6)	26 (21.1)	

Table 3. Association between the circumstances of falls and socio-demographic, physical and mental health and functional variables in the elderly living in the community (FIBRA Network; n=299). Barueri, São Paulo and Cuiabá, Mato Grosso, 2009 – 2010.

Variables	Stumbled			Balance			Slipped		
	No	Yes	*p* value	Didn't lose	Lost	*p* value	No	Yes	*p* value
Gender									
Male	27.3%	31.6%	0.47	28.6%	31.6%	0.83	31.6%	28.6%	0.83
Female	72.7%	68.4%		71.4%	68.4%		68.4%	71.4%	
Age Range (years)									
65 to 79	85.0%	83.5%	0.72	90.5%	83.5%	0.41	83.5%	90.5%	0.41
80 or over	15.0%	16.5%		9.5%	16.5%		16.5%	9.5%	
Perceived Health									
Very good	47.3%	49.4%	0.46	50.0%	49.4%	0.89	49.4%	50.0%	0.89
Fair	40.0%	46.8%		35.7%	46.8%		46.8%	35.7%	
Poor/Very poor	12.7%	3.8%		14.3%	65.3%		3.8%	14.3%	
Number of Illnesses									
0 to 1	29.2%	25.6%	0.51	35.7%	25.6%	0.47	25.6%	35.7%	0.47
2 to 3	42.5%	50.0%		50.0%	40.5%		50.0%	40.5%	
4 or more	28.3%	24.4%		24.4%	23.8%		24.4%	23.8%	
Diabetes									
No	74.5%	77.2%	0.76	77.2%	78.6%	1.00	77.2%	78.6%	1.00
Yes	25,5%	22,8%		22.8%	21.4%		22.8%	21.4%	
Number of Medications									
0 to 1	30.9%	31.6%	0.77	40.5%	31.6%	0.03	31.6%	40.5%	0.03
2 to 3	35.0%	46.8%		23.8%	46.8%		46.8%	23.8%	
4 or more	34.1%	21.5%		35.7%	21.5%		21.5%	35.7%	
Osteoporosis									
No	62.7%	67.1%	0.58	73.8%	67.1%	0,53	67,1%	73,8%	0,53
Yes	37.3%	32.9%		26.2%	32.9%		43,8%	26,2%	
Arthritis/Rheumatism									
No	61.8%	59.5%	0.78	64.3%	59.5%	0,41	59,5%	64,3%	0,69
Yes	37.3%	40.5%		35.7%	40.5%		40,5%	35,7%	

to be continued

continued from Table 3

Variables	Stumbled			Balance			Slipped		
	No	Yes	*p* value	Didn't lose	Lost	*p* value	No	Yes	*p* value
Incontinence									
No	76.8%	73.1%	0.77	76.2%	73.1%	0,82	73,1%	76,2%	0,82
Yes	23.2%	26.9%		23.8%	26.9%		26,9%	23,8%	
GDS									
No depression	65.5%	65.8%	1.00	61.9%	65.8%	0,69	65,8%	61,9%	0,69
Depression	73.8%	26.2%		38.1%	34.2%		34,2%	38,1%	
AAVD									
Below median (0-5)	49.8%	45.6%	0.60	47.6%	45.6%	0,85	45,6%	47,6%	0,85
Above median (>5)	50.2%	54.4%		52.4%	54.4%		54,4%	52,4%	
AIVD									
Below median (0-1)	53.2%	60.8%	0,29	57.1%	60.8%	0,70	60,8%	57,1%	0,70
Above median (>1)	46.8%	39.2%		42.9%	39.2%		39,2%	42,9%	

GDS: *Geriatric Depression Scale*; AADL: Advanced Activities of Daily Living; IADL: Instrumental Activities of Daily Living; Fischer's Exact Test or Pearson's Chi-squared Test for the value of *p*

DISCUSSION

The results of the present study show that elderly persons who suffered recurring falls were women, aged between 65 and 79 years old, with more comorbidities, especially those that are risk factors for falls, and who presented greater impairment in functional performance and social participation. The characteristics of the most recent fall revealed that recurrent elderly fallers fell sideways, forward or into a sitting position more often, and the related circumstances were stumbling and losing balance, which differed from the elderly who fell once. However, there was no association between the mechanism of the fall and the variables studied, and only the number of medications was associated with the circumstance of losing balance and slipping.

The prevalence of falls among women was 79.7%, a finding consistent with the results of Brazilian and non-Brazilian literature which show that women are more affected than males. This can occur due to greater physical frailty and a lower amount of lean mass and muscular strength in relation to men[18]. The occurrence of falls is greater in elderly persons aged 80 years and over than in those aged 65 to 79 years. This result is attributed to the natural process of aging, which involves progressive losses of balance and muscle and bone mass[19]. Research has revealed that the regular practice of physical activity can minimize the deficits in balance and muscle mass associated with this process, helping to improve functional capacity, balance and strength[20]. Among the diseases studied, there was an association with arthritis/ rheumatism, urinary incontinence, osteoporosis, depression and dizziness. This finding was similar to that of a population-based study of 1,520 elderly people in Brazil[21]. Joint diseases and osteoporosis contribute to the reduction of physical capacity in the elderly, as well as causing inflammation and pain, and consequently influence balance and postural control, thus increasing the risk of falls. Dizziness was associated with falls. De Moraes et al.[22] analyzed the factors associated with complaints of dizziness and found that 51.4% of elderly persons who complained of dizziness fell and 64.1% fell recurrently. In order to avoid falls, stability control mechanisms and postural orientation must function properly. Dizziness impairs this control and may make these elderly persons more susceptible to falls. Depression was also found to be associated with falls in this study, a finding also observed in other works[5,21]. A study carried out in Sweden found that stressful events and mobilizers of negative feelings acted as triggers for falls among the elderly[23]. In terms of perception of health, the present study found that most of the elderly reported having a good to very good perception of their own health. Elderly people with a positive perception of health and who have a history of falls may attribute falls to environmental factors[24]. It is possible that this population, who have preserved their functional capacity, expose themselves to greater risk, while frail elderly persons are able to cope only in environments with low physical demands[25]. Most of the elderly investigated limited their social activities and instrumental activities of daily living. When the elderly fall, there is a tendency to reduce daily activities, either for fear of being exposed to the risk of falling or due to the protective attitudes of family members and caregivers[10]. This reduction can cause immobility and consequent muscular atrophy, facilitating the recidivism of falls.

Regarding the circumstances of falls, the main factors that contributed to recurring falls were stumbling and losing balance. Most falls are due to the loss of dynamic balance, or in other words, they occur during locomotion, being caused mainly by stumbling and slipping when walking[26]. Studies indicate that aging is associated with changes in gait patterns and balance, meaning that gait dysfunctions are the most common problem in the elderly population and their prevalence increases with age[26]. Regarding the mechanisms of the falls, results showed that there was a higher frequency of elderly people who fell sideways and forward. The dynamics of gait are related to the sensorial integration of the vestibular, visual and proprioceptive systems, as well as muscular strength, joint mobility and adequate neuromotor control. Gait is a complex motor skill in which the body moves via a cyclic pattern of coordinated movements of the lower limbs[3].

Greater muscle strength may provide more stable support during walking, and previous studies have shown that reduced muscle strength plays an important role in falls in the elderly[27,28]. In addition, exercises that improve muscle strength help reduce fear of falls and can have positive results in reducing falls in the future[29].

The present study indicates that the use of medications was related to the circumstances of the fall. Chronic medications may potentiate the risk of falls and cause effects such as orthostatic hypotension, cognitive dysfunction, balance disorders, dizziness, vertigo, drowsiness, motor dysfunction, reflex impairments, visual changes[30]. Therefore, the use of multiple medications among the elderly is associated with a negative outcome. In the studied population the use of two to three medications was associated with a loss of balance, which may be related to elderly persons who reported being dizzy and was statistically significant, corroborating the results of De Moraes et al.[22]. Slipping and the use of four or more medications were also associated, which can be explained by the impairment of reflexes that occurs due to the adverse effect of medications. These reflexes are diminished by the natural process of aging, especially that of protection[31,] and potentialized by the use of medication, thus impairing the corporal mobility leading the elderly to fall by slipping. Berg et al.[26] reported that slipping was highly prevalent, accounting for 59% of falls in the elderly population. However, this study was not related to drugs.

The American Geriatrics Society and the British Geriatrics Society[12] recommend that geriatricians ask elderly persons about their history of falls, allowing the doctor or gerontology professional to identify the possible contributing factors of falls. The period prior to the fall event and the post fall result should also be explored, enquiring if there was a loss of consciousness, if the individual stumbled, felt dizzy, or had difficulty getting up. Health professionals should ask about health conditions, and investigate the use of medications to see if there have been recent changes in the use of vasodilators, diuretics and hypnotic sedatives. Finally, it is important to ask about sight and the use of alcohol, if all possible causes are to be understood.

The present study has some limitations. It is a cross-sectional study, which does not allow the determination of risk factors for falls. There is possible memory bias as falls in the last 12 months were reported. Regarding medication, the reason for administration was not described, which impedes the identification of the action of the drug in relation to falls in the elderly population. Only the most recent fall was investigated, preventing typology from being determined. These limitations may explain why some of the associations were not found, and means the results should be used with caution.

CONCLUSION

The characteristics of falls were different for elderly persons who fell once and those who fell twice or more, which may guide health professionals, the elderly and their families in relation to specific strategies for the prevention of falls.

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Evaluation of the effectiveness of a care program for elderly patients with hip fractures: a network strategy

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Abstract

Objective: Evaluate the effectiveness of a care program for elderly persons with hip fractures due to a fall, based on a public network in Canoas, Rio Grande do Sul, Brazil. *Methods:* a prospective cohort study of quantitative character was carried out. A total of 182 elderly person above 60 years diagnosed with hip fractures were included. The sample was divided into two groups, one who underwent their usual treatment (n=91) and another who were included in a care program for elderly persons with hip fractures (n=91). The program had as its main axis a clinical Protocol and an Access Protocol. The treatment of choice was surgical in all cases. In statistical analysis, categorical variables were described by absolute and relative frequencies. The Mann-Whitney test was used to compare numeric variables. In the comparison of proportions, the Pearson's Chi-squared test or Fisher's exact test were applied. The significance level adopted was 5%. *Results:* The average age was 79.4 years, with a prevalence of the female gender. The most frequent morbidity was hypertension. After the implementation of the program there was a reduction in the average time between the fracture and the beginning of surgery, the average length of hospitalization, the urinary tract infection rate, the death rate and care costs. *Conclusion:* The care program of elderly persons with hip fractures modified the expected results as it reduced mortality, average hospital stay, postoperative complications and the costs of treatment during the hospitalization.

Keywords: Elderly. Hip Fractures. Health Services for the Aged. Falls.

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INTRODUCTION

According to data from the Instituto Brasileiro de Geografia e Estatística (the Brazilian Institute of Geography and Statistics) (IBGE)[1], serious diseases are common and frequent among the elderly, leading such patients to functional decline, morbidity and mortality. Among these diseases is an acute event of significant proportions, the hip fracture (HF).

For Auerbach et al.[2], a HF in the elderly is the result of low-impact trauma, most often due to falls, which are increasingly likely as people get older. One in three people over 65 will fall every year, according to epidemiological data from the IBGE[1]. Tsang and Cromwell[3] state that among the most prevalent risk factors for hip fractures among the elderly are osteoporosis, diabetes, vision problems, inadequate safety/surveillance at home and other health conditions that impair balance.

According to Eriksson et al.[4] elderly patients with HF have a higher risk of mortality, are unable to return to their previous living conditions, have an increased need for care and supervision, reduced mobility and locomotion capacity, and a greater chance of secondary fractures.

When the costs of treatment are evaluated, Friedman et al.[5] calculated that in general caring for a hip fracture is three to seven times more expensive than the average cost of other types of treatment. According to Burgers et al.[6] the elderly spend more time in hospital than other age groups and have a greater exposure to risk factors and more adverse effects arising from the interventions used.

According to data from the *British Orthopaedic Association* (BOA)[7], despite the complexity involved in the treatment of HF, there is still significant variation in the key aspects of treatment between hospitals, resulting in considerable differences in the patient experience, especially in relation to the preoperative (in the time patients are referred for treatment) and postoperative (in the care for risk prevention – the risk of developing pressure ulcers, delirium, thromboembolism and infection, among others) periods.

The studies by Mendelson and Friedman[8] indicate that dedicated programs for elderly persons with HF can positively to treatment, bringing results with greater overall value. According to Porter and Teisberg[9], these programs presuppose, in addition to the incorporation of clinical guidelines, the use of a systematic method to achieve adherence, which includes the training of professionals, the nomination of medical and nursing leaders, the monitoring of the units involved, the use of indicators and the reorganization of service logistics and networks.

However, the British Orthopaedic Association[7] warns that for these practices to be modified, new mechanisms need to be adopted for the coordination of activities, with the search for more collaborative ventures and more precisely executed processes. These variables should be seen as a challenge, and initiatives to improve care quality should be integrated and conducted throughout the care network.

In this context, the present study evaluated the results of a program of care for the elderly with hip fractures caused to falls, applied in a public care network in the city of Canoas, in Rio Grande do Sul.

METHOD

The research strategy chosen was a cohort study which was retrospective for the control group. It was performed based on the analysis of the medical records, and was prospective for the cases included in the program. Elderly patients of both genders, aged over 60 years, with a diagnosis of HF due to a fall, were included. HF were considered to be fractures of the proximal end of the femur. All the patients were attended at an Emergency Hospital and transferred for definitive surgical treatment at a hospital in the rear, the Hospital Universitário (HU), both of which were in the town of Canoas in Rio Grande do Sul, Brazil. The Guidelines of the British Association of Orthopaedics[7] were used as a reference for the sample calculation. Based on a significance level of 5%, a power of 80%, an estimated mortality incidence of 20% and a 15% reduction when applied to the protocol, a minimum total of 88 patients in each group was obtained. All patient records in the period were considered eligible and the sample was divided into two groups. The first group of patients was referred to as the *usual treatment group* (n=91) and were admitted to the hospital from June 2014 to June 2015. The second group of elderly patients

(n=91) was included in a program with broad clinical guidelines and an access procedure applied in a municipal network that involved multidisciplinary prehospital care teams, a first aid hospital and a back hospital. The main thrust of the program was to prepare people and resources for the early surgical treatment of low-impact HF patients. This group was admitted to the hospital from October 2015 to October 2016.

The demographic data collected were gender and age. Previously investigated morbidities were diabetes mellitus type II, systemic arterial hypertension, dyslipidemia, previous coronary artery disease, congestive heart failure, chronic obstructive pulmonary disease, and chronic renal insufficiency.

To follow up on the results of the program, some indicators were defined as process and outcomes and were then compared with the results of the usual treatment group. The indicators chosen were: use of prophylactic antibiotics, daily evaluation by hospital doctor and orthopedic surgeon by 2 pm, pain evaluation, nutritional assessment, social assessment, planning of discharge from the first day, early withdrawal of a urinary catheter, time elapsed between fracture and beginning of surgery (2-day goal), mean length of hospital stay; 30-day readmission rate, morbidity rate; mortality rate; rate of surgical site infections, postoperative infection rate; mechanical retention rate, postoperative complication rate – deep venous thrombosis, pulmonary thromboembolism, surgical site infection, pneumonia, urinary tract infection, acute renal failure, stroke, acute myocardial infarction, gastrointestinal bleeding, pressure ulcers, adverse events reported, delirium.

For the composition of costs, three accounting appropriation groups were created – direct costs, daily costs and medical fees. The direct costs included all costs directly related to patient care: emergency room, surgical procedure, medical and nursing services, materials, medicines and prostheses. Daily stay costs included hospitalization, sanitation and food costs. Indirect administrative overheads or transaction costs were not included.

The costs analyzed were calculated by patient and then grouped into mean, median, and total cost, all expressed in *reais* (R$) and converted into US dollars based on the average exchange rate in June 2016 (US$3.42). The cost data were taken from the hospital management tools.

For statistical analysis, the categorical variables related to the morbidity profile were described in absolute and relative frequencies. In order to compare the numerical variables between the group who began surgery in up to 48 hours (two days) and those with a waiting time greater than 48 hours, the Mann-Whitney test was used. In the comparison of proportions, Pearson's chi-square or Fisher's exact tests were applied. For the polytomic variables (more than two categories), the adjusted residuals test was used to locate the significant differences indicated by the chi-square test. The level of significance was 5% (p<0.05).

The study was approved by the Ethics Research Committee of the Pontifícia Universidade Católica do Rio Grande do Sul (Pontifical Catholic University of Rio Grande do Sul) (PUCRS), CAAE 51213715.5.0000.5336.

RESULTS

When the profile of the elderly was characterized (table 1) there was a higher prevalence of individuals in the age range between 70 and 90 years (72.5%), with a prevalence of the female gender (74.2).

Table 1. Characterization of profile of patients involved in the study. Porto Alegre, Rio Grande do Sul, 2016.

Variables	Total (*n*=182)	Usual treatment (*n*=91)	Included in the program (*n*=91)	*p*
	n (%)	*n* (%)	*n* (%)	
Gender				1.000
Female	135 (74.2)	68 (74.7)	67 (73.6)	
Male	47 (25.8)	23 (25.3)	24 (26.4)	
Age (years)	79.4 (±8.8)	78.7 (±8.5)	80.1 (±9.0)	0.289
Age range				0.553
60 to 70	29 (15.9)	15 (16.5)	14 (15.4)	
71 to 80	67 (36.8)	37 (40.7)	30 (33.0)	
81 to 90	65 (35.7)	31 (34.1)	34 (37.4)	
>90	21 (11.5)	8 (8.8)	13 (14.3)	
Presence of Morbidities	159 (87.4)	80 (87.9)	79 (86.8)	1.000
Diabetes mellitus	42 (23.1)	28 (30.8)	14 (15.4)	0.022
Systemic Arterial Hypertension	132 (72.5)	69 (75.8)	63 (69.2)	0.406
Dyslipidemia	18 (9.9)	11 (12.1)	7 (7.7)	0.456
Known Arterial Disease	41 (22.5)	23 (25.3)	18 (19.8)	0.478
Cardiopulmonary resuscitation	1 (0.5)	1 (1.1)	0 (0.0)	1.000*
Stroke	39 (21.4)	24 (26.4)	15 (16.5)	0.148
Sedentary lifestyle	74 (40.7)	48 (52.7)	26 (28.6)	0.002
COPD	14 (7.7)	9 (9.9)	5 (5.5)	0.404
Chronic Renal Insufficiency	9 (4.9)	7 (7.7)	2 (2.2)	0.169*
Congestive heart failure	11 (6.0)	8 (8.8)	3 (3.3)	0.213
Others	46 (25.3)	27 (29.7)	19 (20.9)	0.232

#to compare means: student t-test; to compare proportions: Pearson's chi-squared test ; * Fisher's exact test; COPD: Chronic Obstructive Pulmonary Disease; Other: Dementia, Osteoporosis, Parkinson's, Alzheimer's, Depression, Neoplasms, Epilepsy, Malnutrition, Hypothyroidism, Epilepsy, Known Osteoporosis, Anterior Contralateral Fracture, Glaucoma, Pulmonary Hypertension, Alcoholism, Labyrinthitis, and Atrial Fibrillation.

Regarding morbidities, most of the elderly included in the study (87.4%) had at least one morbidity. Hypertension was the most prevalent morbidity, followed by Diabetes Mellitus.

The other morbidities studied had an incidence lower than 10%, both when evaluated throughout the sample and when stratified by groups. Other morbidities were identified in 46 elderly people (25.3%), among which were: dementia (10), known osteoporosis (4), epilepsy (4), malnutrition (2), hypothyroidism (11), Parkinson's disease (5), Alzheimer's disease (9), pulmonary hypertension (2), alcoholism (2), glaucoma (2), depression (5), HIV (2), atrial fibrillation (1)), neoplasias (12), previous contralateral fracture labyrinthitis (2).

The group treated in the usual manner presented a greater number of morbidities than the group included in the program. As for the association with more than one morbidity, elderly persons with a greater number of morbidities were more common in both groups, and there was a higher prevalence of three or more morbidities in the usual treatment group.

Regarding the results of the program indicators, the data were analyzed for the entire group of patients included in the study (182) and then compared between the groups (table 2). There was an increase in medical visits, a small increase in the number of nutritional assessments and a significant increase in the approach and monitoring by social services of the patients included in the program. There was also an increase in the planning of hospital discharge from the first day of admission of the patients included in the program ($p < 0.001$). There was no further mechanical restraint following the implementation of the program.

Table 2. Results of indicators/guidelines established by program. Porto Alegre, Rio Grande do Sul, 2016.

Variables	Total (*n*=182)	Usual treatment (*n*=91)	Included in program (n=91)	*p*
	n (%)	n (%)	n (%)	
Onset of surgery (days) [1]	6 (3 – 10)	9 (6 – 13)	3 (2 – 5)	<0.001
Beginning of surgery (bands)				<0.001
Up to 2 days	41 (22.5)	0 (0.0)	41 (45.1)*	
3 days	17 (9.3)	0 (0.0)	17 (18.7)*	
4 days	18 (9.9)	11 (12.1)	7 (7.7)	
5 to 10 days	63 (34.6)	43 (47.3)*	20 (22.0)	
> 10 days	43 (23.6)	37 (40.7)*	6 (6.6)	
Assessments				
Visit of hospital doctor by 14.00[1]	4 (2 – 5)	3 (2 – 5)	4 (3 – 6)	0.007
Visit of orthopedist by 14.00[1]	5 (4 – 7)	5 (4 – 6)	6 (4 – 7)	0.066
Nutritionist Evaluation	171 (94.0)	84 (92.3)	87 (95.6)	0.534
Social Worker Evaluation	51 (28.0)	14 (15.4)	37 (40.7)	<0.001
Pain	175 (96.2)	86 (94.5)	89 (97.8)	0.444[a]
Discharge plan on day 1	63 (34.6)	0 (0.0)	63 (69.2)	<0.001
Mechanical Restraint	6 (3.3)	6 (6.6)	0 (0.0)	0.029[a]
Early withdrawal of urinary catheter	81 (44.5)	14 (15.4)	67 (73.6)	<0.001
Use of Prophylactic ATB	170 (93.4)	81 (89.0)	89 (97.8)	0.037[a]
Morbidities	159 (87.4)	80 (87.9)	79 (86.8)	1.000
Death	13 (7.1)	11 (12.1)	2 (2.2)	0.021
Readmission within 30 days	7 (3.8)	4 (4.4)	3 (3.3)	1.000
Days of hospitalization	11 (7 – 17)	16 (12 – 21)	7 (5 – 10)	<0.001
Bands of days of hospitalization				<0.001
≤ 5	26 (14.3)	0 (0.0)	26 (28.6)*	
6 to 10	64 (35.2)	18 (19.8)	46 (50.5)*	
11 to 15	36 (19.8)	26 (28.6)*	10 (11.0)	
> 15	56 (30.8)	47 (51.6)*	9 (9.9)	
Total cost (reais)**	8.295 (5.825 -11.042)	10.520 (8.351-14.557)	5.900 (4.981-7.448)	<0.001
Total (dollars)**	2.291 (1.638-3.142)	2.942 (2.308-4.123)	1.683 (1.399-2.154)	<0.001

*statistically significant association by residuals test adjusted to 5% significance; **Median (P25-P75); # to compare medians: Mann-Whitney test; to compare proportions: Pearson chi-squared test ; [a] Fisher's exact test.

The use of prophylactic antibiotics and early withdrawal of the urinary catheter was significantly higher in the group included in the program (p<0,001).

There was a significant difference in the time elapsed between the fracture and the beginning of the surgery (p <0.001). Usual treatment patients waited for an average of nine days, while the patients included in the program waited three days on average. When stratified by time bands, there was also a significant difference between groups. In the usual treatment group, all 91 patients (100%) waited more than four days. In the group of patients included in the program, 58 (63.7%) elderly persons were surgically treated within a maximum of three days (figure 1).

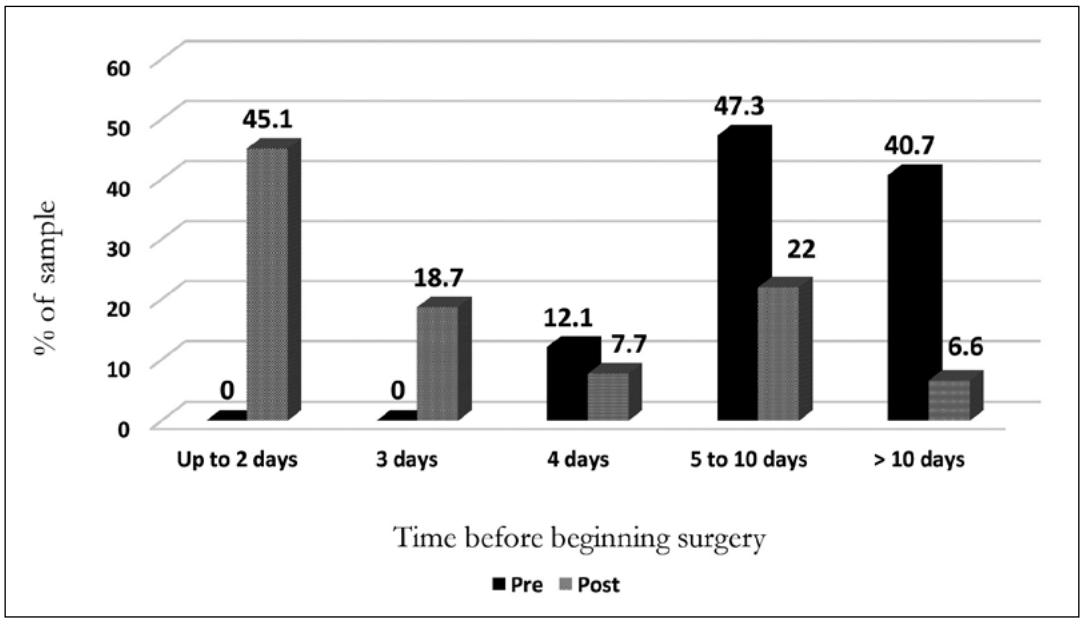

Figure 1. Comparison of times before beginning surgery before and after the program. Porto Alegre, Rio Grande do Sul, 2016.

The time before beginning surgery was a determining factor for the average hospital stay (p <0.001). The longer the time required to begin surgery, the longer the hospitalization (figure 2). The study identified the determinants for non-compliance as a goal of 48 hours (two days) to begin surgery after the start of the program. The "weekend effect" was the main factor. Patients hospitalized on these days encounter a different hospital resource structure, with changes in the rosters of nursing, anesthesiologist and clinical teams, with the latter on on-call schedules (without doctors performing their normal rounds), as well as logistic problems. The readmission in 30 days variable did not present a significant difference between the groups of patients. There was a reduction in the rate of in-hospital deaths from 11 (12.1%) in the usual treatment group to two (2.2%) in the program group (p<0.001). There was also a reduction in mean hospital stay between the two groups, from 16 (12-21) days, to seven (5-10) days (p<0.001) in the program group. When stratified into bands of days of hospitalization, all the bands were statistically significant in the adjusted residuals test at 5%. There was a reduction in long-stay patients (> 15 days), from 47 (51.6%) before the program to nine (9.9%) after the program.

There was also a reduction in the number of postoperative complications, from 24 (26.4%) to 13 (14.4%). Urinary tract infections significantly declined, from 13 (14.3%) in the usual treatment group to 0 (0.0%) in the program group (p<0.001).

In the analysis of the costs, the treatments after the application of the program were significantly less costly (p <0.001), as the usual treatment patients used the ICU (Intensive Care Unit) more than the units included in the program. In the comparison between the groups, the costs of the usual treatment group were R$10,520.00 (US$2,942) on average and those of the group included in the program were R$5,900.00 (US$1,683) on average. In the analysis of the overall costs (182 patients), the hospital had expenses of R$ 1,860,140.00 (US$543,900), with R$1,250,971.72 (US$365,781) spent on the usual treatment group and R$609,188.68 (US$178,125) spent on the group included in the program, a ratio of 67.3% to 32.7% of the total costs, respectively. Some factors were identified as determinants for

the composition of overall cost, including the time before beginning surgery (figure 3). The shorter the time before surgery, the lower the costs (p<0.001). The same was true for days of hospitalization and number of morbidities, with the shorter the length of stay, the lower the cost of treatment (p<0.001). The number of morbidities was a determining factor for longer mean permanence (p<0.001), with the higher the morbidity values, the more days spent in hospital (p<0.001).

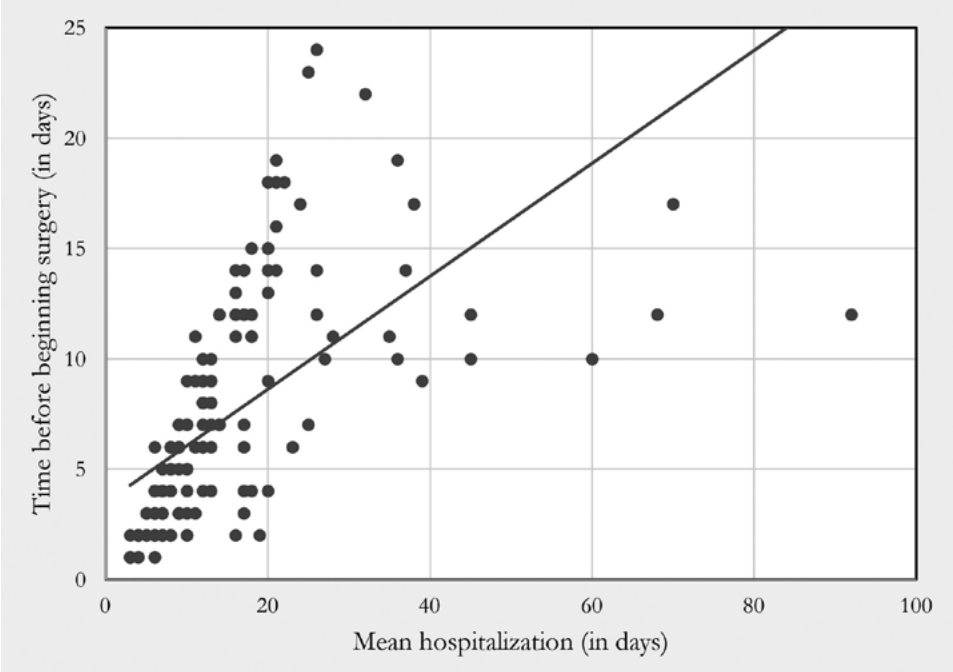

Figure 2. Analysis of impact of time before beginning surgery on length of hospitalization. Porto Alegre, Rio Grande do Sul, 2016.

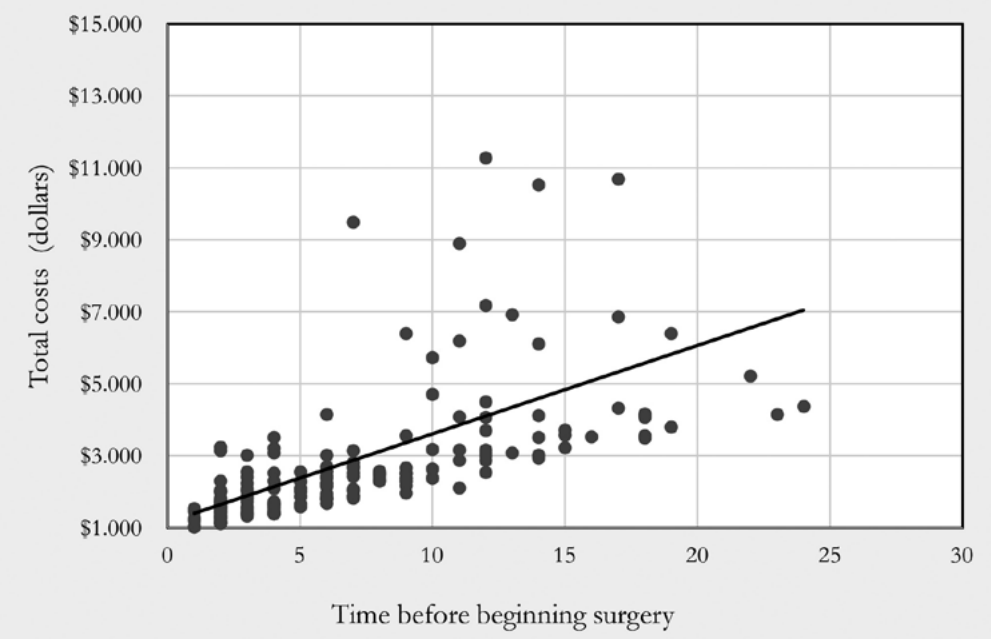

Figure 3. Relationship between time before beginning surgery and total costs. Porto Alegre, Rio Grande do Sul, 2016.

The largest hospital bills were attributed to patients with a longer time interval between the fracture and the onset of surgery, more than seven days of hospitalization, more than two morbidities and complications in the postoperative period.

The most prevalent complications were delirium, renal insufficiency and urinary tract infection, followed by pneumonia and surgical site infection. However, there was no statistical association between the number of complications and mean permanence. Age was not related to higher costs (p> 0.05). The mean age of the group of patients with the highest costs was the same as that of the entire surveyed group.

DISCUSSION

The present study revealed a greater prevalence of females than males. Similar results were found in studies published in the databases of the American Academy of Orthopedic Surgeons (AAOS) [10], the British Orthopaedic Association (BOA) [7] and the Brazilian Ministry of Health[11].

According to Barros et al.[12] and Eriksson et al.[4] the higher prevalence of hip fractures among women may be related to the fact that females have a longer life expectancy and are therefore more exposed to risk factors. They also initiate the process of bone mass decline before men and are more susceptible to falls, in addition to anthropometric influences and genetic factors related to gender.

Longer-lived elderly persons (between the seventh and eight decade of life) were the most affected. Hungria et al.[13], Gibson and Hay[14] and Boulton et al.[15] argue that the proximal fracture of the femur affects older elderly people, as the musculoskeletal alterations that compromise the performance of motor skills make it difficult for such individuals to adapt to the environment and predispose them to falls from their own height.

In spite of the general morbidity rate and the difference in the morbidity profile found among the groups studied, there was no prevalence of a single type of morbidity. Mesquita et al.[16] described a higher prevalence of heart disease, while Uliana et al.[17] states that the prevalence of morbidities is high among hospitalized patients with hip fractures and that there is a high risk for complications.

The overall mortality rate was 7.1%, consistent with the results found by Thomas et al.[18] and Gilberg et al.[19], which were between 8.5% and 6.5%, respectively, as well as those of Tarrant et al.[20]. However, in the present study, mortality decreased after the application of the program, corroborating the "principles of co-management" advocated and applied by Friedman. The average length of hospitalization decreased significantly after the application of the program. However, length of stay was still longer than those obtained by Friedman et al.[5].

The studies and experiences validated by Mendelson and Friedman[8] show that early surgery is an important and determinant factor for the improvement of the quality of treatment, including in terms of cost effectiveness. After the start of the program, the average time between the fracture and the beginning of surgery diminished from nine to three days (p<0.001). The guidelines of the American Academy of Orthopaedic Surgeons (AAOS)[10] and the British Orthopaedic Association (BOA)[7] recommend that surgery is performed on the same day or within 24 hours. However, the population analyzed in the present study is served by a health network involving more than one institution, separated by a distance of kilometers and with different teams, and so the goal was adjusted to 48 hours (two days). In this context, the results of the program were very satisfactory, with a reduction of 70% in the time required to begin surgery, although not all patients started surgery in the anticipated period. The main difficulty faced in meeting the two-day target was the "weekend effect", when there are changes in the staffing and resource structure of the hospital. In an extensive study with 2989 patients by Thomas et al.[18], the so-called *weekend effect* meant that in addition to delays at the beginning of surgery, there was an increase in mortality rates in the first 30 days after fractures in patients hospitalized at weekends.

The program also displayed better results in terms of procedural goals. There was an increase in the use of prophylactic antibiotics and, in parallel, a reduction in surgical site infections. While it was not possible to establish a direct relationship between the two variables due to the small number of cases,

studies by Gonçalves et al.[21] and Machado et al.[22] describe prophylactic antibiotics as one of the main strategies for preventing surgical site infections. These studies demonstrate that the use of such antibiotics, combined with general measures of surgical infection prevention, have been shown to be effective when performed in a rational manner.

Bouvet et al.[23] Rizk et al.[24] and Rennke and Ranji[25] state that urinary tract infection is the first major cause of nosocomial infection and therefore recommend avoiding a urinary catheter, or, when its use is necessary, removing it as quickly as possible. Similar findings were obtained in the present study, which demonstrated a significant association between the early withdrawal of the urinary catheter and a reduction in the percentage of urinary tract infections for the group included in the program.

Although mechanical restraints were not used on any patients during the application of the program, there was a reduction in cases of delirium in this group. Some studies, such as that of Bracco et al, [25] indicate that delirium may be due in part to the functional decline generated by physiological stress caused by the long periods of hospitalization[25] combined with morbidities. The patients included in the program had a shorter wait before starting surgery and consequently reduced their mean hospitalization time, which may explain the reduction of delirium in this group.

The AAOS[10] and BOA[7] contemplate a collaborative model of care that presupposes more frequent communication, anticipates complications and avoids iatrogenic events. When applied in the program of this study, such measures demonstrated favorable results, with the increased presence of the hospital doctor in the management of the cases (p=0.007). Social workers were incorporated into the model and also significantly increased their role in the management of the cases ($p < 0.001$), working as "managers" in preparation for hospital discharge from day one. According to Bracco et al.[26] this measure is highly relevant as the preparation of the patient and their family and the evaluation of the conditions of the home environment and care structure after discharge avoids readmissions and contributes to the quality of life and rehabilitation of elderly persons with hip fractures.

The final analysis contained the costs involved in the treatment of hip fractures, which fell by 44% following the start of the program. The cost-determining factors, besides the direct costs involved in treatment, were the time required to start surgery, the length of hospital stay and the total number of morbidities.

There is some complexity involved when comparing cost evaluation results with those of other studies. The form of appropriation of costs differs from one institution to another and not all determining factors are investigated. In the study by Bracco et al.[26], the same cost appropriation measures were used, and an average cost of hospitalization of R$8,266.25 (US$2,417) was recorded, a little lower than the present study. However, it is unclear whether ICU stays were included, and morbidity profile data or spending on other cost-determining factors that allow comparisons were not reported. Although common in Brazil, studies of the costs associated with hip fractures mostly provide results focused on the costs to the remuneration system, based on data from the sources of payment (SIH/SUS and ANS).[27,28] According to Gerard et al.[29] these costs do not reflect the costs of care, but rather the payments made to health institutions, although they consider the costs of the initial (hospital) treatment, which is the most costly and is also definitive of other costs, and the money spent on rehabilitation and/or readmissions. Studies are often follow-ups (from 1 to 2 years), which do not allow comparisons. Furthermore, when comparing studies from other countries it is necessary to consider the differences in the approach to and the organization of treatments, since the average costs of hospitalizations are much higher than in Brazil. This increase most likely corresponds to the costs of geriatric rehabilitation units as a second stage of hospitalization, which is not a common practice in Brazil. A study by Burgers et al.[6] in the Netherlands identified an average cost of €5,732, while a study by Ginsberg et al.[21] in the US found an average hospitalization cost of (US$ 7,826.00) [20]. These studies agree that the early beginning of surgery and unnecessary days of hospitalization are key factors.

In the present study, the highest costs were related to direct and daily stay costs. The patients in the

usual treatment group used the ICU more and had a 70% increase in average costs of the daily stay type.

The variables tested in this study were based on models and experiences obtained in other countries, adapted to the reality of a health network of the Brazilian Unified Health System (SUS). The sample of 182 patients is perhaps not highly representative of the universe of elderly victims of falls with hip fractures. However, even with the model adapted to the described reality, the results were the same as those reported by Ginsberg et al.[19,] Thomas et al.[28] and Caillet et al.[30] in their social contexts, with a significant association between the application of the program and the reduction of waiting time required to begin surgery, average length of stay, mortality rates and hospital costs. Follow-up studies should be aimed at further analysis.

CONCLUSIONS

The program of care for elderly persons with hip fractures, applied in a network structure, modified the expected results by reducing mortality, mean hospital stay, postoperative complications and treatment costs during hospitalization.

The strategies adopted, using validated clinical guidelines, protocols and tools for care network management, solved problems diagnosed before its application, providing more effective and efficient results for the care of the elderly included in the program.

The collaborative model allowed more coordinated assistance, with more effective planning of the initial approach to the elderly and consequent preparation for hospital discharge. For this to be possible, managerial and technological tools were fundamental for the team to improve its communication efficiency.

In realities where resources are scarce, such as the Unified Health System (SUS), the program linked health care management to clinical guidelines and proved to be cost-effective and capable of bringing together teams to achieve superior outcomes for patients, the teams themselves, hospital institutions and public administrators.

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Scientific production on housing for autonomous elderly persons: an integrative literature review

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Abstract

Objective: To analyze Brazilian scientific production on housing for autonomous elderly persons. *Method:* A descriptive, analytical integrative review type study was carried out. The following guiding question was defined: what is the Brazilian scientific production relating to housing for autonomous elderly persons in indexed on-line periodicals from 2000 to 2015? *Results:* Thirty-three articles were identified in total, of which only 13 met the inclusion criterion. Using the Content Analysis technique, the following categories were formed: Modalities of housing for the elderly; Public housing policies for the elderly and Housing and quality of life. *Conclusion:* Most of the studies discussed types of housing for the elderly, falling into the category "Modalities of housing for the elderly", and identifying a tendency towards one-person dwellings. In relation to the category "Public housing policies for the elderly", the articles reflected on the rights and the guarantees of the elderly in relation to a suitable home. The "Housing and quality of life" category aimed to compare the quality of life of elderly people living alone or with a partner, as well as their perception of exclusive condominium developments for this population. There is a need for research on the issue in question, since there is an increase in the number of elderly people without housing, making it necessary for the state to meet this demand.

Keywords: Housing for the Elderly. Elderly. Public Policies.

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INTRODUCTION

The accelerated growth of the elderly population is a current and established occurrence in today's global reality. It represents an important transformation in the way society is organized[1], and has numerous economic and social consequences for the population as a whole and especially for the elderly.

Aging is a serious concern in Brazil due to its repercussions for overall society in a context of marked social inequality, poverty and the fragility of social institutions, especially as the country undergoes a reassessment of its public policies and includes the elderly as a focus of attention[2].

The aging process therefore places demands on the State and society. Among these are the provision of housing that is suitable for the needs of the elderly population[3].

Brazil has developed legislation, policies and programs to improve the living conditions of the elderly, seeking to ensure the integrity and dignity of this population[3] and extending the effective protection of their rights, including to a suitable home, whether within their family unit or unaccompanied by relatives, when they so choose, or even in long-term public or private institutions[3-6].

The State is responsible for creating public policies that minimize the housing needs of the low-income elderly population, carrying out specific projects and programs and allocating a minimum of 3% of residential housing units in public housing programs for priority acquisition by the elderly[4,6].

In this context, and in order to stimulate reflection and contribute to the debate on how and where these elderly people should live and the consequences that this has for society, the objective of the present study was to analyze Brazilian scientific production in the field of aging on the issue of housing for the elderly.

METHOD

A descriptive, analytical integrative review type study[7] was carried out, with the objective of synthesizing the results (secondary analysis) of previous studies (primary analysis). As a general rule, this method is composed of the following steps: elaboration of a guiding question; searching or sampling of the literature; data collection; critical analysis of included studies; discussion of the results and presentation of the review. The following guiding question was defined: *what is the Brazilian scientific production on housing for autonomous elderly persons in online indexed periodicals between 2000 and 2015?*

An online search was conducted between April and May 2016 for indexed Brazilian journals available for public access through the databases of the Latin-American and Caribbean System on Health Sciences Information (LILACS) and the Scientific Electronic Library Online (SciELO), as well as that of the Medical Literature Analysis and Retrieval System Online (Medline), by searching the Capes portal with the descriptor "aging"; "old age"; "elderly" together with one or more of the following descriptors: "housing"; "habitation"; "housing for the elderly"; "habitation for the elderly".

For inclusion in the study, articles were required to meet the following criteria: be in Portuguese; be available in the databases selected for the proposed study; be available in full and published in the period from 2000 to 2015 in the form of a scientific article, and not discuss Long Term Care Facilities for the Elderly (LTCF).

Data analysis was performed through an exploratory, selective and analytical reading, aimed at identifying the subject of the study and its relationship to the issue of housing for autonomous elderly persons. Using the Content Analysis technique[8], it was possible to classify the studies into the following categories: Type of housing for the elderly; Public housing policies for the elderly and Housing and quality of life. The Content Analysis technique uses inductive reasoning whereby themes and categories emerge from the data through judicious examination and constant comparisons[7].

RESULTS AND DISCUSSION

A total of 33 productions were identified. Of these, only 13 articles met the inclusion criterion, as shown in figure 1.

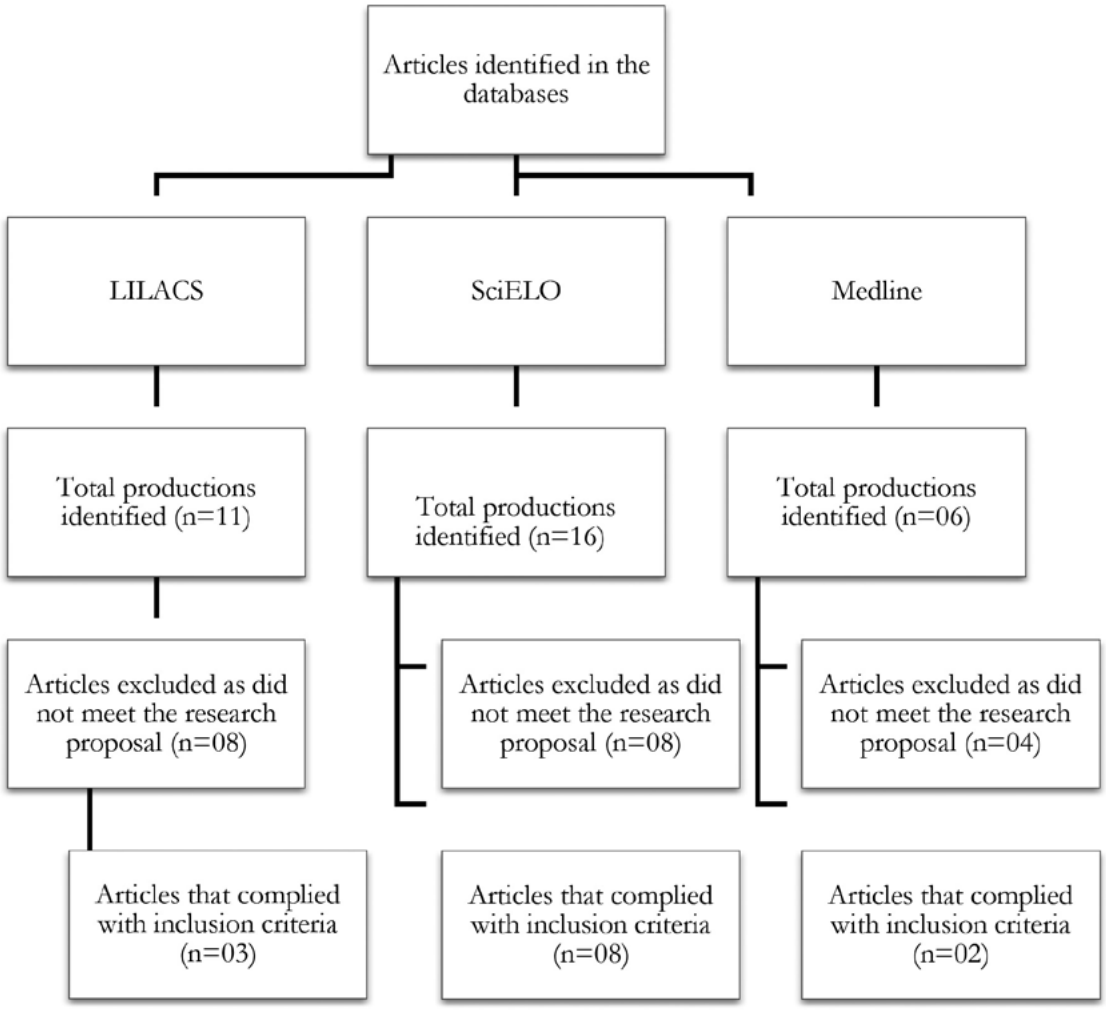

Figure 1. Articles identified in the databases. São Paulo, 2016.

The number of articles on housing for autonomous elderly persons found in Brazilian scientific production showed that, although the theme is highly relevant in a country where the elderly population is growing in an accelerated manner, it remains little explored in the field of human aging.

Regarding the periodicals in which the articles were published, 38.4% of the production was concentrated in thematic publication in the area of Gerontology in 2010, the subject of which was "Housing in Old Age".

Considering the significant increase in the Brazilian elderly population, the country faces several challenges, one of which is the question of how and where these elderly persons will live and the consequences that this entails for society. Seven studies were published by Brazilian authors focusing on category 1 (Types of housing for the Elderly), which deal with some housing modalities such as single-person dwellings, shared housing, hostels and condominiums for the elderly, as shown in Chart 1.

Chart 1. Articles included in integrative review, including title, author(s), year and aim of study in the category Types of Housing for Elderly Persons. São Paulo, 2016.

Types of Housing for Elderly Persons			
Title	Authors	Year	Study objective
The art of living alone and being happy in old age[9]	Santos DF, Tomazzoni AMR, Lodovici FMM, Medeiros SAR	2010	To analyze the reasons that leads a person to live alone when elderly and what they think about LTCFs – Long Term Care Facilities.
The constitution of single-person households in a condominium for the elderly [10]	Teston EF, Marcon SS	2014	Identify the perception of elderly persons living alone about the constitution of single-person households.
The relation between income and living alone for São Paulo elderly persons, 2000[11]	Camargos MCS, Machado CJ, Rodrigues RN	2007	To analyze the relationship between income and living alone for elderly São Paulo residents, in 2000, using the database of Project Sabe (Health, Welfare and Aging in Latin America and the Caribbean).
The elderly, family and the household: a narrative review about the decision to live alone[12]	Camargos MCS, Rodrigues RN, Machado CJ	2011	Establish a basis of argumentation to better understand the reasons that lead an elderly person to live alone and how transfers are processed (flows of resources, actions and information that are exchanged and circulated) when living alone.
New Forms of Living: Shared Housing for the Elderly[13]	Fortes R	2010	Show how the lives of elderly persons living in a shared house can be pleasurable and beneficial.
Sensations of living and housing for elderly people from a hostel [14]	Silva ACL, Mincache GB, Souza Rosa MA, Mutchnik VI	2010	Contribute socially through the elaboration of proposals that understand subjective feeling in homes aimed at the elderly and what aspects make such individuals feel at home.
A model for housing for the elderly: the case of Vila dos Idosos do Pari-São Paulo (SP)[15]	De Deus SIA	2010	Analyze the Pari Vila dos Idosos Armando Amadeu Housing Scheme, known as Vila dos Idosos (Town for Older Persons).

The creation of single-person households seems to be an increasingly present trend in Brazilian life due to a reduction in the number of children, an increase in the number of divorces, changes in lifestyle, improved health conditions and increased longevity. The trend is inevitable even for those who, despite feeling lonely or abandoned, do not have other people with whom they can reside[15]. In addition, while living alone may be indicative of successful aging and such elderly people are likely to retain their independence and autonomy, equally they may be more frail and susceptible to the risks of becoming ill, due to a lack of capacity for self-care and physical safety[16].

This statement corroborates some excerpts from the studies described below:

> "[...] the relationship between the elderly and their home represents the expression of their identity, with their significant and personal brand, for the construction of their means of protection and well-being, a space under their power and control"[9].

> "[...] improvements in financial conditions may allow a large proportion of the elderly to live alone, exercising their choice for independence and, at the same time, maintaining contact with the family and support networks"[11].

> "[...] the single-person domicile emerges from separation or the death of a companion. Others see it as a choice and opportunity to start over"[10].

> "[...] In view of the recent trend of a reduction in the number of children, an increase in divorces, changes in lifestyle, individualism, an improvement in the health conditions of the elderly and a consequent increase in longevity, especially for women, it is expected that there will be a growth in single-person households, or in other words the number of elderly people living alone, in coming years"[12].

The health complications that may affect elderly people living only were also noted, as the following extracts show:

> "[...] It is precisely at this moment that the feeling of sadness affects the heart, sometimes leading to depression. Some have mentioned the fear of suffering an accident and not having anyone to turn to. These elderly people are not comfortable asking strangers for help and do not enjoy the obligation of telling their children every time they visit the doctor. However, they feel fine during the day when occupied by their daily activities"[9].

> "[...] Possible imbalances in the general health situation, such as sequelae, whether temporary or permanent, which may limit the performance of activities of daily living, were the main disadvantages pointed out regarding the single-person domicile"[10].

In category 2 (Public housing policies for the elderly), four studies were identified that discuss the adequacy of public policies and actions that can reduce the housing needs generated by the increase of the elderly population in Brazil, as shown in Chart 2 below.

Chart 2. Articles included in integrative review, including title, author(s), year and aim of study in the category Public policies on housing for the elderly. São Paulo, 2016.

Public policies on housing for the elderly			
Title	Authors	Year	Study objective
Housing for the elderly: a policy yet to be guaranteed[16]	Almeida Prado AR, Besse M, Dutra LN	2010	How to guarantee housing with quality of life for an aging population.
The environment of aging in Brazil: why plan?[17]	Mendes FRC, Côrte B	2009	The article reflects on the home environment and the complexity involved in aging. It discusses public and housing policies that contemplate accessible and adaptable residential projects, considering the physiological and functional changes of aging, providing environments that allow a harmonious relationship in all phases of life, contributing to the well-being and permanence of the elderly in their home, their affective space.
The elderly and housing[18]	Schussel ZGL	2012	To discuss the urban policies that are being implemented in Brazil, in particular, social housing policies and their capacity to respond to changes in the age profile.
Public housing policies for the elderly: the *vila dignidade* (dignity town) of the state of São Paulo[19]	Monteiro JC	2012	Analyze exclusive condominiums for elderly persons in Itapeva and Avaré, both in the state of São Paulo, known as Vila Dignidade, part of a new housing policy for the elderly in the state.

In this sense, in addition to the 1988 Constitution[20], which guarantees the elderly, whether through their family, society or the State, the right to decent housing, the National Policy for the Elderly[21] and Ordinance 73[22] of the former Ministry of Social Security and Assistance discuss several aspects related to housing for the elderly, such as ways of improving habitability conditions and the adaptation of housing, models for financing housing projects, forms of living considering their physical and mental state, respecting socioeconomic indicators, the profile of the elderly and the sociocultural characteristics of each locality.

However, the main legal document related to the elderly population is Law 10,741, dated October 1, 2003, which establishes the Statute of the Elderly[23], an instrument that regulates the rights guaranteed to persons aged sixty or over. The Statute is a central reference document that ensures that public policies deal properly with the process of population aging.

Articles 37 and 38 are worthy of note, and discuss

> "the right to decent housing with their family of origin, or alone, should they wish, in a public or private entity, as well as the reservation of at least 3% of residential units in housing programs to meet housing demand in the elderly population"[23].

The UM, meanwhile, established the International Plan of Action on Aging in 2002[24]. Theme 1 of this plan (Housing and living conditions), exposes the major concern of society with the issues of housing and accessibility for the elderly population and sets out in priority orientation III the creation of a favorable and suitable environment.

From the same perspective, article 24 of the Inter-American Convention on Protecting the Human Rights of Older Persons[25], deals with the right to adequate and decent housing and to live in safe, healthy, accessible and adaptable environments adapted to their preferences and needs. The same article states that

"State bodies should guarantee the right of the elderly to decent and adequate housing and adopt policies to promote the right to housing and access to land by recognizing the needs of the elderly and giving priority to those who are vulnerable".

In light of the above, some excerpts from the studies that relate to category 2, which deals with the importance of Public Policies in the field of housing for the elderly population, should be highlighted:

> "[...] In this sense, public housing policies are necessary, since in general the elderly population does not have the financial resources to buy or rent a house in the real estate market"[16].

> "[...] the housing policies for this age group require flexible programs that adapt to different situations. These considerations are also true for the other age groups, whose cultural and economic diversity requires the attention of the federal government, through social programs which do not replicate generic solutions and solve problems with local characteristics"[18].

> "[...] The major challenge is to make municipal governments implement housing policies for aging people and ensure the approval of projects and works and the application of legislation that proposes buildings with universal accessibility"[18].

> "[...] the State is responsible for public policies aimed at mitigating social problems, especially those related to housing, aimed at the realization of the precepts of a democratic society of rights"[19].

According to the Coordination of Population and Social Indicators of the IBGE[26], in its Basic Municipal Information survey 2011, while most municipalities have programs aimed at the elderly in several areas, there is no reference document on housing for the elderly. Although there is a housing deficit of approximately 5.5 million housing units in Brazil, there is insufficient information relating to the size of this deficit for people over 65.

Some Brazilian states offer housing programs for the elderly[19], however, such as the state of São Paulo, whose housing policy includes programs such as *Vila Dignidade de Avaré, Itapeva, Recanto Feliz* and *Vila dos Idosos,* and the state of Paraíba, with its *Cidade Madura* (Mature City) program. In addition to providing the right to decent housing for the elderly, these housing policies value the maintenance of quality of life, and represent an important parameter for the evaluation of public policies.

Based on the survey of the studies produced on housing for the elderly, two papers were found

that related to Category 3 (housing and quality of life of the elderly), focusing on quality of life and discussing, in general terms, the importance of developing scientific studies that deal with the quality of life of the elderly and types of housing, as shown in Table 3 below.

Chart 3. Articles included in integrative review, including title, author(s), year and aim of study in the category Housing and quality of life of the elderly. São Paulo, 2016.

Housing and quality of life of the elderly			
Title	Authors	Year	Study objective
Quality of life of residents of an exclusive condominium for the elderly[27]	Teston LJ, Ferraz EM, Silva S	2014	Compare the quality of life of elderly persons who live alone with those who live with a partner.
Quality and conditions of live from the perspective of residents of a condominium for the elderly[28]	Teston LJ, Marcon SS	2014	Identify how residents of a "condominium for the elderly" perceive the quality and conditions of live in this type of housing.

The studies emphasize that the concept of quality of life is still hard to grasp, since it involves the perception of the individuals about their position in life and individual factors as well as cultural, social and environmental contexts[27].

While quality of life may vary from one individual to another depending on their goals and the scale of their life expectancies, however, it is common and universal in some respects, such as physical and psychological well-being, social relations, environment, level of independence and personal beliefs or religiosity[29,30] as shown by the following excerpts from the publications included in category 3.

> "[...] when defining QOL, the elderly value aspects related to health, but also demonstrate that this is not understood simply as the absence of disease"[27].

> "[...] Quality of Life is more than having good mental or physical health, it is feeling good about oneself, about life, about one's loved ones, and finally, about balance. These are often complicated situations for this population that suffers from sedentary lifestyles and dependence in daily activities"[28].

It should be pointed out that the studies presented here describe the quality of life of a specific population, namely the elderly, and how this relates to their housing.

> "[...] the quality of life of the elderly can vary depending on their housing arrangement, their living environment, time and the priorities of life"[27].

Based on the studies that tackle this issue, it is clear that quality of life in old age depends on lifelong interactions and many elements, such as longevity, biological health, mental health, satisfaction, cognitive control, social competence, productivity, activity, efficacy cognitive, social status, income, the continuity of family and occupational roles, and continuity of informal relationships with friends[31].

CONCLUSION

The present study found Brazilian scientific production available in full on the issue of housing for the autonomous elderly to be incipient and little explored, with most of the studies on the subject related to types of housing for the elderly.

Elderly persons in Brazil today have to face not only the physical and health demands arising from the aging process itself, but also the social and economic crisis that the country is experiencing. This reinforces the need to broaden the understanding of the implications that population aging brings to society and thus to the issue of housing.

It can be seen that public policies in the area of aging highlight the family as the main source of housing support, followed by Long-term Care Facilities (LTCF). Although there are some changes in terms of national public housing programs for autonomous elderly people, these are still very restricted in what they offer, suggesting that many of these policies need to become more effective and consider the reality of Brazil.

The present study has some limitations, such as that it analyzed only scientific production relating to the autonomous elderly and did not consider studies on LTCF, as the elderly living in such institutions may present some degree of dependence. Despite this, it is believed that it contributes to the compilation of data on the issue of housing for the elderly.

It is hoped, furthermore, to raise the interest of researchers in the field of aging, and to include this highly relevant theme in Brazilian research projects, as the number of elderly people without housing increases every year, and action from the State is required to meet such housing demands.

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Association between religiosity and functional capacity in older adults: a systematic review

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Abstract

Objective: To verify the association between religiosity and functional capacity in the elderly. *Method:* a systematic review of literature in the SciELO, Lilacs, MEDLINE/PubMed and the portal of CAPES Journals databases was performed. The descriptors were selected through the list of Descriptors in Health Sciences (Decs) and Medical Subject Headings (Mesh). Original articles in Portuguese and English, published between 2007 and 2017, with a sample composed of elderly persons aged 60 years or more were included. Systematic or integrative reviews, case studies, scale validation studies, dissertations and theses and studies on religious social support were excluded, as well as articles that included elderly persons and adults in the sample. *Result*: 280 articles were identified, of which six were included in this review. Religiosity was associated with improved functional capacity and coping with disability and the delay of functional decline in the elderly. Different aspects of religiosity were associated with functional capacity, such as participation in religious activities, religious leadership role performance and religious beliefs and traditions. In three articles the positive association between religiosity and functional capacity was linked only to public religious activities and not to intrinsic religious practices. *Conclusion:* religiosity is significantly and positively associated with the functional capacity of the elderly. The association between intrinsic religiosity and functional capacity is still unclear.

Keywords: Elderly. Religion. Spirituality. Activities of Daily Living.

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INTRODUCTION

The development of a long-lived population has revealed the importance of understanding human aging which, despite being a process characterized by physical and biological alterations, also causes changes in the psychological, relational and social dimensions[1].

Since the World Health Organization (WHO) recognized the psychosocial dimensions of health and quality of life, certain aspects have begun to be considered in the evaluation and promotion of health[2]. In the elderly population, one of these aspects is religiosity, which has a variety of implications for the health/disease process[3].

Religiosity is how much an individual believes, follows, and practices a religion. It can be practiced publicly, in an organized (participation in a church or temple) or non-organized (participation in activities outside a religious institution) manner, and/or intrinsically[4] (prayers and orisons, readings, meditations).

The relationship between the different aspects of religiosity and health in the elderly is of gerontological interest. Some studies have already described the association between religious practice and mortality and physical and mental health[5,6]. In the elderly, it should be considered that physical and mental health is closely linked to functional capacity, a new and important paradigm in health and aging[7].

The functional capacity of the elderly can be understood as the ability to perform, with autonomy and independence, the basic activities of daily living (BADL), linked to self-care, and instrumental activities of daily living (IADL) related to an independent life in the community[7].

While a decline in functional capacity is accepted with advancing age, maintaining independence facilitates the life of the elderly person within the family and social environment[8]. The frequency and intensity of this decline vary greatly, and are associated with gender, cognition, educational level, general health conditions and use of medications[9,10].

Psychosocial aspects also play an important role in this process and have been described as factors associated with functional capacity. According to Kagawa and Corrente[7], quality of life, self-knowledge and participation in the community influence the performance of BADL and IADL. For Nogueira et al.[10], non-socialization and a more negative self-perception of health are positively associated with reduced functional capacity.

Considering the importance of functional capacity as an indicator of health for the elderly and religiosity as a psycho-sociocultural dimension of great significance in the daily life of such individuals, it is useful to research and understand the benefits that this dimension can offer to the elderly. The objective of this article, therefore, was to verify the association between religiosity and functional capacity in the elderly through a systematic review of articles related to the theme.

METHODS

A systematic review of literature was carried out based on the following guiding question: *What is the association between religiosity and functional capacity in the elderly?* The search for articles was carried out in April 2017 in the SciELO, Lilacs, MEDLINE/PubMed and CAPES Periodicals Portal databases.

Descriptors in Portuguese and English were used in the article search. These were divided into two categories: category 1) elderly (*idoso*), functionality (*funcionalidade*), disability (*incapacidade*), activities of daily living (*atividades de vida diária*) and day to day activities; and category 2) religion (*religião*) and spirituality (*espiritualidade*). Each term in category 1 was combined with a category 2 term (of the same language), using the Boolean operator "AND", until all combinations had been made.

The descriptors were selected from the lists of the Descriptors in Health Sciences (Decs) and the Medical Subject Headings (Mesh).

Original articles in Portuguese and English, published between 2007 and 2017, with a sample

composed of elderly individuals aged 60 years or older, were included. Systematic or integrative reviews, case studies, validation of scales studies, dissertations and theses, and studies on religious social support were excluded, as were articles that included elderly and non-elderly adults in their samples.

The article searches and selection process was performed by two independent reviewers with a third evaluator requested in cases of disagreement. After consulting the databases, duplicate studies from more than one database were excluded. Analysis by title and subsequently abstract was carried out, which allowed the exclusion of further studies. The selected studies were read in full and included in the review in accordance with the inclusion and exclusion criteria. An active manual search of the references of the included studies was also performed.

The data were extracted and input into a standard form, adapted from the Cochrane Collaboration[11].

RESULTS

Although the initial search using the descriptors identified 280 articles, only six were included in this systematic review. The methods used and the excluded articles are summarized in Figure 1.

Among the included studies, only one was qualitative[3] and the others were quantitative. Two articles had a cross-sectional design[12,13], three were longitudinal[14-16] and one was an observational ethnographic study[3]. Five studies[12-16] were conducted in the United States and only one was carried out in Brazil[3] (Chart 1).

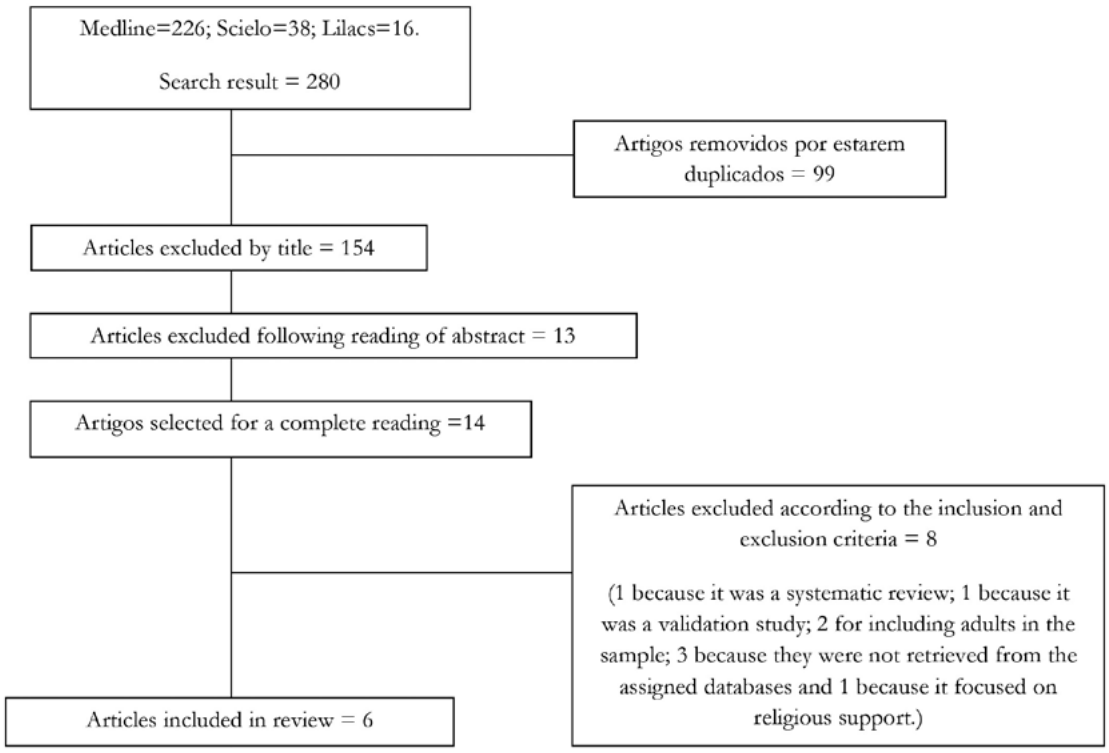

Figure 1. Flowchart of inclusion and exclusion of data. Brasília, Distrito Federal, 2017.

Chart 1. Summary of studies selected for review. Brasília, Distrito Federal, 2017.

Reference	Journal; Year; Location	Design	Instruments used to evaluate functional capacity and religiosity	Sample	Main findings
Santos et al.[3]	Ciência & Saúde Coletiva (Science and Collective Health); 2013; Bambuí, Minas Gerais	– Ethnographic observational – Qualitative	Semi-structured interview in which the elderly were asked to talk about life and about their health conditions and eventual experience of functional disability.	57 elderly persons registered in a Basic Health Unit - Saturation criterion used to regulate sample size	Religious beliefs and traditions have proven to be an important tool for coping with disability[4]
Berges, Kuo and Markides[12]	*Experimental Aging Research* -2007 -Texas, USA	– Cross-sectional – Quantitative	– BADL and IADL: Katz index, Guttman functional health scale. – Functional Mobility: Performance Oriented Mobility Assessment (Poma) – Religiosity: direct question "how often do you attend church or religious activities?"	118 non-institutionalized Hispanic adults (of Mexican origin), who had suffered a stroke - Representative sample of around 500,000 Hispanic elderly persons	Frequent participation in religious activities was associated with a reduced decline in the performance of BADLs (p=0.017) and IADLs (p=0.05) in the elderly post-stroke.
Arcury et al.[13]	*The Journal of Rural Health* -2013 -North Carolina, USA	– Transversal – Quantitative	– BADL and IADL: *Medical Outcomes Study* (MOS) functionality scale – Religiosity: the authors created questions and scores about public and private religious practices.	701 elderly diabetics from rural areas with different ethnicities (American, African American and white) - Randomized, stratified sample.	Improved functional capacity was associated with public religious practices (p<0.05). There was no association between functional capacity and intrinsic religious practices.
Park et al.[14]	*Research on aging* -2008 -Alabama, USA	-Observacional longitudinal – Quantitative	– BADL and IADL: Lawton Scale. – Religiosity: Duke Religiosity scale (DUREL)	784 American elderly persons living in the community - Sample stratified by municipal region, ethnicity and gender.	The frequent participation in religious activities was associated with less difficulty in the performance of BADLs (p =0.001) and IADLs (p=0.05), however, a longitudinal protective effect was detected only for IADLs (p=0.05).

to be continued

continued from Chart 1

Reference	Journal; Year; Location	Design	Instruments used to evaluate functional capacity and religiosity	Sample	Main findings
Hybels et al.[15]	*The Gerontologist* -2012 -North Carolina, USA	– Longitudinal – Quantitative	– BADL and IADL: Katz index, Fillenbaum scale. – Functional mobility: Guttman functional health scale. – Religiosity: direct question "how often do you go to religious events?", "how often do you watch or listen to religious programs on TV or the radio?", how often do you spend time on private religious activities such as praying, medication or religious study?"	2.924 elderly Americans living in the community -Representative sample of five municipal regions in the state of North Carolina	A greater frequency in religious activities was associated with reduced limitations in BADLs, IADLs and in mobility (p<0.0001). Watching religious programs on TV or listening on the radio was associated with the greater development of limitations in IADLs and mobility (p<0.0001), in an uncontrolled analysis.* Intrinsic religious practice was not associated with functional changes.
Hayward and Krause[16]	*Journal of Behavioral Medicine* - 2014 - USA	- Longitudinal. - Quantitative.	– BADL and IADL: based on 15 items of the BADL and IADL the authors investigated the number and severity of functional limitations – Religiosity: direct question about the performance of any of these positions: deacon, elder, counselor, pastor or minister, committee chair, choirmaster, or Sunday Bible School teacher .	1,152 American elderly persons living in the community - Representative sample of elderly population of USA (excluding Hawaii and Alaska)	Elderly men with a religious leadership position had a slower and less aggressive functional decline trajectory than those with no leadership roles (p =0.009) and non-frequenters (p=0.004).

The samples of the studies were varied. Three articles[14-16] were conducted with American elderly persons living in the community, one with diabetic rural elderly persons from different ethnic groups (American, African American and white)[13], one with institutionalized Hispanic elderly persons (of Mexican origin) who had suffered a stroke[12] and one with elderly Brazilians registered with a Basic Health Unit[3].

In two articles[12,15] the authors included in the evaluation of functional capacity, as well as the analysis of daily activities, the evaluation of aspects of mobility, such as lower limb strength and gait.

All six articles indicated a significant association between the religiosity and functional capacity of the elderly, revealing its beneficial and protective influence on functionality. Religiosity was associated with functional capacity in three different forms: coping with disability[3], improved functional capacity[13,14] and delayed functional decline[12,15,16]. Different aspects of religiosity displayed an association with functional capacity, such as: participation in religious

activities[12-15], a position of religious leadership[16] and religious beliefs and traditions[3].

In three articles[13-15], the positive association of religiosity with functional capacity was linked only to public religious activities, whether organized or non-organized, and not intrinsic religious practices such as prayers and readings.

DISCUSSION

Religiosity positively affects physical and mental health, promoting successful aging[17]. Many elderly persons attribute a special value to religiosity in relation to the improvement of their condition, considering that it contributes to quality of life, well-being, and social and psychological integration[1]. In addition, one study[3] included in this review identified an association between religiosity and coping with disability, meaning that it is a valuable resource for the acceptance of common losses in aging, such as the loss of functional independence[18].

According to Santos et al.[3], coping responses are alternatives where the negative element is controlled. Religious beliefs and behaviors therefore help the elderly to cope with the suffering experienced in functional dependence, and serve to facilitate problem solving and prevent or alleviate negative emotional consequences.

In the coping process, the individual plays an active role, using religious resources as an aid to reduce anxiety, increase hope, and broaden the meaning of existence. Religious involvement can provide an increased sense of purpose and meaning in life, which is associated with a greater capacity to respond positively to the demands of everyday life. In addition, meditations and prayers enable the mind to focus on other things, diverting thought away from problems and afflictions[18,19].

The spiritual support of people in the religious community is also a positive resource for coping with the effects of functional disability, as it provides the elderly with a manner of restructuring physical health problems by helping them find meaning in the face of such adversity. A study of 583 elderly Americans showed that those with a high level of spiritual support had gains in personal control when dealing with functional dependence[20].

Other authors identified greater social support[21] and more positive forms of religious coping[22] in individuals with religious leadership roles, which in this review was associated with a slower functional decline[16]. According to Hayward and Krause[16], religious leadership can contribute to successful aging by providing a sense of purpose and positive self-image; in addition, the personal value generated by group leadership provides the motivation to engage in healthier behavior in order to remain active in the role, and potentially reduces the stress and depression associated with a loss of roles, thereby reducing their impact on physical health.

The association between religiosity and improved functional capacity described in two articles included in this review[13,14] is corroborated by the findings of a previous review[17] that showed benefits of religiosity in the physical and functional evolution of hospitalized elderly persons, as well as a positive correlation between spirituality and functionality in adults in rehabilitation. In contrast, the study by Santos and Abdala[18], which evaluated the relationship between religiosity and the dimensions of health-related quality of life among the elderly, did not find any association between religiosity and the "functional capacity" dimension.

Moraes and Souza[19], however, found that elderly persons whose personal beliefs gave more meaning to life had up to a tenfold greater chance of experiencing a successful aging process. According to Luccheti et al.[17], religiosity is one of the determining factors of successful aging, which encompasses high physical functioning and the absence of functional disability. It can therefore be inferred that religiosity, by positively influencing successful aging[20], also influences the improvement of functional capacity.

Other benefits to the elderly have been attributed directly to religiosity, such as a reduced fear of falling[21], a lower prevalence and slower evolution of neuropsychiatric diseases[17], and greater adherence to medical treatments and preventive care[22], which also contributes to better functional capacity[23,24].

The association between religiosity and the delay in functional decline identified in some of the studies[12,15,16] in this review can be justified by the fact that elderly people with religious beliefs are more

likely to adopt healthy habits and reduce alcohol and cigarette intake[1,25], which makes them less exposed to risk factors for chronic diseases that anticipate the loss of functionality, such as diabetes[26], arterial hypertension, heart and lung diseases[27], thus delaying functional decline. Ratifying this idea, studies have already shown a lower index of cardiovascular diseases[28] and depression[29] among the elderly who engage in religious and spiritual activities. Thus, religiosity seems to protect the elderly against chronic diseases that accelerate functional decline.

Four articles[12-15] included in this review identified an association between participation in religious activities and a better performance in BADL and IADL. Corroborating our findings, previous studies have shown that religiosity is closely linked to factors such as community participation, socialization and well-being[17,30] and these factors have previously been associated with a better performance in BADL and IADL[7,31]. This suggests that by producing such psychosocial benefits among the elderly, religiosity contributes to greater independence in daily activities.

While participating in social and leisure activities themselves also provides these psychosocial benefits[32], religiosity goes further than social participation as it is associated with intrinsic religious practice[13,15]. Some authors[33,34] have identified the benefits of intrinsic practices such as prayer and meditation in coping with chronic diseases and pain, generating feelings of well-being and relaxation. Another study[4] found that a higher level of intrinsic religiosity was associated with an improved mental component and quality of life in the elderly. However, although intrinsic religiosity brings benefits to aspects associated with functionality[21,24,35], three studies[13-15] found no association between functional capacity and intrinsic religious practice.

A possible hypothesis for the non-association of intrinsic religiosity with functional capacity may be the fact that elderly persons who describe a greater participation in intrinsic religious practices are those with inferior functionality, as functional decline intensifies with increasing age. There is then a tendency to reduce participation in formal religious activities, due to physical and functional limitations. To compensate for non-attendance at church, temples and organized events, the elderly individuals end up spending more time on intrinsic religious activities[18].

The association between the greater frequency of intrinsic religious practices and functional decline, together with the association between intrinsic religiosity and functional capacity, remain unclear, however. Comparative studies of the functionality of elderly people who attend religious activities and those who frequent social activities are also necessary to clarify whether both activities have the same effect on the functional capacity of the elderly.

This study presents certain limitations, such as the scarcity of Brazilian articles, meaning that the analysis is largely based on samples of American elderly persons. Another limitation to be considered is that there was no standardization in the instruments of the evaluation of religiosity, which may result in different interpretations of the term "religiosity" by different authors.

This article does not consider a specific type of religion, but rather the benefits of religious activities for functional capacity.

CONCLUSION

Based on this review, it can be concluded that religiosity is associated with improved functional capacity, delayed functional decline and more effective coping with disability.

Religious beliefs and traditions, participation in religious activities, and leadership performance were aspects of religiosity that were associated with functional capacity.

Despite generating well-being among the elderly, the association of intrinsic religiosity with functional capacity is still unclear.

More studies are therefore needed to clarify the real association between functional capacity and intrinsic religiosity, as well as a greater appreciation of religious aspects by all professionals who deal directly with the elderly, so that the psychosocial dimension is considered in the care of this population and the principle of integrality in the Unified Health System is respected.

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