VOLUME 20, NUMBER 2 - MARCH / APRIL 2017

Revista Brasileira de Geriatria e Gerontologia

Brazilian Journal of Geriatrics and Gerontology

UnATI
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UERJ
UNIVERSIDADE DO ESTADO DO RIO DE JANEIRO

ISSN 1981-2256

Revista Brasileira de Geriatria e Gerontologia

Brazilian Journal of Geriatrics and Gerontology

VOLUME 20 NUMBER 2 - MARCH/APRIL 2017

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ABEC

Contents

EDITORIAL

ORIGINAL ARTICLES

Contents

CASE REPORT

REVIEW ARTICLES

http://dx.doi.org/10.1590/1981-22562017020.160039

Vested rights, active aging and resiliance: the importance of such concepts throughout life

2016 is engraved on everyone's memory due to the profound economic, political and social crisis that Brazil has been undergoing. Although the triggers of this crisis are to be found in previous years, it worsened over the course of the year and I believe we have yet to reach the nadir. The repercussions of the crisis are extremely worrying. The numbers of the unemployed (including those who are working less than they could and they would like) already exceed 20% and projections indicate that this percentage is likely to increase in 2017. Many elderly persons have become the main resource providers for their whole family, and purchasing power continues to fall. Our social policies have been made fragile and our public institutions weakened. The health sector has undergone repeated cuts. Public hospitals offer ever more unstable services. Unemployment has led millions to lose their health insurance. Inevitably, all this has affected the well-being of millions of elderly people. In several states, many do not receive their pensions on time. There are major uncertainties about the nature of the proposed pension reforms, which seem to me to be inevitable. In 2016, urban social security spending reached a total of R$150 billion, and if nothing changes, this number will increase exponentially. Such spending has become unsustainable in its present form. Brazil cannot remain among the very few countries where there is no minimum retirement age and where the average retirement age is only 54–52 for women and 56 for men. Life expectancy has reached more than 75 years, while the social security plan has not changed since it was conceived in an era when such expectancy was barely over 40 years. The implementation of such reforms, however, is highly sensitive. There are vested rights at stake, as well as expectations that if not handled properly, could generate major social instability. It is essential that all groups are heard from the bottom up, and that reform does not take the form of an imposition from above, passed by a Legislative whose credibility has been put under question by the actions of its own members.

This scenario reinforces the importance of planning policies that embrace the principles of active aging, as defined by the World Health Organization in 2002. In that year, at the United Nations Assembly on Aging, the WHO launched its policy framework on active aging, defining it as the *process of optimizing opportunities for health, participation and security/protection in order to enhance quality of life as people age*. To these pillars, our Centro Internacional da Longevidade-Brasil (International Longevity Center, Brazil) (ILC-Brazil) added a fourth – that of *lifelong learning* – in the document "Active Aging: A Political Framework in response to the Longevity Revolution" (www.ilcbrazil.org). In practice, for the aging individual, regardless of age, this definition presupposes the accumulation of four essential capitals for positive aging: health, intellectual capital, social capital and financial capital (*Exame* magazine, January 18, 2017, page 33). The earlier we start to accumulate these capitals the better, but it is never too late. However, responsibility does not lie with the individual alone. It is imperative that the public sector does its part, and accompanies the situation. It is also

necessary for academia, non-governmental institutions, the private sector and the media to facilitate the process. In October 2016, ILC-Brazil organized the IV International Forum on Longevity with the theme of "the function of design and technology in a more long-lived society". The document arising from the event (www.ilcbrazil.org) sets out the principles which should guide the various sectors of society regarding the objective of developing products, services and policies that are friendlier to the elderly – and thus to people of all ages.

In recent years, the concept of resilience has gained increasing space in gerontological discussion. And here it is a word of hope. Studies have shown that the elderly are often vulnerable. However, they have also shown that, above all, they are resilient (Annual Review of Gerontology and Geriatrics, Volume 32, 2012 *Emerging Perspectives on Resilience in Adulthood and Later Life).* As far as the development of policies related to aging is concerned, as well as in the field of gerontological research, which explores its multiple dimensions and wide range of determinants, I believe that in coming years we will learn more and come to understand the importance of the following concept throughout the course of life – *resilience: access to the reserves necessary to adapt, support or grow from the challenges encountered in life"* (ILCBrazil.org).

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RBGG Editor

http://dx.doi.org/10.1590/1981-22562017020.160090

Lack of accessibility in public transport and inadequacy of sidewalks: effects on the social participation of elderly persons with functional limitations

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José Eduardo Pompeu[1]

Abstract

Objective: To analyze the association between the decline in the mobility of community dwelling elderly persons in São Paulo, Brazil and their capacity to use public transportation, and its impact on their quality of life and social participation. *Method:* A cross-sectional study was conducted of 32 community dwelling elderly persons, of both genders (59% female), with an average age of 75.5 years (±9.2). The participants were evaluated by functional mobility, risk of falls, fear of falls and independence in activities of daily living. In addition, the perception of the elderly persons of their mobility on public transport and its impact on their social participation was evaluated. The elderly persons were divided into two groups: with mobility impairment and without mobility impairment. The groups were compared using the Fisher's Exact, Chi-Squared and Mann-Whitney tests, and the unpaired Student's t-test. An alpha level of 0.05 was adopted as a level of statistical significance. *Result:* Elderly persons with greater mobility impairment exhibited greater difficulty accessing public transport and a greater number of falls during their use of the same. Elderly persons who reported difficulty accessing public transport suffered greater impact on their social participation and quality of life. *Conclusion:* Elderly persons with greater mobility impairment had a greater number of complaints related to public transport. Additionally, they suffered a greater impact on their social participation, characterized by limitations in their capacity for independent movement around the city, limiting their social activities.

Keywords: Aged. Quality of life. Social participation. Locomotion.

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INTRODUCTION

The increased population aging of recent decades[1,2] has challenged cities to transform in order to guarantee the independence and autonomy of the elderly, as well ensuring they enjoy an active and productive life[3-5].

A key factor if this population is to maintain independence and autonomy and delay the emergence of disabilities is their ability to move around the city[6]. The mobility of the elderly can be defined as their ability to move from one place to another independently and safely[7].

This mobility may be limited by personal factors associated with the physiological process of aging, or environmental factors. Personal factors include the impairment of muscle strength and flexibility, increased rigidity of the periarticular and intramuscular connective tissues, the decline of the tolerance of the body to exercise, decreased nerve conduction and reduced visual, auditory and vestibular acuity[7,8]. Among environmental factors, the main barriers are associated with the inadequacies of public transportation accessibility and irregularities in the sidewalks and roads used by the elderly. The safe and independent movement of the elderly around the city depends on a suitable physical environment that facilitates accessibility[1,9]. While subways and trains are rapid modes of transport, it is often necessary to walk long distances to reach stations, as well as to go up and down stairs and walk along long corridors until reaching the desired platform. Buses, on the other hand, are a slower form of travel, and are often hindered by city traffic. However, access is usually easier via locations closer to the residence of the user, which reduces the need to travel long distances. In addition, the bus has the flexibility of rapid integration in special terminals[10].

Mobility and accessibility are also related to quality of life, as the elderly may have difficulties performing instrumental activities of daily living (IADL) such as shopping or banking, if external environments do not facilitate such activities[11]. They also discourage social interaction, as the possibility of moving through the city determines the participation of the elderly in such interaction[12].

In order for the population to age in a more active manner, there is a need either for environments that support the elderly, without physical barriers that discourage them from leaving home, and a system of public transportation and streets and avenues that meets the specific needs of this group[10,11,13,14], or a treatment program that will help them overcome these barriers.

After extensive research in existing literature, the authors of the present study did not locate studies on the relationship between mobility deficiencies among the elderly and their ability to use public transportation. There is therefore a gap in the literature on the impact of personal and environmental limitations related to mobility and the conditions of accessibility to public transport on the social participation of these individuals. Most studies are linked to civil engineering and transport engineering issues, and address only the satisfaction of the public transport user. Issues related to the health sector are scarce, and it is important that research is carried out that provides information and knowledge about this relationship[4,5].

The objective of the present study was therefore to analyze the association between the declining mobility of elderly persons and their ability to use public transport, and its impact on the quality of life and social participation of such individuals.

METHODS

An observational, analytical, cross-sectional study was carried out. A pilot study that evaluated ten community-dwelling elderly persons living in the city of São Paulo, Brazil was initially performed. From these results, a sample calculation was performed for the execution of the final project, which evaluated 32 elderly people in the period from July 2015 to January 2016. These elderly persons were evaluated in the outpatient clinic of the Hospital das Clínicas of the Faculdade de Medicina da Universidade de São Paulo (the Clinical Hospital of the Medical School of the University of São Paulo) (HCFMUSP) after routine appointments. The elderly persons who were invited and agreed to participate in the study were interviewed once only on the same day.

The inclusion criteria applied to the study participants were: a) elderly people aged 60 and over of both genders (male and female); b) elderly people who used one or more of the main modes of public transport (bus, subway or train). The exclusion criteria were the inability to perform the tests or to answer the study questionnaires due to motor or cognitive impairment.

After agreeing to participate and signing a Free and Informed Consent Form (FICF), the elderly persons were evaluated individually. Each evaluation lasted from 40 to 60 minutes. The evaluation consisted of the registering of sociodemographic characteristics, cognitive tracking and mood disorders through the MMSE and the Geriatric Depression Scale (GDS-15), respectively. Functional mobility was evaluated by the Short Physical Performance Battery (SPPB) and Mini Balance Evaluation Systems Test (Mini-BESTest). Manual grip strength was performed by a handgrip dynamometer. Self-reported difficulties in daily and social living activities were evaluated through the *Questionário Brasileiro de Avaliação Funcional Multidimensional* (the Brazilian Questionnaire of Multidimensional Functional Assessment) (BOMFAQ) and the Participation Scale, respectively. Fear of falling was assessed through the Falls Efficacy Scale–International (FES-I) instrument. Finally, perception of the accessibility conditions of public transport and their impact on social participation was evaluated through two questionnaires created by the authors of the present study.

The MMSE[15] is a cognitive tracking instrument that evaluates temporal orientation, spatial orientation, three word registration, attention and calculation, three word recall, language and visual constructive ability. The score can vary from a minimum of zero points, which indicates the highest degree of cognitive impairment of an individual, to a maximum total of 30 points, which corresponds to the highest cognitive capacity. The cut-off points used were based on schooling: 20 points for illiterate individuals; 1-4 years of schooling: 25 points; 5-8 years: 26 points; 9-11 years: 28 points; >11 years: 29 points[15].

The SPPB[16] has been used as an effective instrument to evaluate the physical performance of the lower limbs (LL). The SPPB adapted for the Brazilian population[17] is composed of three tests that evaluate in sequence, standing static balance, gait speed and the muscular strength of the LL. A differentiated score of 0 to 4 was given for each test, according to the performance time of each task[17], with 0-3 points considered: inability or very poor performance; 4-6 points: low performance; 7-9 points: moderate performance; 10-12 points: good performance[16].

The Manual Grip Strength Test, which is broadly correlated to the overall muscular strength level of the elderly, was evaluated through the use of a pressure dynamometer in the dominant hand, with maximum manual grip strength recorded over three attempts with a one-minute Interval between attempts. The best score among the three trials was used as a measure[18]. The values were adjusted according to gender and body mass index (BMI) as described by Marucci and Barbosa[18]: men - BMI of 0 to 23, cutoff point (CP) <27.00kgf; BMI between 23 and 28, CP 28.67kgf; BMI between 28 and 30, CP 29.50kgf; BMI greater than 30, CP<28.67kgf; women - BMI between 0 and 23, CP<16.33kgf; BMI between 23 and 28, CP<16.67kgf; BMI between 28 and 30, CP<17.33kgf; BMI greater than 30, CP<16.67kgf.

The Mini-BESTest[19] adapted and validated for the Brazilian population[20], allows the rapid and reliable tracking of balance disorders. It has 14 items, each of which is given a score of from zero to two. The maximum score is 32, which suggests no balance disorders, and the minimum is zero points, which is suggestive of a balance deficit[20]. In the present study, cutoff scores of less than or equal to 21 points among the elderly were considered as deficits of postural response (worse performance) and those who obtained more than 21 points were considered as not having postural response deficits (better performance)[21].

The GDS-15[22] is the most commonly used instrument to track mood disorders in the elderly and is composed of 15 questions scored 0 or 1. Individuals with scores between 0 and 5 are interpreted as being without depressive symptoms; those with 6 to 10 points as having mild depressive symptoms and those with 11 to 15 points as having severe depressive symptoms[23]. This instrument was applied in this

study only for the purpose of characterizing the sample and control of possible bias of the influence of depressive symptoms on the perception of mobility in public transport.

The objective of the *Questionário Brasileiro de Avaliação Funcional Multidimensional* (the Brazilian Questionnaire on Multidimensional Functional Assessment) (BOMFAQ)[24] is to evaluate the difficulties related by the subject in performing 15 activities of daily living. Activities that presented some difficulty received one point regardless of the degree of difficulty described, with a score of 15 indicative of the greatest possible functional impairment.

The Falls Efficacy Scale-International (FES-I)[25] consists of evaluating the fear of new falls described by the subject during a number of daily and social living activities, and may present a decline in mobility by self-limitation. There are 16 tasks with different levels of complexity in which the elderly can report feeling not at all concerned (1 point), a little concerned (2 points), very concerned (3 points) or extremely concerned (4 points) about the risk of falling during the activities. Therefore, a score greater than or equal to 23 points would be associated with episodes of sporadic falls and a score greater than or equal to 31 points would be associated with recurrent falls[25].

The Participation Scale[26] quantitatively compares the impact of physical incapacities and immobility on the social participation of the elderly. This scale was based on the concepts of the International Classification of Functioning (ICF) of Activity and Participation and consists of 18 closed (yes or no) self-reported questions relating to participation in different social tasks, based on comparison "with someone equal to you in everything except your condition or disability," such as "do you participate in recreational and social activities as often as your peers?" "do you visit other people in the community as often as your peers?". If relevant, prior to the question, the subject was asked to not consider going to hospitals or medical consultations as social participation. When the answers were negative, the question was asked "to what extent does this pose a problem for you?". The peer relationship was established with respect to gender, age group and level of schooling. The same scale was also used based on comparison with the elderly persons themselves, but aged ten years younger. Responses were scored according to the level of importance to the subject, where the higher the score, the greater the impact and its relevance to social participation[26].

The urban mobility questionnaire used to evaluate the perception of the elderly regarding mobility in public transport was created by the authors of the study, based on the "Global Guide: Age Friendly Cities"[11]. It contained structured questions about the availability of transport timetables, safety regarding locomotion within the modes of transport, and the access route to the same, the kindness of drivers and other passengers, among other issues considered important for the development of the study.

The questionnaire on quality of life associated with public transport was also prepared by the authors of the study. It contains five easy-to-understand structured questions related to activities that the elderly persons do not attend because of the difficulty in getting around via public transportation.

For comparative data analysis, Fisher's exact and the Chi-squared tests were used for categorical data and the Mann-Whitney test and the non-paired Student's t-test were used for numerical data, according to the normality test. A level of 5% (p<0.05) was considered for statistical significance.

The present study was performed in accordance with the regulatory directives and guidelines on research involving human beings (resolution 466/12 of the National Health Council), and data collection only began following approval by the Ethics Committee for the Analysis of Research Projects of the Hospital das Clínicas of the Faculdade de Medicina da Universidade de São Paulo (the Clinical Hospital of the Medical School of the University of São Paulo) on 20/08/2015 under CAAE number 47.788.915.4.0000.0068.

RESULTS

In the descriptive analysis of the total sample, the mean age of the elderly was 75.5 years (±9.2), 59% of participants were female (n=19), 62% had more than nine years of schooling (n=20) and a

BMI of 25.8 (±4.5), most of the elderly persons were married (n=20; 62%) and scored a mean of 27.2 points (± 2.2) in the MMSE and 3.6 Points (±2.7) in GDS-15 (Table 1 and 2). There was also a preponderance of elderly people living in the western region (n=12; 37%) of the city of São Paulo, and half of the sample used the bus (n=16; 50%) as their main mode of public transportation. Table 1 and Table 2 show that there was a significant difference in relation to age (p=0.01), schooling (p=0.04), marital status (p=0.02), type of public transport used (p=0.005), and MMSE (p=0.009) and GDS-15 (p=0.02) scores between elderly persons who obtained Mini-BESTest scores above (better performance) and below (worse performance) the cutoff point.

Table 1. Sociodemographic characterization and evaluation of mobility of total sample of elderly persons and comparison with Mini-BESTest performance. São Paulo, 2016.

Variables	Total sample n=32 mean (±sd)	Better performance n=16 mean (±sd)	Worse performance n=16 mean (±sd)	p-value
Age	75.5(±9.2)	71.8(±7.3)	79.3(±9.6)	0.01[a]
Body Mass Index	25.8(±4.5)	25.6(±2.8)	25.9(±5.8)	0.85[a]
Mini-mental state exam	27.2(±2.2)	28.1(±1.8)	26.3(±2.2)	0.009[b]
Geriatric Depression Scale	3.6(±2.7)	2.5(±2.2)	4.7(±2.8)	0.02[a]
Short Physical Performance Battery	9.0(±2.4)	9.9(±1.8)	8.1(±2.5)	0.02[a]
Mini-BESTest	23.3(±6.1)	28.6(±2.8)	18(±2.9)	<0.001[b]
Timed Up and Go	11.1(±4.2)	8.7(±2.7)	13.4(±4.1)	0.001[b]
Timed Up and Go with double task	16.6(±6.8)	13.5(±6.1)	19.6(±6.1)	0.006[b]
Falls Efficacy Scale-International	27.1(±8.5)	23.7(±4.3)	30.4(±10.4)	0.02[a]
Multidimensional functional evaluation	3.4(±3.8)	1.0(±1.5)	5.7(±3.9)	<0.001[b]
Social participation (by peers)	7.3(±7.6)	5.9(±7.2)	8.6(±7.9)	0.32[a]
Social participation (10 years younger)	12.2(±9.2)	8.9(±5.8)	15.4(±10.8)	0.04[a]
Manual Handgrip Strength	24.1(±9.7)	28.1(±10.1)	20.1(±7.6)	0.01[a]

a: p-value referring to unpaired Student's t-test in comparison between elderly persons with better and worse performance; b: p-value referring to Mann-Whitney test in comparison between elderly persons with better and worse performance; * The division of the better/worse performing groups was carried out based on the Mini-BESTest cut-off point, where better performance >21 points and worse performance ≤21 points; sd: standard deviation.

Table 2. Sociodemographic characterization and evaluation of mobility of total sample of elderly persons and comparison with Mini-BESTest performance. São Paulo, 2016.

	Total sample n=32 n (%)	Better performance n=16 n (%)	Worse performance n=16 n (%)	*p*-value
Gender				0.47[a]
Female	19 (59)	8 (50)	11 (69)	
Male	13 (41)	8 (50)	5 (31)	
Schooling (years)				0.04[b]
1-4	6 (19)	0 (0)	6 (38)	
5-8	6 (19)	4 (25)	2 (12)	
9-11	10 (31)	7 (44)	3 (19)	
More than 11	10 (31)	5 (31)	5 (31)	
Marital status	6(19)	6 (38)	0 (0)	0.02[b]
Single	20 (62)	9 (56)	11 (69)	
Married	5 (16)	1(6)	4 (25)	
Widowed	1 (3)	0 (0)	1 (6)	
Divorced				
Region of residence				0.50[b]
South	4 (12)	2(12)	2 (12)	
North	6 (19)	3 (19)	3 (19)	
East	5 (16)	1 (7)	4 (25)	
West	12 (37)	8 (50)	4 (25)	
Central	5 (16)	2 (12)	3 (19)	
Transport used				0.005[b]
Bus	16 (50)	9 (57)	7 (44)	
Subway	10 (31)	1 (6)	9 (56)	
Bus and subway	5 (16)	5 (31)	0 (0)	
Subway and train	1 (3)	1 (6)	0 (0)	

a: *p*-value referring to Fischer's test in comparison between elderly persons with better and worse performance; b: *p*-value referring to Chi-squared test in comparison between elderly persons with better and worse performance; * The division of the better/worse performing groups was carried out based on the Mini-BESTest cut-off point, where better performance >21 points and worse performance ≤21 points.

Table 1 shows a significant difference between the best and worst performing groups in terms of elderly mobility in the variables of all the instruments used (SPPB, Mini-BESTest, Timed Up and Go (TUG), TUG dual task, FES-I, BOMFAQ, social participation in comparison with elderly persons ten years younger and manual grip strength), except the social participation scale by peer comparison.

In terms of the perception of urban mobility of the elderly persons, who use the bus as their main mode of transport (n=21), table 3 shows that only six (29%) reported difficulty in walking to their transportation from their respective residences, with holes in the sidewalk (n=12; 57%) and the inadequate height of the same (n=10; 48%) the most frequently reported difficulties. Nine (43%) of the 21 elderly persons reported having difficulty getting on and off the bus, while ten (48%) elderly individuals said that the main obstacle to accessing the bus was the height of the step, and six (29%) claimed to have fallen within the modes of transport. The main reasons for leaving home and using the bus was to attend medical appointments (n=11, 53%) and to go out (n=3; 14%), with 19 (91%) never having missed or been late for an appointment due to transportation difficulties. A total of 18 (n=86%) did not often abandon going out. Table 2 also shows that there was a significant difference between the best and worst performing groups in the following questions: difficulty in travelling from home to the bus stop (p=0.04), difficulty entering and exiting the bus (p=0.005), step height as a difficulty factor (p=0.01) and degree of satisfaction with priority seating (p=0.01).

Table 3. Perception of urban mobility of elderly persons using the bus as their main mode of transport and comparison with Mini-BESTest performance. São Paulo, 2016.

Questions	Total sample n=21. n (%)	Better performance n=14. n (%)	Worse performance n=7. n (%)	p-value
Do you encounter difficulties during the journey from home to bus stop?				**0.04**
Yes	6 (29)	2 (14)	4 (57)	
No	15 (71)	12 (86)	3 (43)	
Are there holes in the sidewalk?				0.06
Yes	12 (57)	6 (43)	6 (86)	
No	9 (43)	8 (57)	1 (14)	
Is the height of the sidewalks unsuitable?				0.53
Yes	10 (48)	6 (43)	4 (57)	
No	11 (52)	8 (57)	3 (43)	
Are there obstacles on the journey?				0.75
Yes	8 (38)	5 (36)	3 (43)	
No	13 (62)	9 (64)	4 (57)	
Is there a lack of respect by pedestrians?				1.00
Yes	3 (14)	2 (14)	1 (14)	
No	18 (86)	12 (86)	6 (86)	
Is there a lack of pedestrian crossings?				0.11
Yes	8 (38)	7 (50)	1 (14)	
No	13 (62)	7 (50)	6 (86)	
Is the crossing time at pedestrian crossings insufficient to cross?				0.43
Yes	4 (19)	2 (14)	2 (29)	
No	17 (81)	12 (86)	5 (71)	
Is it difficult to enter/leave the bus?				**0.005**
Yes	9 (43)	3 (21)	6 (86)	
No	12 (57)	11 (79)	1 (14)	
Does the height of the steps make entering or leaving the bus difficult?				**0.01**
Yes	10 (48)	4 (29)	6 (86)	
No	11 (52)	10 (71)	1 (14)	
Is there the lack of a handrail to help you enter/leave the bus?				0.59
Yes	2 (9)	1 (7)	1 (14)	
No	19 (91)	13 (93)	6 (86)	
Is there disrespect by the other passengers?				0.69
Yes	4 (19)	3 (21)	1 (14)	
No	17 (81)	11 (79)	6 (86)	
Are you satisfied with the behavior of the motorist?				1.00
Yes	15 (71)	10 (71)	5 (71)	
No	6 (29)	4 (29)	2 (29)	
Does the motorist drive too fast?				1.00
Yes	9 (43)	6 (43)	3 (43)	
No	12 (57)	8 (57)	4 (57)	
Does the motorist fail to take care on curves?				0.46
Yes	5 (24)	4 (29)	1 (14)	
No	16 (76)	10 (71)	6 (86)	

to be continued

Continued from Table 3

Questions	Total sample n=21. n (%)	Better performance n=14. n (%)	Worse performance n=7. n (%)	p-value
Are you satisfied with the quantity of priority seating?				**0.01**
Yes	16 (76)	13 (93)	3 (43)	
No	5 (24)	1 (7)	4 (57)	
Do passengers respect the priority seating?				0.11
Yes	13 (62)	7 (50)	6 (86)	
No	8 (38)	7 (50)	1 (14)	
Have you ever missed/been late for medical appointments due to difficulties with transport?				0.59
Yes	2 (9)	1 (7)	1 (14)	
No	19 (91)	13 (93)	6 (86)	
Have you ever not left the house due to difficulties with transport?				1.00
Yes	3 (14)	2 (14)	1 (14)	
No	18 (86)	12 (86)	6 (86)	
What are your main reasons for using the bus?				0.19
Shopping	1 (5)	1 (7)	0 (0)	
Physical activity	2 (9)	2 (14)	0 (0)	
Shopping and physical activity	2 (9)	2 (14)	0 (0)	
Medical appointment	11 (53)	5 (36)	6 (86)	
Get to the subway	1 (5)	1 (7)	0 (0)	
To go out	3 (14)	3 (22)	0 (0)	
To get top laces where there is no parking	1 (5)	0 (0)	1 (14)	
Have you ever fallen inside public transport?				1.00
Yes	6 (29)	4 (29)	2 (29)	
No	15 (71)	10 (71)	5 (71)	

a: *p*-value referring to Chi-squared test in comparison between elderly persons with better and worse performance; * The division of the better/worse performing groups was carried out based on the Mini-BESTest cut-off point, where better performance >21 points and worse performance ≤21 points.

Table 4 shows that 50% (n=8) of the elderly persons who use the subway as their main mode of transport have difficulty walking the route from their respective residences to the station, with the most frequent complaint being holes in the sidewalks (n=12, 75%). Five (31%) of the elderly persons reported that they had fallen within the station once or more, and said that the reason they use the subway most is to go to medical appointments (n=12; 75%). There was a significant difference between the better and worse performing groups in the items "lack of a handrail" as a difficulty factor when entering/exiting the train (p=0.04), and falls within the modes of transportation (p=0.01).

Even with all the difficulties encountered, the elderly persons evaluated rarely do not use public transportation because they do not have someone to accompany them (n=30; 94%). As shown in table 5, however, there is a significant difference between the better and worse performing groups, where the worse performing group would be socially more active if these difficulties were resolved (p=0.02) and would have a better quality of life, participating in more activities that do not currently participate in (p=0.006).

Based on the comparison of the mobility of the elderly who described having or not having difficulty in the journey to the means of public transport, table 5 reveals a significant difference in the FES-I, BOMFAQ and participation scale scores. When comparing the mobility of the elderly who reported having difficulty entering public transport, there was a significant difference only in the scores of the social participation scale (table 6).

Table 4. Perception of urban mobility of elderly persons using the metro as their main mode of transport and comparison with Mini-BESTest performance. São Paulo, 2016.

Questions	Total sample n=16. n (%)	Better performance n=7. n (%)	Worse performance n=9. n (%)	*p*-value
Do you encounter difficulties during the journey from home to station?				0.61
Yes	8 (50)	3 (43)	5 (56)	
No	8 (50)	4 (57)	4 (44)	
Are there holes in the sidewalk?				0.14
Yes	12 (75)	4 (57)	8 (89)	
No	4 (25)	3 (43)	1 (11)	
Is the height of the sidewalks unsuitable?				0.28
Yes	7 (44)	2 (29)	5 (56)	
No	9 (56)	5 (71)	4 (44)	
Are there obstacles on the journey?				0.28
Yes	7 (44)	2 (29)	5 (56)	
No	9 (56)	5 (71)	4 (44)	
Is there a lack of respect by pedestrians?				0.24
Yes	1 (6)	1 (14)	0 (0)	
No	15 (94)	6 (86)	9 (100)	
Is there a lack of pedestrian crossings?				0.24
Yes	1 (6)	1 (14)	0 (0)	
No	15 (94)	6 (86)	9 (100)	
Is the crossing time at pedestrian crossings insufficient to cross?				0.68
Yes	3 (19)	1 (14)	2 (22)	
No	13 (81)	6 (86)	7 (78)	
Do you find it difficult to enter/leave the subway?				0.19
Yes	5 (31)	1 (14)	4 (44)	
No	11 (69)	6 (86)	5 (56)	
Is the distance between the train and the platform unsuitable?				0.36
Yes	1 (6)	0 (0)	1 (11)	
No	15 (94)	7 (100)	8 (89)	
Does lack of handrail make entering/leaving subway difficult				0.04
Yes	4 (25)	0 (0)	4 (44)	
No	12 (75)	7 (100)	5 (56)	
Is there disrespect by the other passengers?				0.37
Yes	3 (19)	2 (29)	1 (11)	
No	13 (81)	5 (71)	8 (89)	
Is the door opening/closing time insufficient?				0.18
Yes	2 (12)	0 (0)	2 (22)	
No	14 (88)	7 (100)	7 (78)	
Are you satisfied with the quantity of priority seating?				0.36
Yes	15 (94)	7 (100)	8 (89)	
No	1 (6)	0 (0)	1 (11)	
Do passengers respect the priority seating?				0.37
Yes	13 (81)	5 (71)	8 (89)	
No	3 (19)	2 (29)	1 (11)	

to be continued

Continued from Table 4

Questions	Total sample n=16. n (%)	Better performance n=7. n (%)	Worse performance n=9. n (%)	*p*-value
Have you ever missed/been late for medical appointments due to difficulties with transport?				0.36
Yes	1 (6)	0 (0)	1 (11)	
No	15 (94)	7 (100)	8 (89)	
Have you ever not left the house due to difficulties with transport?				0.18
Yes	2 (12)	0 (0)	2 (22)	
No	14 (88)	7 (100)	7 (78)	
What are your main reasons for using the metro?				0.37
Shopping	1 (6)	1 (14)	0 (0)	
Physical activity	1 (6)	1 (14)	0 (0)	
Shopping and physical activity	2 (13)	1 (14)	1 (11)	
Medical appointment	12 (75)	4 (58)	8 (89)	
Have you ever fallen inside public transport?				0.01
Yes	5 (31)	0 (0)	5 (56)	
No	11 (69)	7 (100)	4 (44)	

a: *p*-value referring to Chi-squared test in comparison between elderly persons with better and worse performance; * The division of the better/worse performing groups was carried out based on the Mini-BESTest cut-off point, where better performance >21 points and worse performance ≤21 points.

Table 5. Perception of quality of life associated with public transport and comparison based on Mini-BESTest performance. São Paulo, 2016.

Questions	Total sample n=32 n(%)	Better performance n=16 n(%)	Worse performance n=16 n(%)	*p*-value[a]
Have you ever not used public transport due to not having a companion with you?				0.14
Yes	2 (6)	0 (0)	2 (12)	
No	30 (94)	16 (100)	14 (88)	
Would you be more socially active if your difficulties with public transport were resolved?				0.02
Yes	12 (37)	3 (19)	9 (56)	
No	20 (63)	13 (81)	7 (44)	
Would you have a greater quality of life if you participated in more events that you have not taken part in due to difficulties with public transport?				0.006
Yes	9 (28)	1 (6)	8 (50)	
No	23 (72)	15 (94)	8 (50)	

a: *p*-value referring to Chi-squared test in comparison between elderly persons with better and worse performance; * The division of the better/worse performing groups was carried out based on the Mini-BESTest cut-off point, where better performance >21 points and worse performance ≤21 points.

Table 6. Comparison of mobility of elderly persons that described having or not having difficulty on their journey to and when entering the mode of public transport they most use. São Paulo, 2016.

	Elderly persons with difficulties on the journey to transport (n=12)	Elderly persons without difficulties on the journey to transport (n=20)	*p*-value	Elderly persons with difficulty entering the transport (n=14)	Elderly persons without difficulty entering the transport (n=18)	*p*-value
Short Physical Performance Battery – mean (±sd)	8.3 (±2.9)	9.4 (±1.8)	0.16[a]	8.2 (±2.7)	9.2 (±1.9)	0.55[a]
Mini-BESTest - mean (±sd)	20.9 (±6.1)	24.8 (±5.6)	0.08[a]	19.2 (±5.7)	25.1 (±4.8)	0.05[a]
Timed Up and Go - mean (±sd)	12.6 (±5.2)	10.16 (±3.12)	0.10[a]	13.8 (±4.8)	9.8 (±2.6)	0.05[a]
Timed Up and Go with double task - mean (±sd)	18.6 (±8.3)	15.3 (±5.4)	0.19[a]	20.1 (±6.9)	15.3 (±5.6)	0.25[a]
Falls Efficacy Scale–International - mean (±sd)	33.7 (±9.7)	23.2 (±4.4)	**0.002**[b]	29.7 (±9.1)	25.8 (±8.3)	0.36[a]
Multidimensional functional evaluation - mean (±sd)	6.1 (±4.5)	1.7 (±1.9)	**0.01**[b]	5.6 (±3.6)	2.3 (±3.4)	0.06[a]
Social participation (by peers) mean (±sd)	12.9 (±9.3)	3.8 (±3.5)	**0.002**[b]	11.4 (±7.7)	3.0 (±2.7)	**<0.001**[b]
Social participation (10 years younger) mean (±sd)	20.3 (±9.8)	6.9 (±3.9)	**<0.001**[b]	15.2 (±8.0)	9.4 (±9.3)	**0.01**[b]
Manual handgrip strength mean (±sd)	20.8 (±7.2)	26.2 (±10.3)	0.13[a]	20.2 (±4.6)	26.2 (±11.7)	0.18[a]

a: *p*-value referring to unpaired Student's t-test in comparison between elderly persons with and without difficulty; b: *p*-value referring to Mann-Whitney test in comparison between elderly persons with and without difficulty; Sd: standard deviation.

DISCUSSION

The aim of the present study was to analyze the decline of the mobility of the elderly, their perception regarding the use of public transport and its impact on quality of life and social participation. Through the evaluations performed it is possible to perceive that the four aspects mentioned are interconnected. Several studies[2,4,12,27] suggest that the ability to move around the city, as well as guaranteeing autonomy and a better quality of life for the elderly, is an important prevention factor for dependency and institutionalization.

In the present study, the elderly persons who performed poorly in the mobility assessment had a significantly greater mean age than those who performed better. This reinforces that an aging population brings a greater chance of increasing the number of chronic degenerative diseases that can lead to different degrees of functional, social and cognitive limitations. This finding agrees with literature, which shows that the probability of elderly people aged over 75 years presenting some form of impairment in mobility increases by 47% each year[5,27].

Previous studies[1,27] have also shown that some sociodemographic characteristics (the female gender and low level of schooling) lead to a greater possibility of functional disability over time, compromising independence and quality of life, which agrees with the findings of the present study.

Due to the rapid advancement of population aging in Brazil, reporting the positive and negative aspects of the quality of sidewalks and streets, access to public transport and the transport itself is important, as reducing barriers and identifying alternatives is of great importance, along with strategies based on the individual, to guarantee access for the elderly[1,28].

The opinion of almost all the elderly persons in the present study was positive. This can be associated with the fact that they are, for the most part, independent for the performance of activities of daily living, as in the group which performed more poorly in the mobility evaluation, the negative aspects were greater, restricting their ability to use public transport. The main problems reported by the elderly persons from both groups were: holes in the sidewalks, inadequate sidewalk height and height of bus steps. In contrast, Barreto[1] found mostly negative answers, with the few positive points virtually nullified by the negative points, such as it is not an advantage to have buses to different locations if there are no seats at bus stops, and the priority seats are not respected. In a study by Bryanton, Weeks and Less[29] of only elderly women, several reasons for not using public transport were reported, such as a lack of accessibility, long waiting time and difficulty with routes.

Means of transportation are necessary for the elderly persons to have access to health services and social and leisure activities, as they directly depend on such transport[30]. In the present study, there was a strong predominance of elderly people who use public transportation only to access health services, a finding which corroborates with the study by Barreto[1], which raises two hypotheses: from a positive perspective, this population has a much greater degree of self-care and, negatively, there may be an increase in chronic-degenerative diseases, which causes them to seek healthcare services more frequently. Gajardo et al.[5], in addition to observing a large number of elderly people who used transport only for healthcare purposes, reported that the majority of the sample asked their respective doctors to schedule consultations between 10.00 and 11.00 am, avoiding peak hours and facilitating access to means of transport.

Bryanton, Weeks and Lees[29], observed that social requirements have become an extravagance for this population. The finding in this study is similar: in general, the majority of older people with a worse performance in terms of mobility reported that they would be socially more active and would have a better quality of life if their difficulties with public transport were resolved. When the mobility of the elderly persons who described having difficulty in terms of access to transportation was considered, they obtained higher scores on the social participation scale, suggesting that such participation is impaired. This is due to the fact that using public transport helps to maintain connections with family and friends, as well as participation in other social events, and that barriers to access to these means of transport causes elderly people with reduced mobility or who already have some difficulties to abandon the use of these means of locomotion, due to the risks they will be exposed to[1,27,31]. Choi and Dinitto[28] described that transportation that is an obstacle to visiting friends and family can contribute significantly to the increase of depressive symptoms.

In addition, it is important to highlight that elderly persons with poor mobility suffered a higher number of falls than the group that performed better in terms of mobility. While we cannot disregard the existence of factors that are intrinsic to the aging process, environmental factors, reported by the elderly and previously discussed, also contribute decisively to the occurrence of falls[32]. However, in the study by Gajardo et al.[5], none of the interviewees suffered falls, but complained of insecurity about environmental factors and fear of falling.

Public health actions are therefore necessary to make streets and public transport more accessible to the elderly, leading to improvements in individual health and well-being. A city that is friendly to the elderly adapts its structures and services, providing where available free or subsidized transport that is reliable and frequent, ample route coverage, vehicles for the elderly, specialized services, priority seats, kindness and care from drivers, safety and comfort, good conditions at stops, community transport and information on transport options, all of which are fundamental characteristics for a city to be considered as friendly to the elderly.[11] Not all, however, are to be found in the city of São Paulo.

In view of the results observed, and due to the clinical and scientific relevance of the subject, it is hoped that this study will help health professionals

to create specific intervention strategies that address the real limitations of the elderly within the urban environment, which, due to a lack of knowledge of these difficulties and/or the inability of professionals to deal with elderly persons, has led to the development of strategies based only on the difficulties encountered in a controlled environment, when it is known that it is crucial to have a broad gerontological view to deal with this population from different perspectives[30]. In addition, it demonstrates the importance of thinking about public health policies to prevent or postpone the new demographic and epidemiological transition from generating undesirable economic effects in Brazil[33].

The present study presents some limitations, such as the small sample size of both groups and the evaluation of perception, through reports (subjective evaluation) of the difficulties related to public transport, or in other words, the difficulties were not evaluated in an ecological way (by direct observation of their occurrence). With this, an extension of the research is suggested, by evaluating a greater number of elderly persons and carrying out studies that evaluate the different chronic-degenerative conditions that could potentially influence mobility, as well as comparative studies between the ecological evaluation of mobility within public transport and the reports of the elderly.

CONCLUSION

With the results of this study it was possible to observe that the elderly persons who presented a greater degree of difficulty during mobility evaluations had a greater number of complaints related to access to public transport and the impact on their social participation than elderly persons with better mobility, suggesting that irregular sidewalks and inaccessible public transport are just some of the characteristics of the built environment that can create barriers to the external mobility of elderly people who already have some degree of reduced mobility, impacting on their ablity to interact independently with the city and reducing activities and well-being. The objectives of the study were therefore achieved.

REFERENCES

1. Barreto KML. Envelhecimento, mobilidade urbana e saúde: um estudo da população idosa (tese). Recife: Fundação Oswaldo Cruz; 2012.
2. Minayo MCS. O envelhecimento da população brasileira e os desafios para o setor saúde. Cad Saúde Pública. 2012;28(2):208-9.
3. Sherlock PL, Mckee M, Ebrahim S, Gorman M, Greengross S, Prince M, et al. Population ageing and health. Lancet. 2012;379(9823):1295-6.
4. Tavares DMS, Pelizaro PB, Pegorari MS, Paiva MM, Marchiori GF. Incapacidade funcional e fatores associados em idosos de área urbana: um estudo de base populacional. Rev Bras Cineantropom Desempenho Hum. 2016;18(5):499-508.
5. Gajardo J, Navarrete E, López C, Rodriguez J, Rojas A, Troncoso S. Percepciones de personas mayores sobre su desempeño en el uso de transporte público em Santiago de Chile. Rev Chil Ter Ocup. 2012;12(1):88-102.
6. Blanco PHM, Castilho MM, Blanco THM, Cortez LERC. Mobilidade urbana no contexto do idoso. Rev Cesumar Ciênc Hum Soc Aplic 2014;19(1):143-55.
7. Cesar CC, Mambrini JVM, Ferreira FR, Costa MFL. Capacidade funcional de idosos: análise das questões de mobilidade, atividades básicas e instrumentais da vida diária via teoria de resposta ao item. Cad Saúde Pública. 2015;31(5):931-45.
8. Silva NA, Pedraza DF, Menezes TN. Desempenho funcional e sua associação com variáveis antropométricas e de composição corporal em idosos. Ciênc Saúde Coletiva. 2015;20(12):3723-32.
9. Freire Junior RC, Areas GPT, Areas FZS, Barbosa LG. Estudo da acessibilidade de idosos ao centro da cidade de Caratinga, MG. Rev Bras Geriatr Gerontol. 2013;16(3):541-58.
10. Lerner J, Ceneviva C. Avaliação comparativa das modalidades de transporte público urbano [Internet]. Brasília, DF: Associação Nacional das Empresas de Transportes Urbanos; 2009 [acesso em 25 jan. 2017]. Disponível em: http://www.ntu.org.br/novo/upload/Publicacao/Pub635109537433018893.pdf
11. Organização Mundial de Saúde. Guia Global: Cidade amiga do idoso. Suíça: OMS; 2008.

12. Clarke P, Gallagher NA. Optimizing mobility in later life: the role of the urban built environment for older adults aging in place. J Urban Health. 2013;90(6):997-1009.

13. Organização Mundial de Saúde. Classificação internacional de funcionalidade, incapacidade e saúde. Lisboa: OMS; 2004.

14. Castaneda L, Bergmann A, Bahia L. A classificação internacional de funcionalidade, incapacidade e saúde: uma revisão sistemática de estudos observacionais. Rev Bras Epidemiol. 2014;17(2)437-51.

15. Brucki SMD, Nitrini R, Caramelli P, Bertolucci PHF, Okamoto IH. Sugestões para o uso do mini-exame do estado mental no Brasil. Arq Neuropsiquiatr. 2003;61(3B):777-81.

16. Guralnik JM, Simonsick EM, Ferrucci L, Glynn RJ, Berkman LF, Blazer DG, et al. A Short physical performance battery assessing lower extremity function: association with self reported disability and prediction of mortality and nursing home admission. J Gerontol. 1994;49(2):85-94.

17. Nakano MM. Versão Brasileira da Short Physical Performance Battery-SPPB: adaptação cultural e estudo de confiabilidade [tese]. São Paulo: UNICAMP, Faculdade de Educação; 2007.

18. Marucci M, Barbosa A. Estado nutricional e capacidade física. In: Lebrão ML, Duarte YAO, organizadores. SABE – Saúde, Bem-estar e Envelhecimento. Projeto SABE no município de São Paulo: uma abordagem inicial. Brasília, DF: Organização PanAmericana da Saúde; 2003. p. 93-118

19. Franchignoni F, Horak FB, Godi M, Nardone A, Giordano A. Using psychometric techniques to improve the balance evaluation systems test: The Mini-BESTest. J Rehabil Med. 2010;42(4):316-24.

20. Maia AC. Tradução e adaptação para o português – Brasil do Balance Evaluation systems test e do Mini-BESTest e análise de suas propriedades psicométricas em idosos e indivíduos com doença de Parkinson [dissertação]. Minas Gerais: Universidade Federal de Minas Gerais; 2012.

21. Duncan RP, Leddy AL, Cavanaugh JT, Dibble LE, Ellis TD, Ford MP, et al. Comparative utility of the BESTest, mini-BESTest, and brief-BESTest for predicting falls n individuals with Parkinson disease: a cohort study. Phys Ther. 2013;93(4):542-50.

22. Sheikh JI, Yesavage JA. Geriatric depression scale (GDS): recent evidence and development of a shorter version. Clin Gerontol. 1986;5:165-73.

23. Paradela EMP, Lourenço RA, Veras RP. Validação da escala de depressão geriátrica em um ambulatório geral. Rev Saúde Pública. 2005;39(6):918-23.

24. Blay S, Ramos LR, Mari JJ. Validity of a Brazilian version of the Older Americans Resources and Services (OARS) mental healthscreening questionnaire. J Am Geriatr Soc. 1988;36(8):687-92.

25. Camargos FFO, Dias RC, Dias JMD, Freire MTF. Adaptação Transcultural e avaliação das propriedades psicométricas da Falls EficacyScale – International em idosos brasileiros (FES-I). Rev Bras Fisioter. 2010;14(3)237-43.

26. Van WB. The Participation Scale: measuring a key concept in public health. Disabil Rehabil 2006;28(4):193-203.

27. Clarke P, Ailshire J, Lantz P. Urban built environments and trajectories of mobility disability: findings from a national sample of community-dwelling American adults (1986-2001). Soc Sci Med. 2009;69(6):964-70.

28. Choi N, Dinitto DM. Depressive symptoms among older adults who do not drive: association with mobility resources and perceived transportation barriers. Gerontologist. 2015:1-12.

29. Bryanton O, Lees W, Lees J. Supporting older women in the transition to driving cessation. Act Adapt Aging. 2010;34(3):181-95.

30. Webber SC, Porter MM, Menec VH. Mobility in older adults: a comprehensive framework. Gerontologist. 2010;50(4):443-50.

31. Giacomin KC, Firmo JOA. Velhice, incapacidade e cuidado na saúde pública. Ciênc Saúde Coletiva. 2015;20(12):3631-40.

32. GasparottoLPR, Falsarella GR, Coimbra AMV. As quedas no cenário da velhice: conceitos básicos e atualidades da pesquisa em saúde. Rev Bras Geriatr Gerontol. 2014;17(1):201-9.

33. Pereira RHM, Carvalho CHR, Souza PHGF, Camarano AA. Envelhecimento populacional, gratuidades no transporte público e seus efeitos sobre as tarifas na região metropolitana de São Paulo. Rev Bras Est Pop. 2015;32(1):101-20.

Received: June 14, 2016
Reviewed: January 10, 2017
Accepted: March 07, 2017

http://dx.doi.org/10.1590/1981-22562017020.160058

Sociodemographic profile, family aspects, perception of health, functional capacity and depression in institutionalized elderly persons from the north coastal region of Rio Grande do Sul, Brazil

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Abstract

Objective: to describe sociodemographic and family relationships, health status, depression and degree of functional capacity in institutionalized elderly persons in eleven long-term care facilities for the elderly in the north coastal region of Rio Grande do Sul, Brazil. *Methods:* a cross-sectional study was carried out of 60 institutionalized elderly persons without cognitive impairment, confirmed by a score greater than 13 in the Mini Mental State Exam. Questionnaires were used to obtain data on sociodemographic conditions, family relationships, and self-perception of health. Functional capacity was evaluated with the Barthel Index and the Geriatric Depression Scale was applied. *Results:* A predominance of women, widowed and single, with a of low level of education and precarious financial status, most of whom who did not have children, was observed. The elderly persons complained about difficulty walking (38.3%), generalized pain (16.7%) and vision problems (13.3%). The majority (95%) reported suffering from two to three chronic diseases and making daily use of three or more drugs. Although 55% of the participants presented depressive symptoms and morbidity, they reported functional independence and 50% rated their health as good. *Conclusions:* These data contributed to the knowledge of the health status and functional capacity of these institutionalized elderly persons, aiming to improve the care provided to this public.

Keywords: Elderly. Depression. Homes for the Aged. Geriatric Nursing. Functional Capacity.

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INTRODUCTION

The rapid growth of the elderly population is the subject of discussion around the world. In Brazil, this interest arose as a result of the significant increase in the life expectancy of the elderly population, caused by technological advances in the area of health and a decline in fertility rates[1]. In addition, there is a perceptible lack of preparedness among society and family members to face the challenges of this new reality, resulting in a growing demand for long-term care facilities for the elderly (LTCFs).

LTCFs are defined as residential institutions, both governmental and non-governmental, intended for the collective housing of persons aged 60 or over, who may either have or not have family support. Regardless of the negative and prejudiced idea that people have about LTCFs, they can represent a possible alternative for many elderly people and their families[2].

The manner in which the elderly live in institutions, the quality of the last years of life and their most significant limitations can be observed through studies directed at this age group. It has been observed that there are few such studies in this area in Brazil, and that most of those that do exist reflect the profile of this population in large centers[3], involving populations with different habits and characteristics to the populations of small municipal districts.

The self-perception of the health of the elderly presents contradictory findings in literature. One study identified that the majority of elderly persons in an LTCF in Minas Gerais considered their health as poor or very poor[4]; while other studies in Passo Fundo (Rio Grande do Sul)[5] and Guarapuava (Paraná)[6] showed that the majority of the elderly interviewed considered their health to be good or excellent. These contrasting results create the need to investigate the profile of the institutionalized elderly in different regions of Brazil, since economic profile and the practicing of physical activity influence the self-perception of health of these elderly people[7].

In addition to the heterogeneity of the perception of health of the elderly in the different regions of Brazil, a profile of frailty has been identified in relation to the functional capacity of elderly persons, who were dependent in the performance of daily activities[8], while some studies have found that elderly from LTCFs who did not suffer cognitive deficiency were, for the most part, functionally independent[9,10]. Therefore, identifying the profile of the institutionalized elderly in different regions can contribute to the creation of public policies that are more suitable for individual needs, with a view to improving the quality of life of these populations.

Functional capacity has been described as a predictor of depressive symptoms among institutionalized elderly persons, with functional limitations as an indicator of depressive symptomatology among the same[11]. There are reports in literature of depression affecting from 48% to 60% of institutionalized elderly people[12-15]. Another study indicates that the fact that these elderly people live alone, are widowed and institutionalized appears to contribute in an evident manner to the presence of depressive symptoms[16].

Literature regarding the profile of institutionalized elderly persons usually addresses the populations of medium and large cities, which are quite different from the north coast of the state of Rio Grande do Sul. This area comprises 23 small municipal districts, which since 2000 have grown at a greater rate than the state as a whole, despite the low economic development levels of the region. The LTCFs present in this area serve a heterogeneous population, the profile of which should be characterized to allow the creation of specific public policies, and justifying the undertaking of this cross-sectional descriptive study.

The aim of the present study is to identify the socio-demographic profile and family characteristics of institutionalized elderly persons in the north coast region of the state of Rio Grande do Sul, as well as their perception of self-reported health, functional limitations and depression.

METHOD

A descriptive study, involving elderly people aged 60 years or older residing in 11 public and private LTCFs in the north coast of the state of

Rio Grande do Sul, was undertaken. Data collection was carried out between July and October of 2010 in eight municipal districts: Torres, Três Cachoeiras, Capão da Canoa, Tramandaí, Osório, Cidreira, Santo Antônio da Patrulha and Mostardas.

The study population corresponded to 218 institutionalized elderly persons. When the exclusion criteria were applied, 13 elderly people said they were not interested in participating; 24 were bedridden, with significant clinical sequelae; 12 had Severe Psychiatric Disorders, as verified in the medical records available at the LTCF; nine were under the age of 60; three had severe auditory impairment; and four were hospitalized.

In order to evaluate if the participants were sufficiently cognitive to participate in the research, the Mini Mental State Exam (MMSE)17 was applied to the 153 elderly subjects in interview form. The elderly persons answered questions that assessed the presence or absence of cognitive disorders, such as temporal and spatial orientation, registration, immediate memory, calculation and language (aphasia and constructional ability were assessed). According to Bertolucci et al.,17 the absence of cognitive disorder is indicated by the following values: 13 points for illiterates; 18 points for individuals with 1 to 7 years of schooling and 26 points for those with 8 years or more of schooling.

After applying the MMSE, 93 elderly people did not reach the minimum score (13 points)9. Thus, the results of this research are based on the analysis of 60 institutionalized elderly persons.

The following instruments were used to collect data: the Barthel Index Sociodemographic Questionnaire18 and the reduced version of the Geriatric Depression Scale (GDS-15)19. The sociodemographic questionnaire covered various issues related to sociodemographic factors, the characteristics of the institution, length of stay, family ties, general health conditions and the self-perception of health described by the elderly, classifying their health at the moment of the study as: excellent, good, fair, and poor20.

The Barthel Index, an instrument validated in Brazil18, is a questionnaire used to verify the functional capacity of individuals. The protocol comprises ten questions about feeding oneself, transfers, grooming, toilet use, walking on a flat surface, climbing stairs, dressing and control of the anal and bladder sphincters. The total result ranges from 0 to 100 points, ranging from dependent to independent.

One of the most commonly used methods for identifying depressive symptoms in the elderly is the GDS14. The reliability of the Brazilian version of the GDS-15 items has been proven, and it has been found to be a relatively stable indicator for the detection of cases of depression in the elderly and the monitoring of the severity of their symptoms19. It is an instrument with 15 questions, in a reduced and simplified form, referring to the mood and state of health. The cutoff points vary, with 0 to 5 considered a normal state; from 5 to 10 moderate depression; and above 10 points, severe depression.

The qualitative variables were described in simple and relative frequencies while mean and standard deviation or median were used for the quantitative variables. All the instruments used in the method were applied by the same researcher.

The present study was approved by the Research in Human Beings Ethics Committee of the Universidade Luterana do Brasil (the Lutheran University of Brazil) (nº 2010-161H), with the ethical rights of those interviewed guaranteed in accordance with Resolution 466/12. The elderly persons received detailed information about the study and each signed a Free and Informed Consent Form (FICF).

RESULTS

Of the 60 institutionalized elderly participants in the study, 66.7% were female. The elderly persons were predominantly aged between 70 and 79 years (36.7%), had an incomplete elementary education (35%), were widows (46.7%) and white/Caucasian (95%). They worked in agriculture (42%), were from the Rio Grande do Sul countryside (50%) and reported having a monthly income of between one and two monthly minimum wages (48.3%) (Table 1).

Table 1. Sociodemographic profile of elderly residents of Long Term Care Facilities in eight municipal districts (Torres. Três Cachoeiras. Capão da Canoa. Tramandaí. Osório. Cidreira. Santo Antônio da Patrulha and Mostardas) of the north coast of Rio Grande do Sul. Rio Grande do Sul. 2010.

Variables	n (%)
Gender	
Female	40 (66.7)
Male	20 (33.3)
Age range (years)	
60 to 69	15 (25.0)
70 to 79	22 (36.7)
80 to 89	20 (33.3)
90 or more	03 (5.0)
Schooling	
Illiterate	10 (16.7)
Elementary School – Early Years-Incomplete	21 (35.0)
Elementary School – Early Years-Complete	12 (20.0)
Elementary School – Final Years-Incomplete	01 (1.7)
Elementary School – Final Years-Complete	05 (8.3)
Incomplete High School	03 (5.0)
Complete High School	05 (8.3)
Incomplete Higher Education	03 (5.0)
Marital status	
Widowed	28 (46.7)
Single	19 (31.6)
Separated / Divorced	10 (16.7)
Married	03 (5.0)
Skin color/ethnicity	
White/Caucasian	57 (95.0)
Brown/Mixed-Race	03 (5.0)
Nationality	
Countryside of state (Rio Grande do Sul)	30 (50.0)
Metropolitan Area	15 (25.0)
Porto Alegre. Rio Grande do Sul	09 (15.0)
Other states	03 (5.0)
Other countries	03 (5.0)
Occupation	
Agricultural worker	26 (42.0)
Housewife	14 (23.4)
Industrial worker	03 (5.0)
Domestic worker	03 (5.0)
Technical-administrative role	02 (3.3)
Professional	02 (3.3)
Others	10 (18.0)
Monthly income (minimum salary)	
One or less	15 (25.0)
1 to 2	29 (48.3)
3 to 5	07 (11.7)
Over 5	01 (1.7)
No income	03 (5.0)
Don't know	05 (8.3)

The median stay at the institution was 18 months, with 35% of the elderly persons residing in the facilities for up to nine months, 40% between nine and 35.6 months and 25% having over 35.6 months of institutionalization.

The family aspects of the elderly persons are presented in Table 2. In terms of parenting, 36.7% had children, all of whom were visited by their sons or daughters. The majority of the elderly participants (75%) received other visits.

In terms of the main health complaint reported, the majority reported difficulty walking, followed by generalized pain and vision problems. Regarding the perception of general health status, compared to that of another person of the same condition and age group, half of the sample described their health as good. Only 25% of the elderly persons had health insurance (Table 3).

The vast majority of participants reported having at least two to three diseases, with Systemic Arterial Hypertension, Type II Diabetes Mellitus and Osteoarthrosis the most frequently cited. The vast majority of the sample used medications on a daily basis, ingesting three or more types on average (Table 3).

The functional capacity of the elderly evaluated by the Barthel Index varied from 65 to 100 points, with the majority being considered functionally independent (Table 4).

The GDS-15 revealed that 53% of the elderly persons exhibited symptoms of moderate depression while one elderly person revealed symptoms of severe depression (Table 5).

In terms of the institutions surveyed, each had between one and 13 employees, without specialized qualifications, distributed among three shifts (morning, afternoon and night). For weekend shifts, two to four employees were available during the 24 hours of each day. There were two to five health professionals at each institution, with nursing technicians being the most common. It was notable that no institution had contractually hired health professionals, with all such staff volunteers, provided by the local council, or professionals who provided private care to the elderly upon request. Of the 11 institutions, 61.7% did not have a partnership with a health care provider, but only with hospitals and/or the local health department.

Table 2. Family aspects of elderly residents of Long Term Care Facilities in eight municipal districts (Torres, Três Cachoeiras, Capão da Canoa, Tramandaí, Osório, Cidreira, Santo Antônio da Patrulha and Mostardas) of the north coast of Rio Grande do Sul. Rio Grande do Sul, 2010.

Variables	n (%)
Children	
No	38 (63.3)
Yes	22 (36.7)
Do children often visit	
Yes	22 (100)
No	-
Receives other visits	
Yes	45 (75.0)
No	15 (25.0)
With whom did subject live before entering LTCF?	
Alone	18 (30.0)
Children	16 (26.7)
Brother(s) or sister(s)	11 (18.3)
Spouse	03 (5.0)
Others (friends, grandchildren, domestic staff)	12 (20.0)
Does subject own their own home?	
No	33 (55.0)
Yes	27 (45.0)

Table 3. Conditions of morbidity, use of medications and perception of health of elderly residents of Long Term Care Facilities in eight municipal districts (Torres, Três Cachoeiras, Capão da Canoa, Tramandaí, Osório, Cidreira, Santo Antônio da Patrulha and Mostardas) of the north coast of Rio Grande do Sul. Rio Grande do Sul, 2010.

Variables	n (%)
Does subject have a health plan?	
No	45 (75.0)
Yes	15 (25.0)
Main complaint	
Difficulty walking	23 (38.3)
General pain	10 (16.7)
Vision problems	08 (13.3)
Generalized fatigue	06 (10.0)
Memory problems	04 (6.7)
Shortness of breath	03 (5.0)
Dizziness	01 (1.7)
Weight loss	01 (1.7)
No complaints	04 (6.7)
Chronic diseases	
Yes	55 (95.0)
No	05 (5.0)
Use of medications	
Yes	55 (95.0)
No	05 (5.0)
Perception of general state of health	
Excellent	06 (10.0)
Good	30 (50.0)
Fair	20 (33.3)
Poor	04 (6.7)

Table 4. Functional Capacity of elderly residents of Long Term Care Facilities in eight municipal districts (Torres, Três Cachoeiras, Capão da Canoa, Tramandaí, Osório, Cidreira, Santo Antônio da Patrulha and Mostardas) of the north coast of Rio Grande do Sul. Rio Grande do Sul, 2010.

Variables	n (%)
Feeding	
Independent	57 (95.0)
Needs help	03 (5.0)
Transfers	
Independent	46 (76.7)
Needs help	10 (16.7)
Dependent	04 (6.6)
Grooming	
Independent	47 (78.3)
Dependent	13 (21.7)
Toilet Use	
Independent	45 (75.0)
Dependent	15 (25.0)
Bathing	
Independent	32 (53.3)
Dependent	28 (46.7)

to be continued

Continued from Table 4

Walking on flat surface	
Walk 50m without help	36 (60.1)
With help	17 (28.3)
Wheelchair	05 (8.3)
Immobile	02 (3.3)
Climbing stairs	
Independent	26 (43.3)
Needs help	23 (38.3)
Incapable	11 (18.3)
Dressing	
Independent	38 (63.3)
Needs help	15 (25.0)
Incapable	07 (11.7)
Anal incontinence	
Controls sphincter	46 (76.7)
Incontinent	11 (18.3)
Requires assistance	03 (5.0)
Bladder incontinence	
Controls sphincter	35 (58.3)
Incontinent	14 (23.3)
Requires assistance	11 (18.3)

Table 5. Classification of elderly residents of Long Term Care Facilities in eight municipal districts (Torres, Três Cachoeiras, Capão da Canoa, Tramandaí, Osório, Cidreira, Santo Antônio da Patrulha and Mostardas) of the north coast of Rio Grande do Sul, according to the Geriatric Depression Scale. Rio Grande do Sul, 2010.

Geriatric Depression Scale	n (%)
Moderate depression	32 (53.3)
Severe depression	01 (1.7)
No depression	27 (45.0)

DISCUSSION

The aging of the global population is an accelerated process of demographic transition, resulting in an important and growing social transformation that increases the demand for LTCFs[20]. The present study described the profile of the institutionalized elderly population of the north coast region of the state of Rio Grande do Sul, and presented a previously uninvestigated research subject.

Predictors for institutionalization are the female gender, advanced age, widowhood, and low levels of education and income[5,8]. There has been found to be a predominance of females among the institutionalized community[2,5,8,20], corroborating the findings of the present study. There was a predominance of the age range of 70 to 89 years in the sample, with age being a highly oscillating variable in Brazilian LTCFs[20]. Age itself is not a determining factor of institutionalization, but health conditions are, taking into account functional capacity and the cognitive deficit related to the loss of autonomy and independence[21].

In the present study, 93 elderly persons (42.6%) were excluded from the sample due to presenting significant cognitive deficits leading to their inability to properly complete the data collection

instruments. Studies in Brazil[8,22] and other countries[23] have identified results similar to those described here. One of the reasons for the high prevalence of cognitive deficits found in LTCFs may be the greater need for specialized care of such elderly people, which the vast majority of Brazilian families cannot afford to provide at home. With the aging of the Brazilian population, the trend is that more and more elderly people will suffer cognitive impairment in the near future. Therefore, public policies aimed at the prevention of cognitive loss, as well as the management of elderly people already suffering from the same, should be debated and put into practice to promote old age with a better quality of life.

A low level of schooling was prevalent, mainly due to the difficulties of access to schools in the past[20], combined with the predominantly agricultural and "homemaker" occupations found in the sample. Illiteracy among the elderly is a reality in developing countries such as Brazil, mainly because such elderly persons spent their childhood in an era in which education was not a priority[5]. Another relevant aspect is the fact that half of the elderly persons are from rural parts of the state, where the number of schools was very low and access to the same very difficult[24].

Most of the participants did not have partners or children, a result similar to a study carried out in Belo Horizonte, in the state of Minas Gerais[25]. This may be another factor that leads elderly persons to reside in LTCFs[3,26].

A study of elderly people living in LTCFs in Brasília, in the Distrito Federal (Federal District), observed that half of such individuals received visits from their relatives[26]. In Singapore, a significant proportion of elderly residents (82.4%) were visited by their relatives, friends, and volunteers[27]. The findings of the present study, where 75% of the elderly received visits, are corroborated by such surveys. This large number of elderly people receiving visits shows that the family is concerned and cares about such individuals, contradicting questions regarding the abandonment of such individuals. This result is significant as the non-abandonment of the elderly in LTCFs by their network of relationships contributes to such individuals presenting better health conditions and improved adaptation and participation in the proposed activities. These findings contribute to support actions that integrate families with the care routine that LTCFs establish for their elderly residents.

In terms of the morbidity of the elderly, studies have found a high frequency of chronic diseases and use of medication among institutionalized individuals[25,26,28,29], results similar to those of the present study. Half of the participants self-reported their health as good, while about one-third described their health status as fair. Similar data have been found in other studies[5,25,28]. It is important to identify the self-rated health of the population as the perception of negative health is described in literature as a predictor of mortality, functional disability and the mental health of the elderly[30].

Few elderly patients described generalized pain. However, other studies have described a high prevalence of chronic pain among institutionalized elderly persons, and its negative relation with the perception of quality of life. Other health complaints reported by institutionalized elderly people from the north coast of Rio Grande do Sul were difficulty walking and vision problems, which are related to the independence and autonomy of functional capacity. The investigation of pain, the presence of depression and independence in activities of daily living are fundamental to determining the measures necessary to promote the health and well-being of the geriatric population[31].

For the most part, the elderly were considered functionally independent. Among the individuals in the present study, independent feeding was the capacity with the highest percentage of independence (95%), while bathing was the most dependent category (46.7%), findings corroborated by another study that used the Katz Index[25]. There are reports in literature that identify a clear relationship between institutionalization and a decrease in autonomy and perception of quality of life among the elderly after 12 months of living in the institution[32].

The changes experienced by elderly persons, such as loss of a partner, illness, physical dependence and institutionalization may be the starting point

for psychic disorders[22]. It is at this time that depression appears as a significant health problem for the elderly, with the psychiatric syndrome being more prevalent[14,19].

In this study, despite the fact that most of the elderly persons were considered to be functionally independent and reported a health status of good, a profile of depression was identified in 53.3% of individuals. This apparent contradiction between functional independence and the presence of depressive symptomatology has also been reported by other authors[25,33]. This can be explained by the fact that depression has associated risk factors, such as a residence period of over 24 months, a history of known depression, pain, the absence or shortage of social contact and difficulty communicating with caregivers[27]. Being physically independent does not necessarily mean the absence of depressive symptoms. The scenario found in the LTCFs of the north coast of Rio Grande do Sul, which feature elderly people with low educational levels and monthly incomes and high rates of chronic diseases, may also contribute to the rates of depression presented in this study. The combination of the absence of children, low purchasing power, the morbidity rates observed, difficulty in carrying out activities of daily living, and distance from or absence of family can lead the elderly to social isolation, institutionalization and depression[20,26,34].

One possible limitation of the study would be that, in addition to cognitive deficit, the general health situation at the time of data collection restricted the sample size. As a result, it was not possible to describe reliable correlations between the studied variables, which explains the descriptive design of this work. The absence of correlation analysis limits possible inferences but the presented data allows the characteristics of the LTCFs and their residents to be identified.

CONCLUSION

The present study described the sociodemographic profile, the health situation and the degrees of functionality and depression of institutionalized elderly people in the north coast of the state of Rio Grande do Sul in Brazil.

The majority of the institutionalized elderly were women, and the predominant age group was between 70 and 89 years old. Most of the participants had low incomes and schooling levels, did not have spouses and were white/Caucasian. Although the majority did not have children, they received frequent visits. In terms of health, the present study identified a greater percentage of elderly people with chronic diseases, who used medications, and did not have a health plan. More than half of the elderly individuals, however, considered their health to be good or excellent. Although the elderly studied presented good results in functional capacity analysis, many were classified as suffering from depression.

The magnitude and severity of the issues identified in this study constitute a challenge for health services when tackling these problems, due to the shortage of qualified professionals and the lack of a formal support network for Long Term Care Facilities for the Elderly (LTCFs).

This study contributes to the basis for the elaboration of policies that address the working conditions, the services offered and the training of professionals so that the elderly person feels welcomed, respected and safe. It is essential to expand and deepen research that encompasses the elderly in conditions of institutionalization, especially in terms of depression. The health of the elderly is a vast area in terms of the production of knowledge that can contribute to public health policies, as well as to the practices of health professionals in LTCFs.

REFERENCES

1. Prado SD, Sayd JD. A pesquisa sobre envelhecimento humano no Brasil: grupos e linhas de pesquisa. Ciênc Saúde Coletiva. 2008;9(1):57-68.

2. De Oliveira PB, Dos Santos DMT. Condições de saúde de idosos residentes em instituição de longa permanência segundo necessidades humanas básicas. Rev Bras Enferm. 2014;67(2):241-6.

3. Oliveira JM, Rozendo CA. Instituição de longa permanência para idosos: um lugar de cuidado para quem não tem opção? Rev Bras Enferm. 2014;67(5):773-9.

4. Silva ME, Cristianismo RS, Dutra LR, Dutra IR. Perfil epidemiológico, sociodemográfico e clínico de idosos institucionalizados. Rev Enferm Cent.-Oeste Min. 2013;3(1):569-76.

5. Borges AM, Santos G, Kummer JA, Fior L, Molin VD, Wibelinger LM. Autopercepção de saúde em idosos residentes em um município do interior do Rio Grande do Sul. Rev Bras Geriatr Gerontol. 2014;17(1):79-86.

6. Pilger C, Menon MH, Mathias TAF. Características sociodemográficas e de saúde de idosos: contribuições para os serviços de saúde. Rev Latinoam Enferm. 2011;19(5):1230-8.

7. Duarte E, Marques A, Leal M, Melo GP, Silva C. Idosos diabéticos autopercepção do estado geral de saúde. In: Anais do 4º Congresso Ibero-Americano em Investigação Qualitativa; 5-7 ago. 2015; Aracaju. Aracaju: Universidade Tiradentes; 2015. p. 288-90. V. 1: Investigação qualitativa na saúde.

8. Dantas CMDHL, Bello FA, Barreto KL, Lima LS. Capacidade funcional de idosos com doenças crônicas residentes em Instituições de Longa Permanência. Rev Bras Enferm. 2013;66(6):914-20.

9. De Azevedo LM, De Oliveira KMV, Nunes VMA, Alchieri JC. Perdas da capacidade funcional em idosos institucionalizados no município de Natal/RN. Rev Pesqui Cuid Fundam. 2014;6(2):485-92.

10. Pagotto V, Silva VAP, Pereira LV, Santos DPMA. Comparação da funcionalidade de idosos residentes em duas modalidades institucionais. Rev Eletr Enferm [Internet]. 2016 [acesso em 01 jun. 2016];18:1143. Disponível em: http://dx.doi.org/10.5216/ree.v18.34712

11. Silva JKSD, Albuquerque MCDS, Souza EMSD, Monteiro FS, Esteves GGL. Sintomas depressivos e capacidade funcional em idosos institucionalizados. Cult Cuid. 2015;41:157-67.

12. Alencar MA, Bruck NNS, Pereira BC, Câmara TMM, Almeida RDS. Perfil dos idosos residentes em uma instituição de longa permanência. Rev Bras Geriatr Gerontol. 2012;15(4):785-96.

13. Santiago LM, Mattos IE. Sintomas depressivos em idosos institucionalizados. Rev Saúde Pública. 2014;48(2):216-24.

14. Nóbrega IRAP, Leal MCC, Marques APO, Vieira JCM. Fatores associados à depressão em idosos institucionalizados : revisão integrativa. Saúde Debate. 2015;39(105):536-50.

15. Leal MCC, Apóstolo JLA, Mendes AMOC, Marques APDO. Prevalência de sintomatologia depressiva e fatores associados entre idosos institucionalizados. Acta Paul Enferm. 2014;27(3):208-14.

16. Frade J, Barbosa P, Nunes C. Depression in the elderly: symptoms in institutionalised and non-institutionalised individuals. Rev Enferm Ref. 2015;4(4):41-8.

17. Bertolucci PHF, Bruck SMD, Campacci SR. O mini-exame do estado mental. Impacto da escolaridade. Arq Neuropsiquiatr. 1994;52(1):1-7.

18. Ribeiro M, Miyazaki MH, Sakamoto H, Pinto PPN, Battistella LR. Validação da versão brasileira da medida de independência funcional. Acta Fisiátrica. 1988;11(2):72-6.

19. Almeida OP, Almeida AS. Confiabilidade da versão brasileira da escala de depressão em geriatria (GDS) versão reduzida. Arq Neuropsiquiatr. 1999;57(2B):421-6.

20. Lisboa CR, Chianca TCM. Perfil epidemiológico, clínico e de independência funcional de uma população idosa institucionalizada. Rev Bras Enferm. 2012;65(3):482-7.

21. Vivan AS, Argimon IIL. Estratégias de enfrentamento, dificuldades funcionais e fatores associados em idosos institucionalizados. Cad Saúde Pública. 2010;25(2):436-44.

22. Reis LA, Araújo CC, Novaes LKN. Rastreamento cognitivo de idosos institucionalizados no município de Jequié-BA. Psicol Estud. 2010;14(2):295-301.

23. Rebouças M, Pereira MG. Indicadores de saúde para idosos: comparação entre o Brasil e os Estados Unidos. Rev Panam Salud Publica. 2008;23(4):237-46.

24. Guedes JM, Silveira RC. Análise da capacidade funcional da população geriátrica institucionalizada na cidade de Passo Fundo-RS. Rev Bras Ciênc Envelhec Hum 2008;1(2):10-21.

25. Alencar MA, Bruck NN, Pereira BC, Câmara TMM, Almeida RDS. Perfil dos idosos residentes em uma instituição de longa permanência. Rev Bras Geriatr Gerontol. 2012;15(4):785-96.

26. Oliveira MPF, Novaes MRCG. Perfil socioeconômico, epidemiológico e farmacoterapêutico de idosos institucionalizados de Brasília, Brasil. Ciênc Saúde Coletiva 2013;18(4):1069-78.

27. Tiong WW, Yap P, Huat Koh GC, Phoon Fong N, Luo N. Prevalence and risk factors of depression in the elderly nursing home residents in Singapore. Aging Ment Health 2013;17(6):724-31.

28. Gonçalves LG, Vieira ST, Siqueira FV, Hallal PC. Prevalência de Quedas em Idosos Asilados do Município de Rio Grande, RS. Rev Saúde Pública. 2008;42(5):938-45.

29. Silva SA, Scazufca M, Menezes P. Population impact of depression on functional disability in elderly: Results from "São Paulo Ageing & Health Study" (SPAH). Eur Arch Psychiatr Clin Neurosci. 2013;263(2):153-8.

30. Balboa-Castillo T, León-Muñoz LM, Graciani A, Rodríguez-Artalejo F, Guallar-Castillón P. Longitudinal association of physical activity and sedentary behavior during leisure time with health-related quality of life in community dwelling older adults. Health Qual Life Outcomes [Internet]. 2011 [acesso em 22 dez. 2015];9:47. Disponível em: http://www.hqlo.com/ content/9/1/47

31. Tarakci E, Zenginler Y, Kaya-Mutlu E. Chronic pain, depression symptoms and daily living independency level among geriatrics in nursing home. Agri 2015;27(1):35-41.

32. Cobo CMS. The influence of institutionalization on the perception of autonomy and quality of life in old people. Rev Esc Enferm USP. 2014;48(6):1013-9.

33. Nascimento DC, Brito MAC, Santos AD. Depressão em idosos residentes em uma instituição asilar na cidade de Juazeiro do Norte, Ceará, Brasil. J Manag Prim Health Care. 2013;4(3):146-50.

34. Danilow MZ, Moreira ACS, Vilela CG, Barra BB, Novaes MRCG, Oliveira MPF. Perfil epidemiológico, sociodemográfico e psicossocial de idosos institucionalizados do Distrito Federal (DF). Comun Ciênc Saúde. 2010;18 (1):9-16.

Received: March 22, 2016
Reviewed: October 13, 2016
Accepted: March 22, 2017

http://dx.doi.org/10.1590/1981-22562017020.160151

Cognitive impairment and associated factors among institutionalized elderly persons in Natal, Rio Grande do Norte, Brazil

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Abstract

Objective: To identify the prevalence of cognitive impairment and associated factors among institutionalized elderly persons. *Methods:* A cross-sectional study was conducted from October to December 2013 in Long-Term Care Facilities for the elderly in Natal, Rio Grande do Norte, Brazil, featuring 326 elderly persons of both genders. The assessment of cognitive decline was classified using the Pfeiffer test. Information on sociodemographic conditions and health status was also recorded. Nutritional status was assessed by applying the Mini Nutritional Assessment tool and functional capacity with the Katz Index. To identify the factors associated with the presence of moderate or severe cognitive impairment multiple logistic regression analysis of variables with a p value $\geq$0.20 was performed, using the Stepwise Forward method. *Results:* It was observed that 83.6% (95% CI: 78.9 to 87.3%) of the elderly persons had cognitive impairment. The final model, adjusted for type of LTCF, showed that being 83 years old or older was considered a risk factor for moderate or severe cognitive impairment. However, having systemic arterial hypertension (SAH) and having been institutionalized through their own choice were considered protective factors for moderate or severe cognitive impairment. *Conclusion:* the variables age, having SAH and having been institutionalized through their own choice are directly associated, as risk or protection factors, with the presence of severe or moderate cognitive impairment of the elderly population. The early diagnosis of these factors can lead to greater focus in setting goals for prevention and health care, thus improving the quality of life of these individuals.

Keywords: Health of Institutionalized Elderly. Homes for the Aged. Frail Elderly. Cognitive Aging. Cross-Sectional Studies.

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INTRODUCTION

The rapid growth of the elderly population serves as a warning to the Brazilian government about the need to create public policies that will prepare society for this reality. Another consequence of the growth in the number of elderly people is the increased prevalence of chronic-degenerative diseases and the modification of the epidemiological profile of morbidity and mortality of the population, resulting in an overburdening of health services for the elderly and negative social and economic consequences for public health[1].

The aging process is characterized by the impaired functioning of all bodily systems, with the Central Nervous System one of the most affected due to the development of disorders in the neurotransmitter system and cerebral hypotrophy. These changes tend to occur in the regions responsible for cognitive functioning and, consequently, minimum to significant impairments of such functioning are common among elderly individuals[2] During the aging process, 15% of people initially develop progressive cognitive impairment. Of this number, approximately 5% of those over 65 and 20% of those older than 80 develop moderate to severe dementia[3].

Cognition involves the entire sphere of mental functioning and includes the ability to feel, think, perceive, remember, reason, form complex structures of thought, and to produce responses to external demands and stimuli[4]. Some factors, such as socioeconomic, psychological and health-related issues, may contribute to the gradual decline of cognitive functions[5].

The changes and deficits caused by this loss in cognition have direct consequences on the quality of life of the elderly, which can lead to functional decline and the decrease and/or loss of the capacity to perform activities of daily living (ADL). Both physical and mental diseases can lead to the loss of independence and autonomy, which are important risk factors for mortality[6].

For the elderly, the loss of the ability to perform ADLs is not only a risk for mortality, but also, in many cases, a predictor of institutionalization. According to Maseda et al.[7], among the main predictors of institutionalization are a low frequency of living with relatives and friends and increased age.

The diagnosis of the cognitive profile of elderly persons provides long-term care facilities for the elderly (LTCFs) with important information to plan and guide the individualized care of those with a certain degree of dependence, as well as allowing the possibility of adding resources to maintain such elderly persons as active as possible by setting objective goals, such as the training of caregivers, and designing therapies to improve the quality of life of the elderly[8].

Thus, the identification of the health conditions of the elderly, as well as their cognitive status, can contribute to establishing of goals that allow greater care and support for this population, contributing to a better quality of life and reducing institutionalization caused by a lack of autonomy and independence. Thus, the objective of the present study was to identify the prevalence of cognitive impairment and its associated factors in institutionalized elderly persons.

METHOD

A cross-sectional study was carried out between October and December 2013. All elderly persons aged 60 years old or more and residing in private or non-profit LTCFs in the city of Natal, in the state of Rio Grande do Norte, Brazil were included in the study. Of the 14 LTCFs registered with the Sanitary Surveillance Service in the city of Natal, Rio Grande do Norte, ten (71.4%) agreed to participate in the study, five of which were private and five of which were non-profit. Elderly persons who were not present at the LTCFs due to hospitalization, as well as those residents with hearing loss or who did not speak Portuguese, were in a terminal condition, a coma or under palliative care were excluded from the study.

The dependent variable of the study was the presence/absence of cognitive impairment, classified through the Pfeiffer Test, which evaluates long-term and short-term memory, orientation, information about daily tasks and mathematical ability. This instrument allows the classification of the elderly into the categories intact mental function, or mild, moderate or severe cognitive impairment, taking into account the schooling of the individual evaluated[9].

For each elderly person, information on socio-demographic conditions (age, gender, education, marital status, children, type of LTCF, reason for institutionalization, resident per caregiver, retired and health plan) and health status (chronic diseases, history of falls in the last 30 days, mobility, functional capacity, daily use and number of drugs). Nutritional status was evaluated through the application of the Mini Nutritional Assessment (MNA) tool. This instrument is divided into four parts: anthropometric evaluation [Body Mass Index (BMI), arm circumference, calf circumference and weight loss]; overall assessment (questions related to lifestyle, medication, mobility and psychological problems); dietary assessment (questions related to number of meals, food and liquid intake, as well as autonomy in food); and self-assessment (self-perception of health and nutritional status). The sum of the MNA scores classified the elderly into three distinct groups: individuals with adequate nutritional status (MAN≥24), at risk of malnutrition (MAN≥17 and <24); and with malnutrition (MAN <17).

Functional capacity was assessed using the Katz Index, an instrument validated for Brazil, which contains six Basic Activities of Daily Living (BADL): bathing, dressing, toileting, transferring, continence and feeding[10]. For the evaluation of transferring the states of walking without help, walking with help, wheelchair users and being bedridden were considered. Such information was obtained from medical records or was provided by staff of the institutions (social workers, nursing technicians or caregivers).

The present study is part of a project entitled "Human Aging and Health - the reality of institutionalized elderly persons in the city of Natal, Rio Grande do Norte", approved under opinion number 308/2012 of the Comité de Ética em Pesquisa (the Research Ethics Committee) (CEP) of the Universidade Federal do Rio Grande do Norte (the Federal University of Rio Grande do Norte) (UFRN). Residents and direct caregivers of the LTCFs who agreed to participate in this research project signed corresponding Free and Informed Consent Forms (FICF).

The research team was composed of two doctorate students from the post-graduate program in Public Health of UFRN and 18 undergraduate students in Physiotherapy at UFRN, who were properly trained to use the instruments. Meetings were held prior to the beginning of the data collection to explain the research project and the objectives of the work. Afterwards, training was carried out with the data collection instruments, especially with the application of the questionnaires, aiming to ensure uniformity of the understanding and application of the criteria evaluated in the study. The pilot study was conducted in two of the non-profit LTCFs. Twenty-five questionnaires were used to thoroughly review the information collected and detect possible biases, lost or discordant data.

Descriptive analysis, through the presentation of absolute and relative values, was used to analyze the data. The quantitative variables were described by means, with standard deviation (±sd) and later categorized into dichotomous variables by the median. Bivariate analysis was subsequently performed using the Chi-squared test (or Fisher's Test) for nominal categorical variables. The magnitude of the association was verified by the odds ratio for each of the independent variables in relation to the dependent variable.

In order to identify the factors associated with the presence of moderate or severe cognitive impairment, a multiple logistic regression analysis of the variables with a *p* value equal to or less than 0.20 was performed using the Stepwise Forward method. The permanence of the variable in multiple analysis was based on the Likelihood Ratio Test and the absence of multicollinearity, as well as its ability to improve the model through the Hosmer-Lemeshow Test. The variables physical inactivity, immobility, functional disability, falls, urinary and fecal incontinence were not tested in the multiple analysis due to a causality relationship with the dependent variable. A level of significance of 5% was adopted.

RESULTS

Of the 14 LTCFs registered with Vigilância Sanitária (Sanitary Surveillance Service) (VISA) in the city of Natal, Rio Grande do Norte, ten (71.4%) LTCFs accepted to participate in the study. Of the total number of elderly persons (n = 326), ten (3.0%) individuals were excluded from the study: four (1.2%) of whom were hearing impaired or did not speak

Portuguese, four (1.2%) of whom were hospitalized during the data collection period, one (0.3%) of whom was in a terminal phase of life and one (0.3%) of whom was under 60 years of age. In addition, 12 (3.7%) refused to participate. Thus, the total sample consisted of 304 individuals, most of whom were female (76.6%), with a mean age of 81.4 years (sd±8.9). Most of the residents lived in non-profit institutions, were retired, single, illiterate or had an Elementary School I education, and had no health plan. It was found that 50.5% of the elderly persons had children and the mean residence time at the LTCF was 60.4 months (sd±57.9). There were on average 8.0 residents per caregiver (sd±5.1) in institutions.

Regarding health status, 81.6% did not perform physical activity, 41.0% presented a risk of malnutrition, 37.2% walked without help, and 26.3% had total functional dependence. It was verified that 88.2% of the residents had chronic diseases and 6.6% had suffered falls in the previous 30 days. The use of medication was present in 95.4% of the individuals and the average number of medications per elderly person was 4.5 (sd±2.8). It was observed that 83.6% (95%CI: 78.9-87.3) of the elderly persons had moderate or severe cognitive impairment.

Table 1 shows the other sociodemographic and health-related characteristics.

Table 2 contains the independent variables with a value equal to or less than 0.20, as tested in the multiple analysis, but which were not included in the final model.

Table 1. Characteristics of participating elderly persons (n=304). Natal, Rio Grande do Norte, 2013.

Characteristics	N (%)
Gender	
Male	71 (23.4)
Female	233 (76.6)
Age (years)	
60-69	35 (11.5)
70-79	87 (28.6)
80-89	129 (42.2)
90 or more	53 (17.7)
Schooling	
Illiterate	71 (23.4)
Literate	5 (1.6)
Elementary I	70 (23.0)
Elementary II	23 (7.6)
High School	41 (13.5)
Higher Education	44 (14.5)
Could not answer	50 (16.4)
Marital Status	
Single	143 (47.0)
Married	38 (12.5)
Divorced	33 (10.9)
Widowed	79 (26.0)
Could not answer	11 (3.6)
Retired*	
No	14 (4.6)
Yes	289 (95.4)
Children*	
No	147 (49.5)
Yes	150 (50.5)
Type of Institution	
Private/for profit	113 (37.2)
Non-profit	191 (60.8)

to be continued

Continued from Table 1

Characteristics	N (%)
Reason for being institutionalized	
Lack of caregiver	143 (47.0)
Lived alone	41 (13.5)
Lack of housing	11 (3.6)
Illness	36 (11.9)
Own choice	8 (2.6)
No job	1 (0.3)
Other reasons	26 (8.6)
Number of reasons	27 (8.9)
Could not answer	11 (3.6)
Health plan*	
No	116 (38.3)
Yes	187 (61.7)
Physical activity	
No	248 (81.6)
Yes	56 (18.4)
Body Mass Index*	
Underweight	132 (49.4)
Eutrophic	69 (25.9)
Overweight	66 (24.7)
Nutritional State (Mini Nutritional Assessment)*	
Malnutrition	72 (25.0)
Risk of malnutrition	118 (41.0)
Eutrophic	98 (34.0
Mobility	
Bedridden	63 (20.7)
Wheelchair	65 (21.4)
Walk with help	63 (20.7)
Walk without help	113 (37.2)
Functional capacity	
Grade A - Independent	76 (25.0)
Grade B - Independent, except one	22 (7.2)
Grade C - Independent, except bathing and other	7 (2.3)
Grade D - Independent, except bathing, dressing and other	9 (3.0)
Grade E - Independent, except bathing, dressing, except bathing, dressing, toileting and other	17 (5.6)
Grade F - Independent, except bathing, dressing, toileting, transferring and other	70 (23.0)
Grade G - Dependent	80 (23.3)
Non-classifiable	23 (7.6)
Falls in previous 30 days	
No	284 (93.4)
Yes	20 (6.6)
Chronic illnesses	
No	36 (11.8)
Yes	268 (88.2)
Medication	
No	14 (4.6)
Yes	290 (95.4)
Cognitive Impairment	
Intact	26 (8.6)
Mild	24 (7.8)
Moderate	64 (21.1)
Severe	190 (62.5)

*Missing data were not included

Table 2. Bivariate analysis between cognitive impairment and independent variables. Natal, Rio Grande do Norte, 2013.

Variable	Cognitive Impairment		*p*	PR (CI: 95%)
	Yes N (%)	No N (%)		
Gender				
Women	197 (84.5)	36 (15.5)	0.249	1.34 (0.67-2.66)
Men	57 (80.3)	14(19.7)		1.00
Marital status**				
Without partner	206 (80.8)	49 (19.2)	0.005*	0.11 (0.01-0.84)
With partner	37 (97.4)	1 (2.6)		1.00
Retired**				
No	9 (64.3)	5 (35.7)	0.062	0.33 (0.10-1.03)
Yes	244 (84.4)	45 (15.6)		1.00
Reason for being institutionalized: did not have caregiver**				
Yes	126 (88.1)	17 (11.9)	0.016*	2.09 (1.10-3.95)
No	117 (78.0)	33 (22.0)		1.00
Reason for being institutionalized: lived alone**				
Yes	29 (70.7)	12 (29.3)	0.026*	0.42 (0.20-0.91)
No	214 (84.9)	38 (15.1)		1.00
Physical activity				
No	213 (85.9)	35 (14.1)	0.021*	2.22 (1.11-4.44)
Yes	41 (73.2)	15 (26.8)		1.00
Body Mass Index**				
Underweight	118 (89.4)	14 (10.6)	0.004*	2.61 (1.32-5.17)
Eutrophic-Overweight	103 (76.3)	32 (23.7)		1.00
Body Mass Index**				
Overweight	44 (66.7)	22 (33.3)	<0.001*	0.27 (0.13-0.52)
Eutrophic-Low weight	177 (88.1)	24 (11.9)		1.00
Nutritional status**				
Risk of malnutrition-malnutrition	158 (87.3)	23 (12.7)	0.003*	2.52 (1.34-4.75)
Eutrophic	68 (73.1)	25 (26.9)		1.00
Mobility				
Wheelchair-bedridden	121 (94.5)	7 (5.5)	<0.001*	5.58 (2.42-12.89)
Walk with or without help	133 (75.6)	43 (24.4)		1.00
Functional Capacity				
Dependent	202 (90.6)	21 (9.4)	<0.001*	5.36 (2.83-10.16)
Independent	52 (64.2)	29 (35.8)		1.00
Fall in last 30 days				
Yes	13 (65.0)	7 (35.0)	0.030*	0.33 (0.12-0.87)
No	241 (84.9)	43 (15.1)		1.00
Chronic illnesses				
Yes	221 (82.5)	47 (17.5)	0.119	0.42 (0.12-1.45)
No	33 (91.7)	3 (8.3)		1.00
Number of chronic illnesses				
≥ 3	55 (75.3)	18 (24.7)	0.026*	0.49 (0.25-0.94)
0-2	199 (86.1)	32 (13.9)		1.00

to be continued

Continued from Table 2

Variable	Cognitive Impairment Yes N (%)	No N (%)	*p*	PR (CI: 95%)
Diabetes				
Yes	54 (75.0)	18 (25.0)	0.022*	0.48 (0.25-0.92)
No	200 (86.2)	32 (13.8)		1.00
Stroke				
Yes	44 (89.8)	5 (10.2)	0.139	1.88 (0.70-5.02)
No	210 (82.4)	45 (17.6)		1.00
Osteoporosis				
Yes	21 (65.6)	11 (34.4)	0.007*	0.32 (0.14-0.71)
No	233 (85.7)	39 (14.3)		1.00
Rheumatic Disease				
Yes	10 (62.5)	6 (37.5)	0.032*	0.30 (0.10-0.86)
No	244 (84.7)	44 (15.3)		1.00
Urinary Incontinence				
Yes	167 (90.3)	18 (9.7)	<0.001*	3.53 (1.87-6.66)
No	84 (72.4)	32 (27.6)		1.00
Fecal incontinence				
Yes	109 (86.5)	17 (13.5)	0.181	1.42 (0.74-2.69)
No	140 (81.9)	31 (18.1)		1.00
Cardiovascular Disease				
Yes	14 (73.7)	5 (26.3)	0.185	0.52 (0.18-1.53)
No	240 (84.2)	45 (15.8)		1.00
Dyslipidemia				
Yes	39 (73.6)	14 (26.4)	0.030*	0.46 (0.23-0.94)
No	215 (85.7)	36 (14.3)		1.00
Number of medications				
≥ 5	111 (79.9)	28 (20.1)	0.075	0.61 (0.33-1.12)
0-4	143 (86.7)	22 (13.3)		1.00
Group A: medications for metabolic conditions and the alimentary tract				
Yes	130 (78.8)	35 (21.2)	0.013*	0.46 (0.24-0.88)
No	121 (89.0)	15 (11.0)		1.00
Group C: medications for the cardiovascular system				
Yes	141 (78.8)	38 (21.2)	0.006*	0.40 (0.20-0.81)
No	110 (90.2)	12 (9.8)		1.00
Group H: thyroid medications				
Yes	20 (74.1)	7 (25.9)	0.138	0.53 (0.21-1.33)
No	231 (84.3)	43 (15.7)		1.00
Group M: medications for the musculoskeletal system				
Yes	21 (67.7)	10 (32.3)	0.018*	0.36 (0.16-0.83)
No	230 (85.2)	40 (14.8)		1.00
Group N: medications for the nervous system Yes				
Yes	201 (85.2)	35 (14.8)	0.084	1.72 (0.87-3.39)
No	50 (76.9)	15 (23.1)		1.00

*$p \leq 0.20$ (Stepwise Forward); ** Missing data were not included.

The final model, adjusted for the type of LTCF, revealed that being 83 years old or older was considered a risk factor for moderate or severe cognitive impairment. However, having systemic arterial hypertension (SAH) and being institutionalized by choice were considered protective factors for moderate or severe cognitive impairment (Table 3). The presence of collinearity was identified between the variables marital status and institutionalized due to living alone (p<0.001). The variables chronic diseases, number of diseases, diabetes, number of medications, and use of group A and group C medications were collinear with SAH. The Hosmer-Lemeshow Test value was 0.997.

Table 3. Final model for the presence of cognitive impairment in institutionalized elderly persons (n=304).

	Cognitive impairment					
	Yes N (%)	No N (%)	*p*	Bivariate OR (CI: 95%)	*p*	Multivariate OR (CI: 95%)
Age (years)						
83 or more	137 (90.1)	15 (9.9)	0.002*	2.73 (1.42-5.25)	0.007*	2.62 (1.30-5.29)
60-82	117 (77.0)	35 (23.0)		1.00		
Systemic Arterial Hypertension						
Yes	98 (78.4)	33 (25.2)	<0.001*	0.32 (0.17-0.61)	0.001*	0.33 (0.17-0.64)
No	156 (90.2)	17 (9.8)		1.00		
Reason for being institutionalized: own choice**						
Yes	3 (37.5)	5 (62.5)	0.004*	0.11 (0.02-0.48)	0.009*	0.13 (0.03-0.60)
No	240 (84.2)	45 (15.8)		1.00		
Type of Long Term Care Facility for the Elderly						
Non-profit	153 (80.1)	38 (19.9)	0.024*	0.47 (0.23-0.95)	0.148	0.57 (0.27-1.22)
Private/for profit	101 (89.4)	12 (10.6)		1.00		

* Statistically significant (p<0.005); ** Missing data was not included.

DISCUSSION

The prevalence of moderate and severe cognitive impairment was most significant, with 83.6% of the elderly persons in this study affected. This lower cognitive performance in elderly people living in LTCFs may suggest that institutionalization can aggravate this situation. In a review, Bertoldi et al.[11] explained their findings with several factors which can influence cognitive deficit in institutionalized elderly people, when compared to non-institutionalized individuals, such as greater age, a low level of education, the female gender, a lack of physical activity and the social isolation caused by institutionalization itself. From data obtained in the study by Trindade et al.[12], it was concluded that institutionalized elderly individuals present a lower cognitive performance, which leads to impairment of functional abilities and an increase in depression in comparison with the elderly living in society and participating in some physical activity.

The results of the present study revealed that the variable being 83 years of age or older was considered a risk factor for moderate or severe cognitive impairment. This finding was also observed in the study by Herrera et al.,[13] who evaluated factors associated with the cognitive functionality of elderly persons living in nursing homes in Cartagena using the Pfeiffer test, and found that the cognitive functioning of the elderly was associated with chronological age, with 80% of 192 elderly persons presenting some type of cognitive impairment.

This decline can be explained by the fact that aging is a cumulative, irreversible, universal, non-pathological process where the body is degraded, often incapacitating the individual cognitively and functionally[14]. Associated with this is the fact that elderly persons living in LTCFs become increasingly sedentary, losing much of their autonomy and worsening their cognitive capacity[15]. This cognitive deficit directly influences functional capacity, impairing independence and autonomy with a corresponding loss of quality of life among the elderly[16].

According to Mejía-Arango[17], cognitive impairment is associated with increasing age as well as with various diseases. Comorbidities such as diabetes, chronic obstructive pulmonary disease (COPD), brain diseases, depression and heart disease were reported in this study, which reported the prevalence of cognitive impairment in the elderly and its relationship with demographic and health factors in a Mexican population. There was a relationship not only with cognitive, but also with functional decline. These disorders therefore represent conditions that directly affect the quality of life of the elderly and result in a greater use of health services.

It was also observed in the present study that the presence of SAH and being institutionalized by choice were considered protective factors for moderate or severe cognitive impairment. It was found that 88.2% of the institutionalized elderly presented chronic diseases, with the use of medication present in 95.4% of the individuals. In our findings, SAH was considered a protective factor for cognitive impairment. This finding can be explained by the use of antihypertensive medication, which can influence the prevention of cognitive decline due to its deleterious effects, which lead to reduced alterations in the small vessels, reducing the risk of injury to the cerebral white matter and cerebrovascular functioning[18]. Duron and Hanon[19], meanwhile, proposed that hypertension increases the risk not only of cognitive decline, but also of dementia. For these authors there are strong epidemiological arguments to support an association between hypertension, especially in middle age, and the development of cognitive disorders and dementia, including Alzheimer's.

These findings corroborate those of the study by Chaves[18] which suggests that untreated hypertension could be a predictor for cognitive loss, with the use of antihypertensive drugs an important protector of cognition. However, studies have reached contrasting conclusions regarding the effects of antihypertensive treatment on hypertension and cognitive decline[20-22]. The results of Holanda et al.[23] found that hypertensive elderly individuals are at greater risk of cognitive function decline than normotensive elderly persons. Considering the changes and consequences that hypertension can cause in the elderly population, associated with cognitive disorder which can directly affect quality of life, more evidence is needed in order to prevent and treat this dysfunction as early as possible.

In relation to institutionalization, being institutionalized by choice was significantly associated with moderate or severe cognitive impairment, and was a protective factor for its occurrence. According to Cordeiro[24], several reasons may lead elderly persons to choose institutionalization themselves, including living alone, considering themselves a burden or feeling rejected by the family, or being aware that they need health care. Duarte[25] also mentions the reasons for the institutionalization of the elderly who, although they still have a family, prefer to live in the institution for reasons such as the lack of a spouse, the independence of children in the role of formal caretakers, and mistreatment by family members, through a more autonomous decision, not imposed by others.

In the same way, Pereira and Besse[26] found that the self-institutionalized elderly had a higher level of functional independence than elderly persons who were institutionalized through the wishes of their family and those who did not have family or housing options. This finding presupposes that elderly persons who were institutionalized by choice also had a higher functional status, since cognition and functionality are directly linked. Cognitive impairment generates impairment of functional capacity for basic activities of daily living, implying the loss of independence and autonomy. This autonomy is linked to its interdependence with the integral memory related to the individual's

capacity to take care of themselves, to perform tasks that allow them to adapt psychosocially and to be responsible for their own actions[16]. According to the study by Javier et al.[27] which addressed the prevalence of functional disability among the institutionalized elderly, using the same sample as the present study, there was a relationship between institutionalization and the functional disability of elderly persons institutionalized due to the absence of an informal caregiver in the community. Disability explains the dependence of the elderly and their subsequent higher mortality.

Regarding the quality of life of institutionalized elderly individuals, Cordeiro[24] stated that the reasons that lead to the institutionalization of the elderly can result in low levels of quality of life, due to a possible difficulty of adaptation, making them remain in the institution due to pride or health needs. On the other hand, elderly people with morbidities or those abandoned by relatives are likely to find an opportunity for a new start.

Among the limitations of the present study, the Pfeiffer Test has not yet been validated in Brazil. This instrument was used to evaluate the cognitive impairment of the present sample, due to the low complexity of the questions and its quick and easy application. In addition, the maximum amount of information possible was collected through an interview with the staff of the institutions and from medical record data, seeking to minimize underdiagnoses and underreporting.

CONCLUSION

According to the present study, we can conclude that elderly persons tend to exhibit a high probability of moderate or severe cognitive impairment, due to the physiological changes caused by aging. Institutionalization by choice, adjusted for the type of LTCF, was considered a protective factor for cognitive deficit, as elderly persons in LTCFs are more susceptible to a sedentary lifestyle and the loss of functional and cognitive capacity. Systemic arterial hypertension, meanwhile, was identified as a protective factor, which suggests the need for more studies regarding the cognitive diagnosis of this population in order to create more specific strategies that promote healthier aging.

Cognitive impairment is therefore a subject requiring greater study, given the innumerable factors that predispose its occurrence and the growing number of elderly persons in our population. In addition, more attention must be paid to the predisposing variables of the condition in order to establish health prevention and care targets for this population, resulting in improved quality of life and reduced dependence.

ACKNOWLEDGEMENTS

The authors would like to thank the students of the Physiotherapy course of the Universidade Federal do Rio Grande do Norte who assisted with data collection.

REFERENCES

1. Ramos LR, Rosa TEC, Oliveira ZM, Medina MCG, Santos FRG. Perfil do idoso em área metropolitana na região sudeste do Brasil: resultados de inquérito domiciliar. Rev Saúde Pública. 1993;27(2):87-94.
2. Cruz DT, Cruz FM, Ribeiro AL, Veiga CL, Leite ICG. Associação entre capacidade cognitiva e ocorrência de quedas em idosos. Cad Saúde Coletiva. 2015;23(4):386-93.
3. Laks J, Rozenghal M, Engelhardt E. Sintomas psiquiátricos na doença de Alzheimer e sua relação com o estado cognitivo. Rev Bras Neurol Psiquiatr. 1995;31(5):225-34.
4. Vieira EB, Koenig AM. Avaliação Cognitiva. In: De Freitas EV, Py L, editores. Tratado de Geriatria e Gerontologia. Rio de Janeiro: Guanabara Koogan; 2002. p. 921-8.
5. Canineu PR, Bastos A. Transtorno Cognitivo Leve. In: Freitas EV, Py L, editores. Tratado de Geriatria e Gerontologia. Rio de Janeiro: Guanabara Koogan; 2002. p. 128-32.
6. Gurian MBF, Oliveira RC, Laprega MR, Rodrigues Júnior AL. Rastreamento da função cognitiva de idosos não institucionalizados. Rev Bras Geriatr Gerontol. 2012;15(2):275-83.

7. Maseda A, Balo A, Lópes LL, Fernández LL, Villamil JSR, Calenti JCM. Cognitive and affective assessment in day care versus institutionalized elderly patients: a 1-year longitudinal study. Clin Interv Aging. 2014; 9:887-94.

8. Ferreira LS, Pinho MSP, Pereira MWM, Ferreira AP. Perfil cognitivo de idosos residentes em Instituições de longa permanência de Brasília - DF. Rev Bras Enferm. 2014;67(2):247-51.

9. Martinez LJ, Duenas HR, Onis VMC, Aguado TC, Albert CC, Luque LR. Spanish language adaptation and validation of the Pfeiffer's questionnaire (SPMSQ) to detect cognitive deterioration in people over 65 years of age. Med Clín. 2001;117(4):129-34.

10. Cruz EP, Sánchez DCL, Esteves MRM. Asociación entre desnutrición y depresión en el adulto mayor. Nutr Hosp. 2014;29(4):901-6.

11. Bertoldi JT, Batista AC, Ruzanowsky S. Declínio cognitivo em idosos institucionalizados: revisão de literatura. Rev Dep Educ Fís Saúde Mest Promoç Saúde Unive Santa Cruz Sul. 2015;16(2):1-5.

12. Trindade APNT, Barboza MA, De Oliveira FB, Borges APO. Repercussão do declínio cognitivo na capacidade funcional em idosos institucionalizados e não institucionalizados. Fisioter Mov. 2013;26(2):281-89.

13. Herrera EM, Lopez ADA, Osorio DAP. Cognitive functionality of elderly residents in social protection centers in Cartagena, 2012. Indian J App Res. 2015;5:146-150.

14. Burnside IM. Enfermagem e os idosos. São Paulo: Organização Andrei; 1979.

15. Borges MGS, Rocha LR, Couto EAB, Mancini PC. Comparação do equilíbrio, depressão e cognição entre idosas institucionalizadas e não-institucionalizadas. Rev CEFAC. 2013;15(5):1073-9.

16. Abreu ID, Forlenza OV, Barros LH. Demência de Alzheimer : correlação entre memória e autonomia. Rev Psiquiatr Clín. 2005;32(3):131-36.

17. Mejía-Arango S, Miguel-Jaimes A, Villa A, Ruiz-Arregui L, Gutiérrez-Robledo LM. Deterioro cognoscitivo y factores asociados en adultos mayores en México. Salud Publica 2007;49(4):475-81.

18. Chaves AS, Santos AM, Alves MTSSB, Salgado Filho N. Associação entre declínio cognitivo e qualidade de vida de idosos hipertensos. Rev. Bras Geriatr Gerontol. 2015;18(3):545-56.

19. E Duron, O Hanon. Hypertension, cognitive decline and dementia. Arch Cardiovasc Dis. 2008;101:81-189.

20. Di Nucci FRCF, Coimbra AMV, Neri AL, Yassuda MS. Ausência de relação entre hipertensão arterial sistêmica e desempenho cognitivo em idosos de uma comunidade. Rev Psiquiatr Clín. 2010;37(2):52-6.

21. Cavalini LT, Chor D. Inquérito sobre hipertensão arterial e décifit cognitivo em idosos de um serviço de geriatria. Rev Bras Epidemiol. 2003;6(1):7-17.

22. Posner HB, Tang X, Luchsinger J, Lantigua R, Stern Y, Mayeux R. The relationship of hypertension in the elderly to AD, vascular dementia, and cognitive function. Neurology. 2002; 58(8):1175-8.

23. Holanda GM, Santos CCC, Pedrosa R, Costa FA, Mendonça KMPP. Análise da função cognitiva e capacidade funcional em idosos hipertensos. Rev Bras Geriatr Gerontol. 2011;14(2):241-50

24. Cordeiro LM, Paulino JL, Bessa MEP, Borges CL, Leite SFP. Qualidade de vida do idoso fragilizado e institucionalizado. Acta Paul Enferm. 2015; 28(4):361-66.

25. Duarte LMN. O processo de institucionalização do idoso e as territorialidades: espaço como lugar? Estud Interdiscipl Envelhec. 2014;19(1):201-17.

26. Pereira FM, Besse M. Fatores associados à independência funcional de idosos residentes em instituição de longa permanência. Acta Fisiat. 2011;18(2):66-70.

27. Jerez-Roig J, De Medeiros JF, Fidélis KNM, De Lima Filho BF, De Oliveira NPD, Amaral FLJS, et al. Activity limitations in Brazilian institutionalized older people. J Geriatr Phys Ther. 2016:1.

Received: August 09, 2016
Reviewed: February 08, 2017
Accepted: March 22, 2017

http://dx.doi.org/10.1590/1981-22562017020.160131

Survival analysis of elderly patients in Intensive Care Units

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Abstract

Objective: Conduct a survival analysis of elderly patients hospitalized in an intensive care unit (ICU), identifying the predictors of mortality among this age group. *Methods:* A retrospective cohort study was performed with data from the medical records of 457 elderly patients hospitalized in an ICU located in the city of Natal in Brazil. Survival functions were estimated using the Kaplan-Meier estimator, and the Log-rank test was used for comparisons. In addition, a multiple Cox proportional hazards model was constructed to identify the independent effects of the predictors of survival. *Results:* It was found that the survival of elderly ICU patients declined due to factors such as increased hospitalization time, advancing years, unmarried (including common-law-marriage) status, the presence of shock, pneumonia, septicaemia, fractures, a reduced state of consciousness, hospitalization for clinical reasons, being bedridden prior to hospitalization, fever, bradycardia, hypotension, cardiac arrest and the need for mechanical ventilation. The multiple Cox proportional hazards model revealed that variables such as shock, longevity, bradycardia, fractures, fever, hospitalization in the public healthcare system and admission for clinical reasons remained significant as predictors of reduced survival in intensive care units. *Conclusions:* The survival rates of elderly persons in an ICU in the city of Natal in Brazil were affected by demographic and clinical predictors, and those related to the type of hospitalization and the health care network. This shows that any initiative aimed at increasing the survival of elderly ICU patients must look at individual and social issues and factors related to the health care network.

Keywords: Intensive Care. Health of the Elderly. Survival Analyses.

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INTRODUCTION

One of the biggest challenges for health in Brazil is the construction of a network of services that can directly influence the social determinants of the health of the population and reduce the inequalities that impact on ways of living and dying, especially among socially vulnerable population groups such as the elderly.

This assertion is supported by the fact that the elderly in both Brazil and the rest of the world, especially those from low income groups, exhibit the poorest self-evaluations of health, high levels of functional disability and have difficulty accessing consultations, exams and hospitalizations[1]. An aggravating factor in Brazil is that the proposed universal public access offered by the Sistema Único de Saúde (the Unified Health System) (SUS) is still in the process of effectuation, as spending on private health care is greater than government investment in the sector, which affects both family income and, often, the efficacy of the services provided[2,3].

SUS underfunding also increases the harm done to the health of the elderly. It is the responsibility of the Ministry of Health, as a managerial body, to plan and implement improvements in the short, medium and long term, always considering the need for greater investment, faced with a scenario of population aging and a higher prevalence of chronic diseases that cause frailty and death[4]. In this context, Brazil also needs to invest in the construction of intersectoral public policies that guarantee the promotion, prevention, treatment and rehabilitation of health, taking into account the needs of different age groups, with a view to tackling the social determinants inherent in the health/disease process of each such group[5].

The hospitalization of the elderly in an Intensive Care Unit (ICU) is one facet of this reality, as such units have become increasingly expensive in the context of a hospital-centered health care model, restricting their capacity for innovation to technological areas and neglecting aspects such as the links with the network of preventive services, for example[3]. The role of intensive care in the health care of the elderly has expanded precisely because of the lack of preventive services. As an example of this, 52% of ICU hospitalizations in Brazil involve elderly persons, who in turn represent 60% of the overnight stays and financial resources available in adult ICUs, with a mortality rate that climbs as high as 62%, while the number of deaths among adult individuals in the sector is about 25%[6,7].

The causes of the disparity in these mortality figures is not exclusively clinical, as health professionals also face difficulties in establishing precise criteria for the admission of the elderly to ICUs. These doubts stem from educational, ethical, legal, religious, cultural and social dilemmas that are not systematically dealt with during the training of health professionals. Most of the time, during academic training, students in the field focus on technical discussions about ways to prolong life, where bioethical questions about terminality and finitude are superficially considered in the point-by-point and fragmented approach of the course curriculum[8].

Prognostic scores could therefore be an auxiliary tool in decision-making about the hospitalization of elderly patients in the ICU. However, it is important that the application of such measures is accompanied by good clinical practice, the support of complementary exams, the health history of elderly individuals, a sense of ethics and the capacity to manage the resources available in the hospital institution to support each individual case in its singularity, avoiding negligent actions such as unnecessary hospitalizations and the misuse of resources.

The ICU is a space for seriously ill patients with a chance of recovery and not for the palliative care of terminally and irreversibly sick patients[8]. Thus, this article aims to carry out a survival analysis of elderly patients hospitalized in adult ICUs, highlighting the factors that impact the heightened mortality rates among this age group. The analysis of the object of study is relevant as it applies directly to the discussion regarding the recommendation of hospitalization in ICUs and the optimization of the use of resources available in public and private health networks.

METHODS

A retrospective cohort study was carried out, with the purpose of identifying predictive factors of death among the elderly population admitted to ICUs. The study was carried out in the city of Natal in the state of Rio Grande do Norte. Data collection was based on the medical records of elderly patients hospitalized between November 1, 2013 and January 31, 2014 in the ICUs of the participating institutions.

The data were collected from 155 ICU beds, of which 101 were from the SUS and 54 were from private institutions. This total represented 62% of the ICU beds available to the population of Natal, Rio Grande do Norte during the field phase of the study. Data were collected between January and August 2014, and the data of all subjects who complied with the inclusion and exclusion criteria were collected in the survey, totaling 457 hospitalizations of elderly persons. To be included in the study, subjects were required to be aged 60 years or older in the period of hospitalization and to have been admitted to the ICU within the temporal cut-offs of the study. Medical records that reported discharge or death in the ICU before 24 hours of hospitalization was completed were excluded, as in this case a Hospitalization Authorization (HA) was not generated in the medical records of the SUS ICUs, meaning that such occurrences were not classified as hospitalizations from a legal perspective in this sector. Outliers of the length of hospital stay variable were also excluded to improve the accuracy of the multiple analysis.

Prior to the data collection period, a pilot study was carried out with the purpose of adjusting the collection instrument, assessing the plausibility of the set of variables listed and delimiting the temporal cut-off of the study[9]. It should be stated that the three-month period for data collection established in the pilot study did not result in seasonal bias, as the prevalence of the hospitalization of elderly patients in ICUs is high and its incidence rate is not proven to be seasonally related[10].

The dependent variable was divided into two categories, death and non-death during the follow-up period. The time until the event was counted in complete days from ICU admission (number of days recorded on the HA), starting with the hospitalization of the elderly in the ICU and with monitoring continuing for a period of 20 days. This period of time is justified by the fact that international studies of survival usually consider two groups of predictors of mortality: impacting factors that have an effect in up to 30 days, known as short-terms; and long-terms, which are variables that impact survival after 30 days from the date of admission. It was also observed in other studies that the average length of hospitalization of the elderly in ICUs, including standard deviations, is around 20 days[11-13]. Remaining faithful to these assumptions is important for discussion and comparison between different studies.

The independent variables analyzed were gender, age, self-declared ethnicity/skin color, occupation, religion, place of residence, main diagnoses or diagnostic hypotheses, previously diagnosed chronic diseases which were not the reason for the current hospitalization, signs and symptoms present during ICU admission, length of hospital stay, and type of ICU bed (public or private).

Therefore, a descriptive analysis of the dependent variables in relation to the time of hospitalization was carried out. The survival functions were calculated using the Kaplan-Meier estimator, with and without stratification, using the Log-rank Test to compare the functions at 3, 6 and 9-day intervals. The descriptive analysis showed that the outcomes of 78% of admissions occurred in up to nine days. This justifies the choice of the upper limit of the cited time interval. The lower limit of three days is based on the definition of Hospital Infection, characterized as infections that manifest themselves clinically within three days after hospitalization or the discharge of the patient from the health institution[11]. This was taken into account as both the infection and sepsis variables were found to be important during preliminary analyzes of the database.

The prognostic factors were calculated using hazard ratios (HR), taking into account 95% confidence intervals and the Cox proportional hazards model. Only variables with a crude HR with $p<0.20$ were included in the multiple analysis.

After the application of the Wald tests and the likelihood ratio test between the adjusted models, the Cox proportional hazards (hazard ratio) model was used to identify the independent effect of the variables which explained survival. The assumption of proportionality of the risks was assessed by Schoenfeld graphical analysis. The relevance of each variable included in the multiple model was verified by Wald statistics, with variables with statistical significance remaining in the final model ($p<0,05$).

The initial project was sent to the Ethics Research Committee of the Hospital Universitário Onofre Lopes (CEP-HUOL) before the field work, in accordance with the directives of Resolution 466/12, which guides the carrying out of studies involving humans in Brazil. The research project was approved by the CEP-HUOL under CAAE N° 20578913.1.0000.5292. The FICF waiver was requested from the CEP-HUOL, while the signature of documents authorizing the access of the researchers to patient record data was requested from the institutions, with the anonymity of the names of the subjects enrolled in the research guaranteed.

RESULTS

A total of 457 elderly patients were admitted to the ICU, with a mean age of 74.23 (±9.78), of whom 108 (23.6%) died. The average length of stay in the ICU was 5.03 (±4.78) days. When stratified by discharge and death, however, means of 7.60 (±5.64) and 4.60 (mean±4.18) days, respectively, were observed. The variables occupancy, religion and place of residence were missing in more than 90% of cases due to incomplete medical records, and were not considered during the analysis.

At the end of the follow-up period, the overall survival rate (Figure 1) without stratification was 90.99% after three days, 80.01% after six days and 66.64% after nine days of hospitalization. A gradual decline of the accumulated survival rate was observed over the same period, when comparing the functions in relation to the sociodemographic variables related to hospitalization (Table 1). A lower survival rate was observed among elderly persons in the age group of 80 years or older, who were unmarried (including civil marriages), and who were hospitalized in the SUS.

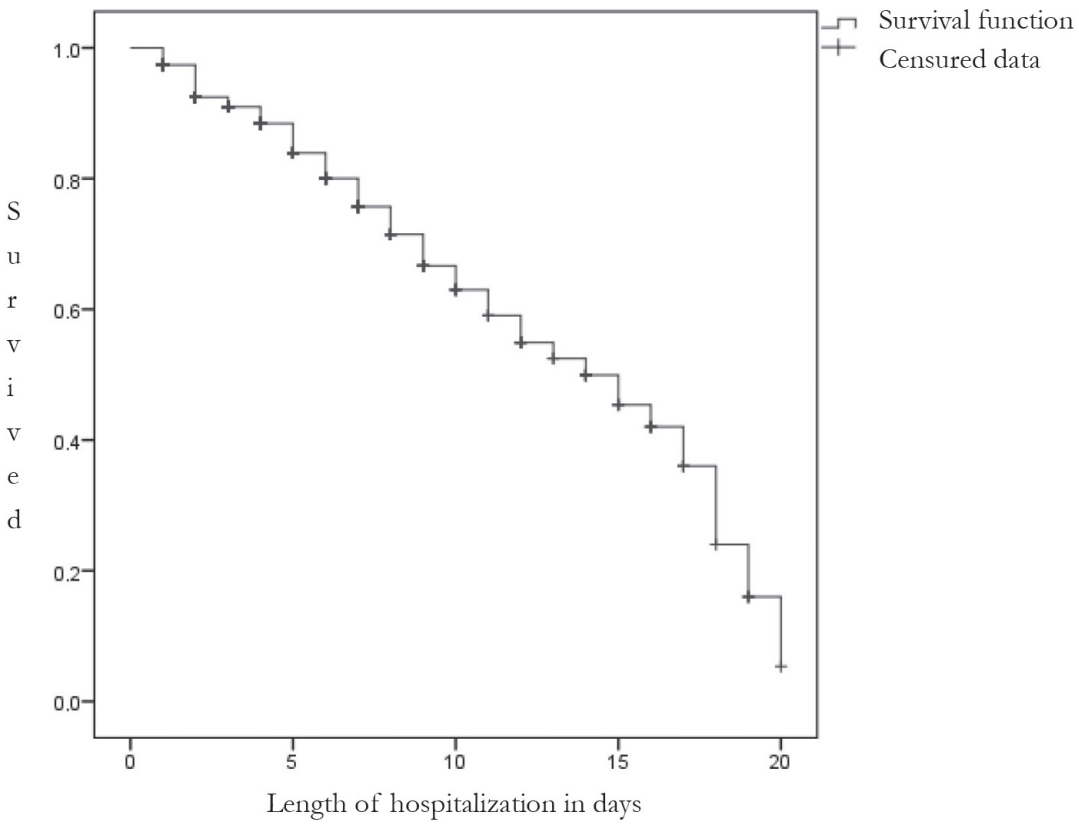

Figure 1. Overall survival rate of elderly persons in intensive care units. Natal, Rio Grande do Norte, 2015.

Table 1. Survival table of elderly persons hospitalized in ICUs based on sociodemographic variables and variables related to hospitalization. Natal, Rio Grande do Norte, 2015.

Variables	Deaths (%)	3 days	6 days	9 days	*p* value*
Gender					
Male	48 (44.44)	93.42	80.72	64.42	0.968
Female	60 (55.56)	88.76	79.34	68.57	
Age (years)					
60 to 80	59 (54.63)	92.94	82.85	68.25	0.002
81 or more	49 (45.37)	86.05	73.33	62.72	
Marital status					
Married (including common-law marriage)	43 (39.81)	94.05	82.64	71.92	<0.001
Unmarried (including common-law marriage)	55 (50.93)	85.96	69.71	50.92	
Network					
Private	53 (49.07)	92.28	84.41	73.53	0.015
SUS	55 (50.93)	88.68	73.56	57.04	

* Student's T-test

In relation to clinical and morbidity variables, elderly persons who were diagnosed with pneumonia or shock, were suffering from sepsis, were hospitalized for a fracture, were disoriented, hospitalized due to a clinical condition, had bradycardia, were bedridden before hospitalization, used artificial ventilation or suffered cardiorespiratory arrest, fever or hypotension had a lower survival rate (Table 2).

When Cox regression was performed, presenting simple and adjusted proportional hazard values (Table 3), the elderly persons who remained in the model and had a higher risk of death in the ICU were those who exhibited shock (140%), were aged 80 or older (95%), suffered from bradycardia (131%), were hospitalized in SUS beds (114%), had fractures (108%), were hospitalized for clinical reasons (102%) or had fever (91%).

The variables infection, acute respiratory insufficiency, acute myocardial infarction, dyspnea, cyanosis, edema and comorbidities not directly related to the current hospitalization were not considered predictors for the death of the elderly persons in the ICU in the present study.

Table 2. Survival table of elderly persons hospitalized in ICUs based on clinical and morbidity variables. Natal, Rio Grande do, 2015.

Variables	Deaths (%)	3 days	6 days	9 days	*p* value*
Pneumonia					
No	72 (66.67)	92.98	83.67	68.65	0.012
Yes	36 (33.33)	80.01	63.79	55.99	
Shock					
No	84 (77.78)	92.93	84.53	70.11	<0.001
Yes	24 (22.22)	66.67	39.89	34.90	
Sepsis					
No	68 (62.96)	93.33	88.08	74.05	<0.001
Yes	40 (37.04)	76.27	46.77	37.20	

to be continued

continued from Table 2

Variables	Deaths (%)	3 days	6 days	9 days	*p* value*
Fractures					
No	98 (90.74)	92.18	81.26	67.18	0.020
Yes	10 (9.26)	67.99	54.39	54.39	
Bedridden					
No	77 (71.30)	92.03	81.37	69.59	0.003
Yes	31 (28.70)	85.75	73.50	55.96	
Type of hospitalization					
Surgical	22(20.37)	95.62	85.54	77.15	0.032
Clinical	86 (79.63)	88.76	77.63	62.66	
Level of consciousness					
Orientated	30 (27.78)	96.33	90.44	76.67	<0.001
Disoriented	23 (21.30)	94.05	85.92	74.64	
Unconscious	55 (50.93)	78.79	61.67	48.80	
Bradycardia					
No	91 (84.26)	92.01	80.13	70.28	0.017
Yes	17 (15.74)	82.61	78.26	41.09	
Hypotension					
No	75 (69.44)	93.24	83.84	73.80	<0.001
Yes	33 (30.56)	80.83	65.50	43.71	
Artificial Ventilation					
No	47 (43.52)	97.23	91.95	78.79	<0.001
Yes	61 (56.48)	75.11	56.33	44.48	
Cardiorespiratory arrest					
No	90 (83.33)	93.66	82.80	68.70	0.002
Yes	18 (16.67)	63.31	43.83	38.35	
Fever					
No	91 (84.26)	91.31	80.51	68.22	0.184
Yes	17(15.74)	88.93	76.23	55.74	

* Chi-squared test.

Table 3. Multiple proportionate hazard model for deaths in ICU, with simple and adjusted hazard ratios for the study variables, Natal, Rio Grande do Norte, 2015.

Variables	HR[a]	HR Aj[b]	IC 95%[c]	*p Value* [4]
Shock				
No	1.00			
Yes	2.87	2.40	1.49 - 3.88	<0.001
Age (years)				
60 to 79	1.00			
80 or more	1.76	1.75	1.17 - 2.64	0.007
Bradycardia				
No	1.00			
Yes	1.84	2.31	1.33 - 4.00	0.003
Network				
Private	1.00			
SUS	1.57	2.14	1.42 - 3.21	<0.001

to be continued

continued from Table 3

Variables	HR[a]	HR Aj[b]	IC 95%[c]	*p Value* [4]
Fractures				
No	1.00			
Yes	2.07	2.08	1.02 - 4.24	0.043
Type of hospitalization				
Surgical	1.00			
Clinical	1.64	2.02	1.21 - 3.37	0.007
Fever				
No	1.00			
Yes	1.40	1.91	1.11 - 3.27	0.019

a: Hazard ratios; b: Adjusted hazard ratios; c: Confidence interval of 95%; d: Wald Test.

DISCUSSION

Elderly persons hospitalized in the ICUs for longer periods, who were older, unmarried (including common-law marriages), hospitalized in the SUS, diagnosed with shock, pneumonia, sepsis, fractures, had a reduced level of consciousness, were affected by clinical disorders, bedridden before hospitalization, exhibited fever, bradycardia, hypotension, cardiorespiratory arrest and required mechanical ventilation had lower survival rates during the study period.

However, when these findings were subjected to the Cox proportional multiple model, it was observed that only the variables shock, older elderly persons, bradycardia, fractures, fever, hospitalization via the public network and admission due to clinical reasons remained as prognostic factors for lower survival rates among elderly persons admitted to the ICU. Comorbidities and previously diagnosed chronic diseases unrelated to the reason for the current hospitalization were not associated with the survival of the elderly persons at any of the analysis levels.

Acute clinical disorders and factors such as the longevity of patients appear to be more significant in survival studies with a follow-up period of less than 30 days. In this range, conditions such as level of consciousness, respiratory diseases and mechanical ventilation were identified as predictors of mortality. In studies with a follow-up period of more than 30 days, comorbidities are associated with a worse survival prognosis, which is consistent with the results presented here. However, the variable sepsis is equally significant in survival studies with both short and long follow-up periods, including those of up to five years, which highlights the impact of this variable on the mortality of elderly patients in ICUs[12-14].

However, the present study found that the chronic condition of being bedridden at home before hospitalization was significant for the survival of elderly persons in the ICU, even over a period of less than 30 days. This demonstrates that the impairment of functional capacity is an important element for the quality of life of the elderly and is associated with a greater probability of death during the hospitalization of individuals of this age group[14].

At the same time, the association of the functional decline of the elderly with falls and fractures is a commonly discussed theme in studies in geriatrics and gerontology[15,16]. In addition, death due to post-fracture hospitalization has attracted the attention of researchers, especially as such events have intensified in age groups younger than 75 years[17,18]. In this scenario, where fractures also appear as a prognostic factor for the death of elderly persons in the ICU, it is important to consider strategies for the prevention of traumatic events, even for elderly individuals who are considered robust.

In some situations, surgical intervention is necessary in the case of fractures among the elderly, and the intensive therapy unit is the site of immediate post-surgical recovery for the most severe cases, which in the present study were considered as hospitalizations for surgical reasons. However, hospitalizations for clinical reasons appeared as a risk in the survival table and in the multiple Cox model, a finding also obtained by other studies[12,14,18]. It is therefore assumed that the elective and controlled nature of non-emergency surgical procedures guarantee lower mortality than clinical events that usually affect the elderly in an acute and unexpected way.

Regarding shock and cardiorespiratory arrest, the study by Fuchs et al.[18] presented results similar to those of the present work. Such variables, clinically and physiologically related to bradycardia and hypotension, which were also associated with a decrease in the survival of the elderly in the ICU, are prognostic factors of death, even after a one year follow-up period[18].

SUS patients had a lower survival rate than elderly persons hospitalized in the private system. To understand this, it is necessary to go beyond hospitals and ICUs, and to perceive these institutions in the context of public health policies in Brazil. The public health system faces financial problems that directly affect the quality of services provided, including health care for the elderly. However, addressing this crisis also involves an approach that goes beyond economic factors, such as: breaking away from the fragmented care model, seeking interdisciplinary care, improving resource management and professional training systems[19].

CONCLUSIONS

A retrospective study based on medical records presents a potential limitation in relation to possible calibration bias. However, this study considered final diagnoses, usually identified following examination and analysis by various health professionals from a range of areas. In addition, the rigor of the Federal Medical Council regarding the correct completion of death certificates has improved death information systems in Brazil.

The survival of elderly persons hospitalized in ICUs in Natal, Rio Grande do Norte is affected by different prognostic factors represented by demographic and clinical variables related to the type of hospitalization and to the network of health services. The diversity of the classification of these variables indicates the complexity of the phenomenon studied. It also suggests that any action aimed at increasing the survival of elderly persons in ICUs needs to go beyond the clinical approach and function both on an individual level and within the social context of individuals and in the health care network.

However, there is a need for further studies to contribute to this discussion. The importance of performing cohort studies with elderly patients hospitalized in ICUs with a longer follow-up period, including the post-discharge period, is important. In this way, it would be possible to perceive not only death/discharge rates, but also the quality and the years of life added after the treatment offered to the elderly.

REFERENCES

1. Lima e Costa MFF, Facchini LA, Matos DL, Macinko J. Mudanças em dez anos das desigualdades sociais em saúde dos idosos brasileiros (1998-2008). Rev Saúde Pública. 2012;46 (Supl):100-7.
2. Boing AC, Bertoldi AD, Posenato LC, Perez KG. Influência dos gastos em saúde no empobrecimento de domicílios no Brasil. Rev Saúde Pública. 2014;48(5):797-807.
3. Barbosa PR, Gadelha CAG. O papel dos hospitais na dinâmica de inovação em saúde. Rev Saúde Pública. 2012;46(Supl):68-75.
4. Mendes AN. Tempos turbulentos na saúde pública brasileira: impasses do financiamento no capitalismo financeiro. São Paulo: Hucitec; 2012.

5. Fundação Oswaldo Cruz. A saúde no Brasil em 2030: prospecção estratégica do sistema de saúde brasileiro. Rio de Janeiro: Fiocruz; 2013.

6. Pedrosa IL. Construção de um instrumento de avaliação prognóstica para idosos em unidade de terapia intensiva [tese]. Porto Alegre: Pontifícia Universidade Católica do Rio Grande do Sul; 2014.

7. Oliveira ABF, Dias OM, Mello MM, Araújo S, Dragosavac D, Nucci A, et al. Fatores associados à maior mortalidade e tempo de internação prolongado em uma unidade de terapia intensiva de adultos. Rev Bras Ter Intensiva. 2010;22(3):250-6.

8. Poletto S, Santina JS, Bettinellia LA. Dilemas do enfrentamento da morte de pacientes Idosos. Rev Ciênc Juríd Empres. 2012;13(2):49-55.

9. Canhota C. Investigação passo a passo: perguntas e respostas para investigação clínica. Lisboa: APMCG; 2008.

10. Brasil. Ministério da Saúde. Diretrizes metodológicas: análise de impacto orçamentário: manual para o Sistema de Saúde do Brasil. Brasília, DF: Ministério da Saúde; 2012.

11. Garcia LM, César ICO, Braga CA, Souza GAD, Mota EC. Perfil epidemiológico das infecções hospitalares por bactérias multidrogarresistentes em um hospital do norte de Minas Gerais. Rev Epidemiol Control Infect. 2013;3(2):45-9.

12. Garland A, Olafson K, Ramsey CD, Yogendran M, Fransoo R. Distinct determinants of long-term and short-term survival in critical illness. Intensive Care Med. 2014;(40):1097-1105.

13. Davis JS, He V, Anstey NM, Condon JR. Long term outcomes following hospital admission for sepsis using relative survival analysis: a prospective cohort study of 1,092 patients with 5 year follow up. PLos ONE. 2014;9(12):12-5.

14. Taccone FS, Artigas AA, Sprung CL, Moreno R, Sakr Y, Vincent JL. Characteristics and outcomes of cancer patients in European ICUs. Crit Care. 2010;(13 (1):1-10.

15. Soares DS. Fraturas de fêmur em idosos no Brasil: análise espaço-temporal de 2008 a 2012. Cad Saúde Pública. 2014;30(12):2669-78.

16. Falsarella GR, Gasparotto LPR, Coimbra AMV. Quedas: conceitos, frequências e aplicações à assistência ao idoso. Rev Bras Geriatr Gerontol. 2014;17(4):897-910.

17. Kannegaard PN, Mark SVD, Eiken P, Abrahamsen B. Excess mortality in men compared with women following a hip fracture. National analysis of comedications, comorbidity and survival. Age Ageing. 2010;(39):203-9.

18. Fuchs L, Chronaki CE, Park S, Novack V, Baumfeld Y, Scott D, et al. ICU admission characteristics and mortality rates among elderly and very elderly patients. Intensive Care Med. 2012; 38(10):1654-61.

19. Mendes J, Bittar O. Com 25 anos de duração, o Sistema Único de Saúde - SUS - enfrenta problemas no financiamento e na qualidade dos serviços produzidos. Seus desafios envolvem mudanças nas necessidades de saúde (transições demográfica e epidemiológica) e na tecnologia médica. Rev Fac Ciênc Méd Sorocaba [Internet]. 2012 [acesso em 20 Mar 2016];38(1):1654-61. Disponível em: http://revistas.pucsp.br/index.php/RFCMS/article/view/18597.

Received: July 11, 2016
Reviewed: January 29, 2017
Accepted: March 11, 2017

http://dx.doi.org/10.1590/1981-22562017020.160127

Retirement decision-making influenced by family and work relationships

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Abstract

Objective: To identify the influence of family and work relationships on decision-making about retiring. *Methods:* A qualitative descriptive study was carried out with 16 pre-retirees from a public university institution located in the north of Paraná, Brazil. Data were collected between July and November 2012 from three reflection groups that discussed aspects related to retirement. The Content Analysis technique was chosen for data analysis. For the theoretical basis of the results, the Theory of Social Representations was used. *Results:* Two categories emerged from discourse analysis: *The influence of family relationships on decision-making about retiring* and *the influence of work relationships on decision-making about retiring. Conclusion:* Family and work experiences influence decision-making about retiring, and become more important when the pre-retiree does not have post-career life projects, demonstrating the importance of the participation of workers in strategies to prepare for retirement during working life.

Keywords: Retirement. Family Relations. Work.

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INTRODUCTION

Retirement is a period of transition and changes that is strongly associated with job loss. It can represent recognition for the years dedicated to work and a period of freedom to carry out activities that work had made impossible. On the other hand, it can mean the need to confront aging and potential diseases[1], as well as feelings of worthlessness and unproductiveness in a societal context. All these interpretations bring the possibility of a new life, with new projects and possibilities[2,3].

Considering the meanings and centrality that work occupies in human life, the difficulties in dealing with the consequent ruptures that retirement brings are understandable. Several activities of interest to individuals are encompassed in work, based in the environment where much of human sharing takes place, represented by important sources for the exchange of experiences, relationships and life events that carry psychosocial meanings. This reflects on how workers perceive their work, their involvement and satisfaction with it, as well as the marks left by the profession[2,4,5].

When an individual is faced with the need to make decisions regarding retirement, questions arise regarding the human feelings and values that can affect this process[2]. It is important to emphasize that human beings are affected by influences from the environment in which they live, and, when faced with indecision over the issue of retirement, can begin to consider the external opinions of family, friends and co-workers, which often affect the complex decision that this moment of life demands[6].

Studies have therefore observed the importance of family and friends, whether from the work environment or other contexts, in the decision making process regarding retirement and the possible changes caused in relationships of family and/or friendship, as the individual is divided between the worlds of family and work[2,7]. It is believed that pre-retirees whose families and friends positively influence the retirement decision will have more optimistic attitudes toward the overall benefits, time for relationships and a new beginning that retirement offers[8].

The present study is of great importance due to its investigation of the social influences that permeate decision making regarding retirement, as it can serve as a support for the understanding of this moment that pre-retirees face and the identification of the influences, whether positive or negative, that affect this process. The study may also assist managers in the implementation of retirement preparation strategies that address the aspects that permeate the decision making related to this phase of life.

In view of such considerations, the objective of the present study was to reveal the influence of family and work relations on the decision-making process related to retirement.

METHOD

A qualitative and descriptive study was carried out at a public university institution located in Londrina, Paraná, Brazil, with approximately 5,266 employees. The survey included pre-retirees who, after participating in a cycle of instructional lectures in the Retirement Preparation Program in 2011, agreed to participate voluntarily in retirement think-tanks that took place in 2012. The aim of these groups was to promote discussions and reflections that could contribute to dealing with the feelings that emerge in the phase preceding retirement.

Of the 120 participants who attended the instructional lectures and were invited to participate in the reflection groups, 20 pre-retirees voluntarily enrolled for the latter stage, forming three groups. The first group contained eight pre-retirees, the second five, and the third seven. Participants were allocated in groups based on availability within their schedules. Four participants were excluded from the study because they attended only one meeting, giving a total population of 16 workers. It was decided to include only pre-retirees who participated in two or more meetings as it was considered that they had the minimum familiarity necessary with the subjects discussed in the discussions.

Five monthly meetings were held between July and November of 2012, with a duration of approximately two hours each. These were coordinated by a faculty

member with professional experience in group dynamics and in research on the subject of retirement. One of the researchers of this study participated as an observer, recording the data and information from the discussions of each meeting in a field diary. Audio and video recording equipment were not used for data collection as the population was considered vulnerable in the context under discussion, and it was thought that these appliances could suppress the participation of pre-retirees in the discussions. It was chosen to record the data in field diaries.

The topics addressed at each meeting were not pre-established by the researchers. The discussions permeated the individually expressed desires that contributed to the collective construction of the representation of retirement for the group. At the beginning of each meeting, the coordinator returned to the previously discussed themes, in order to identify the reflections triggered in the previous meeting and which would be followed-up in later discussions.

The content analysis technique was used for data analysis, and contained the following steps: pre-analysis, exploration of material, treatment of results and interpretations[9]. When describing the discourses, the letter P (Participant) was assigned followed by a number corresponding to the pre-retiree in question, to preserve their identity.

The Theory of Social Representations (TRS)[10] was used as a theoretical reference, as pre-retirement presents itself as a moment of choice and decision-making, in which the individuals seek to explore more deeply meanings and similarities together with their peers. In this way, the theory of social representations suggests that representations are present in all human interactions, influencing the behavior of the individual participant in a collective.

In this context, social representations aim to make communication within a group relatively unproblematic and reduce "vagueness" through a certain degree of consensus among its members, making it favorable for people and groups to transform ideas and images into a concrete reality[10].

The study was approved by the Ethics Research Committee of the institution, under approval number 171/2010. All the participants signed a Free and Informed Consent Form.

RESULTS AND DISCUSSION

Sixteen pre-retirees participated in this study, of which 13 were female and three were male; the age range ranged from 48 to 68 years. Thirteen participants worked in administrative positions and three were faculty members.

The analysis of the discourses from the reflection groups led to the construction of two categories, based on the family and work influences that affect the retirement decision making process, identified in the discourse of participants and described below: *the influence of family relationships on decision making about retirement* and *the influence of work relationships on decision making about retirement*.

The influence of family relationships on decision making about retirement

Pre-retirees are influenced by the family in making retirement decisions, with family relationships being a symbol of resilience for the challenges to be overcome[8].

In terms of conjugal relationships, spouses have an important role in this stage of life, and the more satisfactory the conjugal relationship and the sense of companionship, the greater the propensity to retire. The following accounts demonstrate this explanation:

> "My husband is my companion, not a hindrance to my retirement" (P1).

> "I decided to retire because my husband retired as well" (P7).

> "[...] my husband thinks I should stop" (P8).

The discourses described lead to the reflection that retirement can provide more time for coexistence and proximity between couples, which benefits the search for the pleasures of common life and satisfaction in the conjugal and family relationship. The proximity

of the spouses at this stage may be related to the fact that their children have permanently left home, making it a space of free interaction between the couple. This allows for pleasurable moments by sharing domestic activities and leisure together[8,11].

It should be emphasized that the affective bonds between husband and wife should be narrowed and strengthened during this period, especially in the face of a life plan that includes a meeting of interests, companionship in leisure activities and partnership in investments for the future[5].

Similarly, as a harmonious marriage relationship may influence the desire to retire to be closer to one's partner, some participants reported that retirement could be a difficult time with their spouses, leading to the postponement of retirement. The following examples illustrate the above:

> "My husband complains all the time when I come home. I tell him he's not the same person I married 28 years ago. I tell him that as soon as I put my foot in the door he starts complaining. It doesn't make me want to go home" (P2).

> "My wife is very angry, and that's why I don't want to retire. If I'm in the house for one minute she complains" (P3).

The dialogues of P2 and P3 reveal that family dynamics influence the life of the retiree, as when these relationships are not harmonious and the retiree has no occupation outside the family, the increased time spent in the home can generate problems in the conjugal relationship and relations with other family members. This situation is exacerbated by the onset of old age, characterized by the feeling of career finitude, loss of vitality, fragility of health, illness, dependence and social rejection. The combination of these and other factors further disturbs relationships and weakens the health of the individuals[11,12].

Another difficulty reported in the marital relationship refers to the dependence one spouse has on the other, which may frustrate the expectation of freedom associated with retirement:

> "I don't like this dependence, I'd like him (my husband) to give me a bit more space" (P8).

Giving up work can generate a feeling of liberation and of an opportunity to accomplish what was left behind, a moment of rest, a lack of commitment, and to take part in activities that the work routine did not allow[4,5]. It is also considered that the decision to retire consists of a determining moment in the life of the individual, as it is a rupture with something concrete, namely work, which is replaced with a new life situation, resulting in a search for explanation of something that is uncertain and disturbing[10]. In this sense, the fact that the pre-retiree feels such dependence on the part of their spouse generates a feeling of a loss of the privacy and individuality necessary to reflect on the phase being experienced, given that the decision is often made in favor of the other.

The discourses also showed that the views of children can interfere with the decision to retire, as many encourage their parents to stop working and enjoy this new stage of life. On the other hand, there are children whose influence favors continuing at work, as they believe in the vitality of their parents and the benefits provided by work, or even to avoid the suffering caused by the feeling of "empty nest".

> "I feel pressurized to stop working by my family [...]" (P1).

> "My children don't want me to stop, they think I'm very young [...]" (P8).

> "I still suffer from empty nest syndrome, I'm scared this will surface again when I stop working" (P1).

The Theory of Social Representations explains such ambivalent influences from children, and emphasizes that understanding external stimuli and explaining what they are and what they mean is the first step in any situational or social relationship analysis, and a means of predicting the evolution of interactions between people. In this way, the situation determines both the questions to be formulated and the answers to be provided, being the mediating representations between the stimulus and the response[10]. The influence of their children generates a reaction to the stimulus that occurs among the pre-retirees when making decisions about retirement, when the current condition of life is rethought and the future concretized, whether by retiring, or remaining in the labor market.

Another aspect related to the relationship between parents and children refers to the relevance that the parents of the pre-retirees have in post-career decision making, as many opt for retirement to dedicate more time and attention to such relatives. Comments that exemplify this include:

> "I want to enjoy my father and mother more. I was shocked because my friend lost her father suddenly, and that upset me" (P1).

> "I lost my father last month, and my mother isn't well, so I want to devote more attention to her" (P4).

In relation to such discourse, studies suggest that plans for free time often include the family, as including them in life projects is a basic action[8]. Retirement therefore represents an opportunity, previously deprived by work, to devote time to the family, especially when the pre-retiree has elderly parents, who, following the natural cycle of life, are close to death.

There are, however, other factors that lead the pre-retiree to rethink continuing to work, as they feel influenced by the families to carry out certain unwelcome activities. The following comments illustrate this factor:

> "My sisters want me to stop working. They're attached to the house, but I'm not like that [...]" (P1).

> "I'm very attached to my children. My married son lives near me. I take care of my granddaughter, but it's not my job [...] my son depends on me for everything" (P2).

> "[...] My son always wants help in his business. My husband is retired and my son said that it will be good for his dad to help him on our place in the country, to distract him, but my husband has his own life to live. It's good for leisure, but not for a job" (P7).

> "My friend does not want to retire because her daughter is going to have a baby and she thinks she will be left to take care of her grandchild [...] as my friend always worked outside the home, taking care of her grandchild would be like being used by her daughter" (P9).

The discourses show that pre-retirees, in an uncomfortable situation, seek their own understanding of their reality and desires, in order to concretize ideas and feelings. They postpone retirement when family and friends seek to plan their post-career path with chores and the imposition of relationships of dependency[10].

The possibility of having their retirement tasks defined by family and friends in retirement may also be a consequence of the lack of well-defined post-career life plans. When the time comes for retirement, the individual perceives themselves to be faced with a reality for which they have not prepared, making themselves more vulnerable to the imposition of certain conditions[12,13].

Uncertainty regarding the emotional support of the family during retirement also raises questions regarding this life decision:

> "In what way are my family going to support me in retirement?" (P2).

> "When I get home I have an urge to run away, because my son is a very good boy, but he's very quiet [...] it really bothers me" (P4).

The concerns described lead to the perception that the transition into retirement is experienced differently by people depending on their experience with work, development of skills, coping and resilience abilities, living conditions and other aspects. Therefore, the possibilities for healthy adaptation and the reduction of stress are related to autonomy and independence, affective support and social integration with family, spouse and friends, in order to maintain health and provide motivation for and interest in continuity projects[14]. Investigations that examine family relationships when faced with retirement are important, as a review study verified that research in Brazil addresses the relationship between retirement and the family context only superficially, with the focus of research also exploring other themes. International databases, meanwhile, reveal six publications on this theme in eleven years of research[15].

A reflection on retirement and its impact on personal and professional life, especially in the family

context[15], is therefore important, and may allow this period of life to be satisfactory and based on the support and restructuring of family life.

The influence of work relationships on decision-making about retiring

In addition to family influences, pre-retirees are influenced by co-workers when making decisions about retirement. Many encourage the worker to choose retirement either because of a desire to take their place, or by believing in the need to renew the workforce. The following discourses exemplify the above:

> "My younger colleagues see me as a competitor, they ask me when I'm going to stop working, they want my job [...] They want my place, they even know the day I can retire" (P5).

> "The younger ones say to me: 'Aren't you going to retire?' I don't feel bad, I say that if I want to leave, I'll leave, and if I want to stay, I'll stay. [...] We have the knowledge and the wisdom, but we haven't mastered computers" (P4).

Such explanations lead to an understanding of the social representations that constantly arise in human relations, when one individual confronts the other with intentions and purposes and which occur for practical reasons. Everything that people do or say can have a hidden meaning, intention or purpose, which others try to understand[16]. In expressing inquiries regarding the departure or permanence of the pre-retiree at work, co-workers lead such individuals to a reflection regarding their role in the institution and their future prospects, which can lead to retirement.

Workers can remain at the same company for many years, especially in public institutions, and postpone their retirement due to their financial stability. As a result, the number of aging employees at the institution increases and, as their capacity for work diminishes, stigmas and prejudices related to productivity arise in this environment. In addition, the chronological factor exerts an influence in the evaluation of the activity or inactivity of human beings and imposes the idea of unproductiveness and dependency on the elderly, resulting in discrimination against them[3,6,17].

Studies have shown the embrittlement of the health of workers with advancing age, characterized by cognitive and psychomotor decline, loss of functional capacity and autonomy, as well as the appearance of chronic diseases and the use of more medications than younger workers. Therefore, the pre-retirement period associated with aging can result in a decrease in work performance and lead to non-adherence to the digital world and technological advances, which intensifies the rejection of the same by colleagues[3,17-19].

Other factors that exert a favorable influence on retirement refer to the fact that pre-retirees feel the absence of colleagues who have retired, and thus perceive themselves in an environment that is no longer familiar to them, or when resentment arises with those who remain working in the workplace, generating conflicts. On the other hand, some work influences lead the pre-retiree to the desire to postpone retirement. These are strongly associated with the relations of friendship established at work, and are related to trust and emotional support.

> "I really like to work, but today I don't take as much pleasure as I used to in my area. My colleagues have already retired as well" (P8).

> "I was sure that I wouldn't want to retire [...] I didn't have any problems with my colleagues, the long-standing ones, for over 35 years. [...] The competition at work has been difficult. [...] Events have made me rethink [...]" (P1).

> "My biggest concern about retirement is not having my work colleagues around to let off steam [...]. My family is great, but I can't talk to them about things I can only talk about to my co-workers, not even my sister. [...]I come here and get my worries off my chest, but what about when I don't have this anymore?" (P7).

It is accepted that work represents the best way to serve and be served, and is an experience with pleasant surprises, strong emotions, frustrations, uncontained joy, and also sorrow[5].

Many experiences, stories, struggles and achievements are shared in the work environment, and in some cases friendships are restricted to such places. These relationships help the worker develop resilience and produce strategies to deal with disturbing events. In this sense, retirement can mean the end of this bond[7,20].

Social integration at work provides a better quality of life and work, generates pleasure, reliability, and helps in the process of dealing with adversities, making the environment more pleasant. On a daily basis, the worker is exposed to routine circumstances related to the overload of activities, stress, the privileges of some colleagues, conflicting situations, all of which involve different personalities and possible betrayals, which can lead to the breaking of relationships of friendship within the institution[20].

Another factor that weighs against retirement and was highlighted by the participants relates to the statements of colleagues and friends regarding the positive mood of the pre-retiree, assuring them that they have much contribute to the institution and that work does them good, as expressed below:

> "The external influences of my workmates make things difficult, they say I still have a lot to contribute" (P14).

> "My friends say that I always look nice, I make myself look smart for work like it's a party, because I feel happy when I go to work" (P1).

> "I get a lot of affection from my students, they ask me not to retire" (P3).

The above statements relate to the understanding that people tend to consider and analyze the world in a similar way, especially when the world in which they live is entirely social[10]. This means that the opinions expressed by co-workers interfere in decision making in this phase of life, when the pre-retiree unconsciously shares the opinions of their peers.

Such influences lead the pre-retirees to reflect on the pleasure generated by the relationships that motivate their decision to continue working, bringing dignity and personal satisfaction. These come from the valorization and recognition obtained through actions carried out within the community, with the creation of bonds of trust and friendship. This context is important even for the mental health and self-esteem of individuals, as it contrasts with the stigma of an old, excluded, incapacitated and unproductive person that is often attributed to retirees[17,21].

Because the strategies established to guide the groups did not define the discussion topics for each meeting, the reflections of the participants were restricted to the family and work influences on decision making regarding retirement. This was a limitation of this study as it did not cover all the aspects that influence this process. These results may differ among other populations, as the individual characteristics of these groups contributed to their reflections on retirement.

CONCLUSIONS

The proximity of retirement leads employees to reflect on their work and their personal and family life, thereby raising the possibility of listening to opinions of family and friends and observing family and work factors that can aid in the difficult process of making decisions about retiring.

The results showed that some family and work experiences significantly influence why pre-retirees choose retirement or decide to continue working.

The benefits of retirement were described by those with good family relationships, especially with their spouses, and who wish to have time to perform other activities without the commitment of work. Another factor observed was related to the increased demands of caring for parents who are ill. There were also cases in which workers described feeling unfit for the work environment, whether due to difficulties related to aging, problems with relationships, and even unhappiness.

Pre-retirees who were unfavorable to the idea of retirement were those with disharmonious family relationships, those who fear the dependence of having to look after their grandchildren, and those who do not receive emotional support from home. In relation to the working environment, workers who maintain a strong bond of friendship with co-workers and those who are satisfied with their duties and are valued are unfavorable to retirement.

Emphasis should be placed on the important role that employers should play in this context through the preparation of strategies to prepare workers for retirement, in order to encourage them to reflect on their personal and professional life to ensure a satisfactory decision-making process and, finally, support them by planning life projects that provide a structured post-career life.

REFERENCES

1. Canizares JCL, Jacob Filho W. Fatores de risco à senilidade na transição à aposentadoria. Rev Bras Geriatr Gerontol [Internet]. 2011 [acesso em 08 abr. 2016];14(3):425-32. Disponível em: http://www.scielo.br/pdf/rbgg/v14n3/v14n3a03.pdf
2. Panozzo EAL, Monteiro JKM. Aposentadoria e saúde mental: uma revisão de literatura. Cad Psicol Soc Trab. 2013;16(2):199-209.
3. Rebouças M, Matos MR, Ramos RR, Cecílio LO. O que há de novo em ser velho. Saúde Soc. 2013;22(4):1226-35.
4. Selig GA, Valore LA. Imagens da aposentadoria no discurso de pré-aposentados: subsídios para a orientação profissional. Cad Psicol Soc Trab. 2010;13(1):73-87.
5. Cuello MA, Concha LS. Preparación para la jubilacion em losservicios públicos de Chile. Rev Chil Ter Ocup [Internet]. 2011 [acesso em 05 abr. 2016];11(11):53-64. Disponível em: http://www.revistaterapiaocupacional.uchile.cl/index.php/RTO/article/viewFile/17082/17819
6. Araújo LP. Aposentadoria como proposta de qualificação para uma vida saudável. Rev Incelências. 2011;2(2):63-77.
7. Soares DHP, Luna IN, Lima MBF. A arte de aposentar-se: programa de preparação para a aposentadoria com policiais federais. Estud Interdiscip Envelhec. 2010;15(2):293-313.
8. Franca LHFP, Menezes GS, Siqueira AR. Planejamento para aposentadoria: a visão dos garis. Rev Bras Geriatr Gerontol [Internet]. 2012 [acesso em 12 abr. 2016];15(4):733-45. Disponível em: http://www.scielo.br/pdf/rbgg/v15n4/12.pdf
9. Bardin L. Análise de conteúdo. Lisboa: Edições 70; 2010.
10. Moscovici S. Representações sociais: investigações em psicologia social. 6ª ed. Petrópolis: Vozes; 2009.
11. Zanelli JC. Processos psicossociais, bem-estar e estresse na aposentadoria. Rev Psicol Trab. 2012;12(3):329-40.
12. Santos VB, Tura LFR, Arruda AMS. As representações sociais de "pessoa velha" construída por idosos. Saúde Soc. 2013;22(1):138-47.
13. Chrisostomo ACR, Macedo R. O trabalho segundo a visão de um grupo de aposentados. Rev Kairós. 2011;14(1):149-61.
14. Fernandes GMF, Garcia GG. O sentido da velhice para homens e mulheres Idosos. Saúde Soc. 2010;19(4):771-83.
15. Cruz MAG. Adiando a aposentadoria: um estudo sobre os fatores que levam servidores federais a adiar a aposentadoria em uma instituição de pesquisa [dissertação]. Taubaté: Universidade de Taubaté; 2011.
16. Zanelli JC, Silva N, Soares DH. Orientação para aposentadoria nas organizações de trabalho: construção de projetos para o pós-carreira. Rev Psicol Organ Trab [Internet]. 2010 [acesso em 10 abr. 2016];10(2):177-81. Disponível em: http://pepsic.bvsalud.org/pdf/rpot/v10n2/v10n2a13.pdf
17. Antunes MH, Soares DHP, Silva N. Aposentadoria e contexto familiar: um estudo sobre as orientações teóricas da produção científica. Perspect Gest Conhec. 2013;3(Esp):45-56.
18. Padula RS, Comper MLC, Moraes AS, Sabbagh C, Pagliato Junior W, Perracini MR. The work ability index and functional capacity among older workers. Braz J Phys Ther [Internet]. 2013 [acesso em 10 abr. 2016];17(4):382-91. Disponível em: http://www.scielo.br/pdf/rbfis/v17n4/pt_1413-3555-rbfis-nahead2332012.pdf
19. Mancini RB, Matsudo SM, Matsudo V. Função cognitiva e capacidade funcional em mulheres acima de 50 anos de idade. J Aging Innov. 2014;3(1):15-25.
20. Schujmann A. A influência da promoção nas relações de amizade no ambiente de trabalho [dissertação]. Porto Alegre: Universidade Federal do Rio Grande do Sul; 2010.
21. Brito J, Bercot R, Hourellou-Lafarge CH, Neves MY, Oliveira S, Rotemberg L. Saúde, gênero e reconhecimento no trabalho das professoras: convergências e diferenças no Brasil e na França. Physis [Internet]. 2014 [acesso em 12 abr. 2016];24(2):589-605. Disponível em: http://www.scielo.br/pdf/physis/v24n2/0103-7331-physis-24-02-00589.pdf

Received: July 12, 2016
Reviewed: January 29, 2017
Accepted: March 20, 2017

http://dx.doi.org/10.1590/1981-22562017020.160160

Association of body mass index with the functional fitness of elderly women attending a physical activity program

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Abstract

Objective: to investigate the association between body mass index (BMI) and functional fitness levels linked to the Elderly in Movement Program of the city of Curitiba, in the state of Paraná, Brazil. *Methods:* The study is characterized as correlational and cross-sectional. The sample consisted of 1,806 elderly female participants of the Elderly in Movement Program. The short version of the IPAQ was used to evaluate participation in physical activities; body weight (kg) and height (m) were measured to calculate BMI (kg/m²), while the motor tests proposed in the *Senior Fitness Test* were used to evaluate the functional fitness of the elderly women. Descriptive statistics, the chi-squared test and binary logistic regression were used for data analysis. *Results:* The results showed that 24.0% of the sample exhibited eutrophic nutritional status, 42.9% were overweight and 33.1% were obese. The elderly women classified as overweight and obese had lower functional fitness scores, based on the rating of Rikli and Jones, while the elderly women classified as eutrophic exhibited levels within the normal range. Obese elderly women were more likely to have low scores in the following functional fitness tests: Walk for 6 minutes, Chair Stand, Chair Sit and Reach, Back Scratch and 8-Foot Up and Go. *Conclusion:* The study indicated an association between; BMI and functional fitness in the elderly women participating in the program, where the majority of elderly women classified as obese exhibited low fitness in all tests.

Keywords: Physical Fitness. Elderly. Body Mass Index.

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INTRODUCTION

Due to the rapid increase in the number of elderly people around the world, the maintenance of the health and physical independence of such individuals has become essential to promote healthy aging, considering that the alterations that arise from this natural, inevitable and irreversible process can be prejudicial to one's physical health[1,2].

Even in the absence of any given pathology, structural and functional alterations occur due to the natural aging process which can negatively influence the functional fitness of the elderly individual[3]. Among the alterations that are associated with aging, reductions in bone and muscle mass, flexibility and exercise and vital capacities are the most notable[4].

In addition to the alterations mentioned above, literature shows that the global elderly population is not exercising sufficiently[3,5] and the prevalence of obesity is increasing[6], which negatively affects the functional fitness of these individuals[7,8].

According to literature, functional fitness is the capacity an individual has to complete their daily activities independently, in a manner that is safe and without excessive expense of energy[5]. Due to the alterations that arise from the aging process, a decrease in functional fitness has occurred within the global elderly population[5,8-10].

Among the various factors that may negatively influence one's functional fitness, the Body Mass Index (BMI) parameter should be noted. This is the relationship between the body mass and height of the individual[5], and is also directly associated with the accumulation of body fat within a certain age range[11]. As a rule of thumb, as a person becomes older, their height decreases and their weight increases up to 70 years of age, while after this age, body weight tends to decrease[3,12].

In a study by Davison et al.[11], in which 2917 individuals aged at least 70 years participated, it was noted that women with a BMI of greater than or equal to 30 Kg/m² were twice as likely to suffer from functional limitations.

In order to compensate for the negative effects of the natural aging process on functional fitness and increases in BMI, literature recommends that elderly individuals should engage in regular physical activity, due to the benefits it provides[3,8,12-15]. Being physically active during this period of life is directly associated with greater quality of life and increased independence in performing daily activities[8,10,16], in addition to the positive effects that such activity has on BMI[17].

In light of this evidence, an investigation of the association between BMI and functional fitness among elderly women is of great importance, since gaining an understanding of the various factors that contribute to the decrease in functional fitness during old age may help to develop efficacious preventive strategies that can contribute positively to successful aging.

Hence, the objective of the present study was to investigate the association between BMI and the levels of functional fitness in elderly female patients enrolled in the Idoso em Movimento (Elderly Person in Movement) program in the city of Curitiba, in the state of Paraná, Brazil.

METHOD

The study was undertaken with elderly female participants from the *Idoso em Movimento* program under the auspices of the Secretaria Municipal de Esporte e Lazer (the Municipal Secretariat of Sport and Leisure) in 32 care centers within the nine administrative districts of the city of Curitiba, Paraná, Brazil. The sample of the study was probabilistic and was obtained via the technique of randomly selecting a group proportional to the size of each district. In order to calculate the size of the sample required for this study, the following statistical parameters were taken into account: a) a population of 4,346 elderly female participants of the program from the nine administrative districts in Curitiba (only 54 men were enrolled in the program, explaining why only women were chosen); b) a prevalence of low quality of life (QL) of 50%, taking into account maximum variance; c) a confidence level of 95% (sd=1.96); d) a sampling error of 3 percentage points; e) a design effect of 2.0 to correct for the biases of sampling selection by group; and f) a margin of 30% for possible losses and refusals. Therefore, based on

the sampling calculation, the sample of this study was estimated at 1,886 elderly women.

With the aim of complying with the criteria adopted for selecting the sample, and to reduce possible intervening variables, some criteria were applied to exclude certain elderly female participants from the final sample. As a result, elderly women that were younger than 60 years old and suffered from severe musculoskeletal, neurological and cardiac disorders that could compromise or could become a limiting factor for the completion of functional fitness tests were not included.

Of the 1,895 elderly women that participated in the data collection process, 89 (4.7%) were excluded for not having completed all the evaluations included in this study (questionnaires and the anthropometric evaluations). No refusals to participate in the study were registered. Therefore, the final sample of the study consisted of 1,806 elderly women, representing 95.3% of the elderly women evaluated.

Data collection took place between February and June 2011. The questionnaires were applied during individual interviews due to possible reading difficulties on the part of the participants, including visual deficiencies or illiteracy among the elderly women. The interview, anthropometric evaluation (weight and height measurements) and the functional fitness tests were administered by professionals that were associated with the Centro de Pesquisa em Exercício e Esporte (the Exercise and Sports Research Center) of the Universidade Federal do Paraná (the Federal University of Paraná). These evaluators participated in training sessions that consisted of theoretical explanations and practical simulations for data collection, in addition to being involved in a pilot study that was carried out under the same conditions as those of the principal study.

The present study evaluated, via questionnaire[18] sociodemographic variables (skin color/ethnicity, income bracket, academic background, employment status and marital status) and variables related to clinical and health conditions (self-reported health issues, blood pressure, quantity of medications taken and perception of health); information related to age range (60-64; 65-69; 70-74; 75-79; ≥80 years); skin color/ethnicity (white (Caucasian), brown (mixed-race)/black (Afro-Brazilian), and others); marital status (single, married, separated and widowed); employment status (retired, pensioner, unemployed/homemaker); and academic background (incomplete elementary school, complete elementary school, high school graduate and university graduate). Income bracket was evaluated based on the questionnaire developed by the Associação Brasileira de Empresas de Pesquisa (the Brazilian Association of Research Companies) (ABEP)[19]. This instrument aims to estimate the purchasing power of the family and the academic background of the head of the household, generating a score that estimates income brackets that range from A (highest income bracket) to E (lowest income bracket). The income brackets were grouped into upper (A+B), middle (C) and lower class (D+E).

Other clinical and health conditions were conveyed by the elderly women participants during the interview, based on the following questions: *Do you suffer from a health condition?* (no and yes); *Do you take any medication?* (none, one medication, two medications, three or more medications).

The amount of time that the elderly female participant engaged in physical exercise per week (week before data collection), based on walking and moderate to intense physical exercise, was estimated based on the short version of the *International Physical Activity Questionnaire* (IPAQ), which has been previously validated for the Brazilian population[12]. The elderly female participants were classified as ≤149 min/week; 150-299 min/week, and ≥300 min/week.

Body mass (kg) and height (m) were measured in order to calculate the BMI (kg/m^2), and individuals were categorized into categories based on this index. The body masses of participants were obtained by means of a portable digital scale (make: Wiso; model: W801), which had a variability of 0.1 kg and a capacity of up to 180 kg. The participants were weighed only once in the standard anatomical position, without shoes and wearing light clothing. The height of participants was obtained using a portable stadiometer (make: WCS; model: Compact) that measured a range of between 0 and 220 cm. Height was measured while the participants held their breath. Participants did not wear shoes, maintained their heels together in the standard anatomical position, and were instructed to position their heads according to the *Frankfurt* plane. After these evaluations,

the data were used to calculate BMI, which was classified according to the following World Health Organization parameters (WHO, 2000): eutrophic (18.5-24.9 kg/m²), overweight (25-29.9 kg/m²) and obese (≥30 kg/m²).

The motor tests proposed in the *Senior Fitness Test* were used to evaluate the functional fitness of the elderly female participants[7]. A description of these tests is presented in Table 1. Each of the tests were completed in the form of a circuit in an attempt to minimize the effects of localized fatigue, and the performances of the participants in said tests were recorded on individual cards. Before beginning the tests, each participant warmed up for 10 minutes. The recovery interval between the tests lasted approximately 2 minutes. To familiarize participants with the battery of tests, some time was set aside for explanation and experimentation [7]. The classification of the functional fitness of participants was undertaken in accordance with the Rikli and Jones benchmarks[7]: Low: <50 percentile; Adequate: ≥50 percentile.

Table 1. Description of the tests composing the *Senior Fitness Test* (SFT) used to identify the categories of body mass index and the level of functional fitness among elderly female participants. Curitiba, Paraná, 2011.

Name	Purpose	Description
Body mass index	Evaluate body mass index	Ratio of the weight and height (kg/m²); with normal weight, overweight and obese classified into the following categories, respectively: 18.5-24.9 km/m², 25-29.9 kg/m² and ≥30 kg/m², in accordance with WHO standards (2000).
6 minute walk	Evaluate cardiovascular resistance	Maximum distance (in meters) that the participant walked during 6 minutes within a rectangular, 50-meter circuit.
Arm curl	Evaluate strength of the upper limbs	Number of repetitions of arm curls executed during 30s while holding a 2.5 kg dumbbell.
Chair stand	Evaluate strength of the lower limbs	Number of repetitions where the participant can stand up and return to their initial (seated) position in 30s.
Chair sit and reach	Evaluate the flexibility of the lower limbs	With the participant in seated position with legs extended, measure the maximum extension distance (cm) while lowering the torso in the direction of the feet.
Back scratch	Evaluate the flexibility of the upper limbs	The participant must position their dominant hand over the same shoulder and the other hand below and behind the back in an attempt to link both hands; the distance between the hands is then measured.
8 foot up and go	Evaluate the participants' physical mobility (speed, agility and dynamic balance)	Amount of time that the participant takes to walk 2.44m from the seated position and return to the starting position.

Descriptive analysis was conducted via measurements of central tendency and dispersal (average and standard deviation), as well as measurements of absolute and relative frequency. The chi-squared test was used to verify the significant differences between functional fitness and the categories of nutritional status.

The association between nutritional status and the components of functional fitness was investigated using binary logistic regression with the aim of identifying the odds ratio with a 95% confidence interval. The age range and the amount of time the participant engaged in moderate to intense physical activity were used as control variables. A p value of <0.05 was used as the significance level in each of the analyses.

The Research Ethics Committee of the Department of Sciences and Health of the Federal University of Paraná approved this study (registration No. 1040.165.10.11). Each of the elderly female participants that completed the study signed an Informed Consent Form.

RESULTS

The average age of the participants in the final sample was 68.7 (±6.3) years, and varied between 60.0 and 84.92 years. The greatest proportions of participants were classified within the following categories: age range of between 60 and 64 years (35%), Caucasian race/ethnicity (80.7%), level C income bracket (57.5%), completed elementary school (44.6%), retired (58.8%) and widowed (40.4%). Approximately four in every ten elderly female participants engaged in between 150 and 299 minutes of moderate to intense exercise per week, whereas only 6.9% of these participants reported that they exercised in such a manner for 300 or more minutes per week (Table 2).

Table 3 shows that only 24.0% of the sample had a BMI classification of eutrophic, whereas 42.9% and 33.1% of the participants were overweight and obese, respectively. Regarding functional fitness, the majority of the sample was classified as adequate in the majority of the tests: *Walk for 6 minutes* (51.4%), *Arm curl* (55.6%), *Chair stand* (60.9%), *Chair sit and reach* (53.2%), *Back scratch* (51.1%) and *8 foot up and go* (50.2%).

Table 2. Sociodemographic characteristics and physical activity levels of the elderly female participants. Curitiba, Paraná, 2011.

Variables	N (%)
Age Group (years)	
60-64	624 (35.0)
65-69	432 (24.2)
70-74	409 (22.9)
75-79	196 (11.0)
80-84	122 (6.8)
Race/ethnicity	
Caucasian	1438 (80.7)
Brown/black (mixed race/Afro-Brazilian)	214 (12.0)
Others	131 (7.3)
Income Bracket	
A+B (highest income bracket)	588 (33.0)
C	1026 (57.5)
D+E (lowest income bracket)	169 (9.5)
Academic Background	
Elementary school (incomplete)	573 (32.1)
Elementary school (completed)	796 (44.6)
High school (graduated)	267 (15.0)
University (graduated)	147 (8.2)
Employment Status	
Retired	1047 (58.8)
Pensioner	358 (20.1)
Unemployed/homemaker	378 (21.2)
Marital Status	
Single	141 (7.9)
Married	726 (40.7)
Separated	196 (11.0)
Widowed	720 (40.4)

to be continued

Continued from Table 2

Variables	N (%)
Health Issues	
No	389 (21.8)
Yes	1394 (78.2)
Quantity of medications taken	
None	400 (22.4)
1	786 (44.1)
2	444 (24.9)
3 or more	153 (8.6)
Moderate to intense exercise (mins/week)	
0-149	892 (50.0)
150-299	768 (43.1)
≥300	123 (6.9)

Table 3. Body mass index categories and functional fitness levels in elderly female participants from Curitiba, Paraná, 2011.

Variables	N (%)
Body Mass Index Categories*	
Eutrophic	434 (24.0)
Overweight	774 (42.9)
Obesity	598 (33.1)
Functional Fitness**	
6 minute walk	
Low	878 (48.6)
Adequate	928 (51.4)
Arm curl	
Low	801 (44.4)
Adequate	1005 (55.6)
Chair Stand	
Low	707 (39.1)
Adequate	1099 (60.9)
Chair sit and reach	
Low	846 (46.8)
Adequate	960 (53.2)
Back scratch	
Low	883 (48.9)
Adequate	923 (51.1)
8 foot up and go	
Low	899 (49.8)
Adequate	907 (50.2)

*Body mass index classification according to the WHO[16]: Eutrophic: <25 kg/m², Overweight: Between 25 e 29.9 Kg/m² e Obesity: ≥30 Kg/m²; **The classification of functional fitness was undertaken in accordance with the Rikli and Jones benchmarks[7]: Low: <50 percentile; Adequate: ≥50 percentile.

Table 4 shows the proportion of elderly female participants that had low or adequate fitness in the functional fitness tests according to the BMI categories. The majority of elderly female participants that were classified as being obese displayed low fitness in each of the following tests: *Walk for 6 minutes* (41.8%%), *Arm curl* (35.0%), *Chair stand* (37.9%), *Chair Sit and reach* (38.7%), *Back scratch* (44.3%) and *8 foot up and go* (42.0%). The majority of elderly female participants that were classified as being eutrophic displayed adequate functional fitness in each of the following tests: *Walk for 6 minutes* (27.5%), *Chair stand* (26.3%), *Chair sit and reach* (28.2%), *Back scratch* (31.3%) and *8 foot up and go* (42.0%).

The analyses of association between BMI categories and functional fitness are presented in Table 5. Obese elderly female participants were more likely to display low functional fitness in the following tests: *Walk for 6 minutes* (OR=2.28; CI 95%: 1.77-2.95), *Chair stand* (OR=1.65; CI 95%: 1.27-2.14), *Chair sit and reach* (OR=1.96; CI 95%: 1.52-2.53), *Back scratch* (OR=3.78; CI 95%: 2.90–4.93) and *8 foot up and go* (OR=2.50; CI 95%: 1.93-3.23).

Table 4. Levels of functional fitness stratified into categories of body mass index for elderly female participants in the city of Curitiba, Paraná, 2011.

	Body mass index categories				
Functional capacity*	Eutrophic	Overweight	Obese	X^2	p
6 minute walk					
Low	20.4%[a]	37.8%[a]	41.8%[b]	58.532	0.000
Adequate	27.5%[a]	47.6%[a]	24.9%[b]		
Arm curl					
Low	26.2%[a]	38.8%[b]	35.0%[a]	9.798	0.007
Adequate	22.3%[a]	46.1%[b]	31.6%[a]		
Chair Stand					
Low	20.5%[a]	41.6%[a]	37.9%[b]	14.502	0.001
Adequate	26.3%[a]	43.7%[a]	30.0%[b]		
Chair sit and reach					
Low	19.3%[a]	42.1%[b]	38.7%[c]	30.009	0.000
Adequate	28.2%[a]	43.5%[b]	28.2%[a]		
Back scratch					
Low	16.4%[a]	39.3%[b]	44.3%[c]	111.831	0.000
Adequate	31.3%[a]	46.3%[b]	22.4%[c]		
8 Foot up and go					
Low	19.9%[a]	38.0%[a]	42.0%[b]	65.485	0.000
Adequate	28.1%[a]	47.6%[a]	24.3%[b]		

X^2: Chi-squared test; *Functional fitness was classified in accordance with the Rikli and Jones benchmarks[7]: Low: <50 percentile; Adequate: ≥50 percentile; a/b/c: different letters denote the existence of significant statistical differences between the body mass index categories

Table 5. Ratio of chances and 95% confidence intervals for the association between body mass index and functional fitness in elderly female participants. Curitiba, Paraná, 2011.

	6 minute walk (Low)	Arm Curl (Low)	Chair Stand (Low)	Chair sit and reach (Low)	Back scratch (Low)	8 Foot up and go (Low)
Body mass index categories	Odds Ratio[a] (CI 95%)	Odds Ratio[a] (CI 95%)	Odds Ratio[a] (CI 95%)	Odds Ratio[a] (CI 95%)	Odds Ratio[a] (CI 95%)	Odds Ratio[a] (CI 95%)
Eutrophic	1	1	1	1	1	1
Overweight	1,07 (0.84 –1.36)	0,71* (0.56 – 0.90)	1,22 (0.95 – 1.57)	1,40* (1.10 –1.79)	1,62* (1.27 – 2.08)	1,13 (0.89 – 1.44)
Obese	2,28* (1.77 –2.95)	0,91 (0.71 – 1.17)	1,65* (1.27 – 2.14)	1,96* (1.52 –2.53)	3,78* (2.90 – 4.93)	2,50* (1.93 – 3.23)

a: Adjusted by age range and level of physical activity; *p<0.0.

DISCUSSION

With the dramatic increase in the number of elderly individuals and the physical alterations that arise as a result of the natural aging process, policies that aim to maintain the physical independence of this population must be put in place[4,17,20-23]. Literature on this subject demonstrates that elderly individuals from younger age ranges have greater BMI values than those elderly persons that are over 70 years old[24]. Some studies corroborate this by identifying that higher BMI values negatively influence the functional mobility of elderly persons[3,5,12].

The results of this study showed that a large part of the sample was overweight, with 42.9% and 33.1% of elderly female participants classified as being overweight and obese, respectively. These results corroborate a study by Leite-Cavalcanti et al.[25], which found that 46.2% of the elderly in the sample were classified as being overweight, whereas 40.2% were classified as being Class I obese, in accordance with the cut-off values of the BMI system for the overall population.

The elderly female participants that were classified as being overweight in this study attained lower functional fitness scores, whereas the elderly female participants that were classified as being eutrophic obtained scores that were within the limits of normalcy for the same variable. These results corroborate the results obtained by Elias et al.[26], in which 11 of 18 elderly female participants were classified as being overweight. Among the 11 elderly female participants that were classified as being overweight, 10 exhibited low arm strength and insufficient aerobic conditioning, while all elderly female participants presented low physical mobility.

A study by Piccoli et al.[27] analyzed correlations between BMI and overall motor coordination and static balance among 202 elderly participants. Negative correlations were found between these variables, with a correlation of -0.423 obtained for BMI and overall motor coordination, and a correlation of -0.306 obtained for BMI and static balance.

In the study by Vilaça et al.[28], muscular strength and walking tests were undertaken by a sample of 77 female volunteers aged between 65 and 80 years, who were recruited in community integration programs in the city of Ribeirão Preto in the state of São Paulo. The elderly female participants were divided into three groups, where group A corresponded to the elderly female participants that walked, on average, 369.7±57.6m (240-428m), group B corresponded to participants that walked, on average, 450.2±12.3m (433-470m), and group C corresponded to participants that walked, on average, 524±44.5 (478-643m) in the *Walk for 6 minutes* test. The elderly female participants that walked a shorter distance also had higher BMIs, a greater amount of body fat and worse physical performance, which suggests that an elevated proportion of body fat has a negative influence on functional performance, even in active elderly female participants. Such results are in keeping with the findings of the present study, where the participants from the obese group were 2.28 times more likely to present inadequate performance in the *Walk for 6 minutes* test.

In the present study, elderly female participants that were classified as obese demonstrated low functional fitness in the *Chair stand* test, which conflicts with the study completed by Barbosa et al.[29] which aimed to identify an association between the nutritional status of elderly participants and their motor performance. In the study by Barbosa et al.[29], participants were required to complete five repetitions of the *Chair stand* test; no associations between BMI and this test were encountered.

A study by Mazo et al.[7] aimed to investigate the relationship between the Overall Functional Fitness Index (OFFI) and the BMI of 52 elderly female participants who engaged in regular exercise. Of the 52 elderly female participants, only five (9.6%) of them were classified as having a good OFFI. Of the five elderly female participants with a good OFFI, two were overweight. Of the 47 elderly female participants (90.4%) that were classified as having a poor OFFI, 43 (95.6%) were classified as being overweight. In order to confirm the reliability of the results of the Mazo et al. study[7], Fisher's Exact Test was applied. The test produced a value of 0.014, which confirmed the significance of the results of Mazo et al., in which there was a tendency of 95.6% of the elderly female participants classified as overweight according to BMI to have a poor OFFI, thus producing an inverse relationship between BMI and physical fitness among the elderly female participants.

Rech et al.[30] reached the same conclusions in a study which verified the association between functional fitness and being overweight among 394 women with an average age of 69.4 years. The results showed that overweight elderly female participants had lower OFFI ratings (p<0.001). In addition, the overweight elderly female participants were 5.07 (CI 95% =3.12-7.14) times more likely to have low functional fitness than eutrophic participants, resulting in an inverse relationship between BMI and functional fitness in accordance with OFFI.

Danielewicz; Barbosa and Duca[31], by means of a transverse epidemiological study of 477 elderly participants of both genders, aged from 60 to 100 years old, showed that underweight (BMI<22kg/m2) was associated with functional limitation and excess weight (BMI>27kg/m2) was associated with deficiencies in the Activities of Daily Living Scale. Moreover, these associations were independent of gender, age, academic background, occupation, purchasing power and cognitive state.

Soares et al.[32] completed a study which aimed to investigate the association between nutritional status and motor ability performance in elderly individuals. Their results also corroborate the results of the present study, in which an inverse association was found between elderly individuals classified as obese and motor skill performance (p<0.005). Obese elderly individuals needed more time to execute the same activities than eutrophic elderly individuals. The authors of the study affirm that various factors can influence the association between obesity and poor performance in motor tests, such as, for example, a greater risk of an elderly individual suffering from osteoarthritis in the knees (and such condition being of greater severity) and an excess of body fat, which increases overloading in the body, making movement more difficult and increasing stress on the joints.

Moreira et al.[33] presented results that supplement the results of the present study. By means of a longitudinal study, performed on a sample of 103 elderly participants aged 67 to 92, who were residents of a determined Brazilian community, the authors concluded that from 2008 to 2010, the elderly participants exhibited reduced lean muscle mass, increases in obesity rates and a reduction in physical functioning due to increasing age. In addition to identifying risk factors such as hypertension, it was noted that arthritis and depression can be identified and treated, helping to prevent functional decline in the elderly.

The results of this study are subject to limitations. The first is related to the fact that the sample was selected from elderly care centers, making it impossible to extrapolate the results to the populations of Curitiba or Brazil as a whole. The utilization of a cross-sectional study to indicate associations between the variables also represents a limitation of the present study, since the possibility of achieving reverse causality is a characteristic that is inherent to the cross-sectional study experimental design. The limitations mentioned suggest that caution should be adopted when attempting to extrapolate the results of the present study.

CONCLUSIONS

The present study indicated an association between BMI and the functional fitness of elderly women enrolled in the Idoso em Movimento program in the city of Curitiba, Paraná, Brazil. The results showed that the majority of the elderly female participants that were evaluated were either overweight or obese. The majority of individuals classified as obese exhibited low fitness in each of the tests that were completed. It was shown that a greater proportion of elderly female participants classified as eutrophic displayed adequate functional fitness when executing the following tests: *Walk for 6 minutes*, *Chair stand*, *Chair sit and reach*, *Back scratch*, and *8 foot up and go*. The analyses of the variable categories of BMI associated with functional fitness revealed that obese elderly female participants were more likely to have low functional fitness for the following tests: *Walk for 6 minutes*, *Chair stand*, *Chair sit and reach*, *Back scratch* and *8 foot up and go*.

The present study indicates that the BMI categories of the elderly female participants from the program are associated with functional fitness. This emphasizes the importance of controlling the BMI of elderly persons, as it can interfere with the execution of activities that involve functional fitness, which are of fundamental importance to the day-to-day life of elderly individuals, ensuring they are capable of carrying out their daily activities through the use of muscular exertion, physical conditioning, flexibility, agility and balance.

REFERENCES

1. Instituto Brasileiro de Geografia e Estatística. Censo Demográfico. Rio de Janeiro: IBGE; 2010.
2. Olsson IN, Runnamo R, Engfeldt P. Medication quality and quality of life in the elderly, a cohort study. Health Qual Life Outcomes. 2011;9(1):95.
3. Chodzko-Zajko W, Proctor DN, Fiatarone SMA, Minson CT, Nigg GR, Salem GJ, et al. Exercise and physical activity for older adults. Med Sci Sports Exerc. 2009;41(7):1510-30.
4. Chou CH, Hwang CL, Wu YT. Effect of exercise on physical function, daily living activities, and quality of life in the frail older adults: a meta-analysis. Arch Phys Med Rehabil. 2012;93(2):237-44.
5. Rikli R, Jones J. Development and validation of a Functional Fitness Test for community-residing older adults. J Aging Phys Act. 1999;7:129-61.
6. Cabrera MAS, Jacob FIlho W. Obesidade em idosos: prevalência, distribuição e associação com hábitos e co-morbidades. Arq Bras Endocrinol Metab. 2001;45(5):494-501.
7. Mazo GZ, Kulkamp W, Lyra VB, Prado APM. Aptidão Funcional Geral e índice de massa corporal de idosas praticantes de atividade física. Rev Bras Cineantropom Desempenho Hum. 2006;8(4):46-51.
8. Milanović Z, Pantelić S, Trajković N, Sporis G, Kostić, James N. Age-related decrease in physical activity and functional fitness among elderly men and women. Clin interv aging. 2013;8:549-56.
9. Gerage AM, Januário RSB, Nascimento MA, Pina FLC, Cyrino ES. Impact of 12 weeks of resistance training on physical and functional fitness in elderly women. Rev Bras Cineantropom Desempenho Hum. 2013;15(2):145-54.
10. Vagetti GC, Barbosa Filho VC, Oliveira V, Mazzardo O, Moreira NB, Campos W. Functional fitness in older women from southern brazil: normative scores and comparison with different countries. Rev Bras Cineantropom Desempenho Hum. 2015;4(17):472-84.
11. Davison KK, Ford ES, Cogswell ME, Dietz WA. Percentage of body fat and body mass index are associated with mobility limitations in people aged 70 and older from NHANES III. J Am Geriatric Soc. 2002;50(11):1802-9.
12. Matsudo S, Araujo T, Matsudo V, Andrade D, Andrade D, Oliveira LC, et al. Questionário internacional de atividade física (IPAQ): estudo de validade e reprodutibilidade no brasil. Rev Bras Ativ Fis Sáude. 2001;6(2):5-18.
13. Garber CE, Blissmer B, Deschenes NR, Franklin BA, Lamonte MJ, Lee IM, et al. American College of Sports Medicine position stand. Quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: guidance for prescribing exercise. Med Sci Sports Exerc. 2011;43(7):1334-59.

14. Koeneman MA, Verheijden MW, Chinapaw MJM, Hopman-Rock M. Determinants of physical activity and exercise in healthy older adults: a systematic review. Int J Behav Nutr Phys Act. 2011;8(142):1-15.

15. Ueno DT, Gobbi S, Teixeira CVL, Sebastião E, Prado AKG, Costa JLR, et al. Efeitos de três modalidades de atividade física na capacidade funcional de idosos. Rev Bras Educ Fís Esporte. 2012;26(2):273-28.

16. World Health Organization. Global recommendations on physical activity for health. Geneva: WHO; 2010.

17. Gudlaugsson J, Gudnason V, Aspelund T, Siggeirsdottir K, Olafsdottir AS, Jonsson PV, et al. Effects of a 6-month multimodal training intervention on retention of functional fitness in older adults: a randomized-controlled cross-over design. Int J Behav Nutr Phys Act. 2012;9(1):1-11.

18. Mazo G. Atividade física e qualidade de vida de mulheres idosas (tese). Porto: Universidade do Porto, Faculdade de Ciências do Desporto e de Educação Física; 2003.

19. Associação Brasileira das Empresas de Pesquisa. Critério de classificação econômica Brasil. São Paulo: ABEP; 2015.

20. Costa EC, Nakatani AYK, Bachion MM. Capacidade de idosos da comunidade para desenvolver atividades de vida diária e atividades instrumentais de vida diária. Acta Paul Enferm. 2006;19(1):43-8.

21. Costa Rosa ET, Benício MHD, Latorre MRDO, Ramos LR. Fatores determinantes da capacidade funcional entre idosos. Rev Saúde Pública. 2003;37(1):40-8.

22. Nascimento CMC, Ayan C, Cancela JM, Pereira JR, Andrade LP, Garuffi M, et al. Exercícios físicos generalizados, capacidade funcional e sintomas depressivos em idosos brasileiros. Rev Bras Cineantropom Desempenho Hum. 2013;15(4):486-97.

23. Tavares DMS, Dias FA. Functional capactiy, morbidities and quality of life. Texto & Contexto Enferm. 2012;21(1):112-20.

24. Martins TI, Meneguci J, Damião R. Pontos de corte do índice de massa corporal para classificar o estado nutricional em idosos. REFACS. 2014;3(2):78-87.

25. Leite-Cavalcanti C, Rodrigues-Gonçalves MC, Rios-Asciutti LS, Cavalcanti A. Prevalência de doenças crônicas e estado nutricional em um grupo de idosos brasileiros. Rev Salud Pública. 2009;11(6):865-77.

26. Elias RGM, Gonçalves ECA, Moraes ACF, Moreira CF, Fernandes CAM, et al. Aptidão física funcional de idosos praticantes de hidroginástica. Rev Bras Geriatr Gerontol. 2012;15(1):79-86.

27. Piccoli JCJ, Quevedo DM, Santos GA, Ferrareze ME, Gluher A. Coordenação global, equilíbrio, índice de massa corporal e nível de atividade física: um estudo correlacional em idosos de Ivoti, RS, Brasil. Rev Bras Geriatr Gerontol. 2012;15(2):209-21.

28. Vilaça KHC, Alves NMC, Carneiro JAO, Ferrioli E, Lima NKC, Morigutti JC. Body composition, muscle strength and quality of active elderly women according to the distance covered in the 6-minute walk test. Braz J Phys Ther. 2013;17(3):289-96.

29. Barbosa AR, Souza JMP, Lebrão ML, Marucci MFN. Estado nutricional e desempenho motor de idosos de São Paulo. Rev Assoc Med Bras. 2007;53(1):75-9.

30. Rech CR, Cruz JLS, Araujo EDS, Kalinowski FG, Dellagrana RA. Associação entre aptidão funcional e excesso de peso em mulheres idosas. Motricidade. 2010;6(2)47-53.

31. Danielewicz AL, Barbosa AR, Duca GFD. Nutritional status, physical performance and functional capacity in an elderly population in southern Brazil. Rev Assoc Med Bras. 2014;60(3):242-8.

32. Soares LDA, Campos LDA, Campos FACS, Araújo MGR, Falcão APST, Lima BRDA, et al. Análise do desempenho motor associado ao estado nutricional de idosos cadastrados no programa saúde da família, no município de Vitória de Santo Antão-PE. Ciênc Saúde Coletiva. 2012;17(5)1297-1304.

33. Moreira PL, Correa CR, Corrente JE, Martins LC, Boas PJ, Ferreira AL. Anthropometric , functional capacity , and oxidative stress changes in Brazilian community-living elderly subjects. A longitudinal study. Arch Gerontol Geriatr. 2016;66:140-6.

Received: August 28, 2016
Reviewed: March 07, 2017
Accepted: March 21, 2017

http://dx.doi.org/10.1590/1981-22562017020.160085

Oxidative damage to DNA in independent-living elderly persons and their correlations with sociodemographic, anthropometric, and functional parameters

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Abstract

Objective: To evaluate the correlations between oxidative DNA damage among elderly persons aged between 60 and 79 years and sociodemographic, anthropometric and functional parameters. *Method:* The present study has a descriptive, quantitative and cross-sectional design. A group of 195 independent-living elderly persons of both genders underwent blood collection and the subsequent measurement of serum concentrations of 8-OHdG, a residue generated by the attack of reactive oxygen species to DNA. The same subjects also underwent evaluation for body mass index (BMI), body fat percentage, the Short Physical Performance Battery (SPPB), and the education level of the participants was analyzed. Statistical analysis was performed using the Spearman correlation test, adopting a 5% significance level. *Result:* Higher fat percentage and BMI are directly correlated with higher concentrations of 8-OHdG, while SPPB and education were inversely correlated with the concentration of this molecule in the sample. *Conclusion:* These results suggest factors such as lifestyle and educational level influenced oxidative DNA damage in these elderly persons and had an impact on their functional capacity.

Keywords: Elderly. Oxidative Stress. Body Mass Index. Anthropometry. Educational Status.

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INTRODUCTION

The aging process is marked by a series of metabolic changes, one of which is increased susceptibility to oxidative stress, induced by the decline of mitochondrial respiratory functioning[1-3].

The Oxidative damage generated during the aging process can be evaluated through the measurement of different products. The oxidation of proteins, for example, tends to produce carbonyl and sulfhydryl residues, while malondialdehyde is a product of lipid oxidation. Oxidative DNA damage leads to the production of 8-hydroxy-2'-deoxyguanosine (8-OHdG)[4].

Assessing the levels of oxidative stress and its implications on the health of the elderly is a complex task, as different tissues, and even different cell types, present varying patterns of oxidative stress throughout the aging process[5,6]. However, 8-OHdG is produced by all the cells of the body, with varying intensity, and is continuously released into the bloodstream and excreted in the urine[7,8]. Increased levels of 8-OHdG have been found in different pathologies and chronic-degenerative diseases, including diabetes, different types of neoplasia and Alzheimer's disease[7]. In addition, an increase in the plasma and urinary concentrations of this molecule has been associated with obesity and the loss of muscle mass in the elderly[9,10].

A study by Kocael et al. found that serum levels of 8-OHdG in patients with morbid obesity declined after surgery for the implantation of a gastric band, evidencing a link between obesity and oxidative DNA damage[11].

Considering this and other evidence, the overall objective of the present study was to measure the levels of 8-OHdG found in the whole blood of elderly individuals aged between 60 and 79 years who lived independently, and to evaluate the correlation between the concentrations of this marker of oxidative damage and sociodemographic, anthropometric and functional data.

METHOD

The present study is descriptive, quantitative and cross-sectional in nature, and was carried out in 2015. The estimate of a proportion of a finite population was used to calculate the sample size, with an alpha level of 5%, a sampling error of 5% and a 50% estimate for the distribution of the study variable. By these parameters, the sample for the municipality of Ivoti was estimated at 235 elderly persons. However, this sample calculation was based on the total number of elderly people, while the present study encompassed only elderly residents in the municipality who were not institutionalized, did not present cognitive impairments, and were not physically or psychologically debilitated.

A probabilistic sample was constructed by means of the cluster sampling technique, with the 5 health centers of the municipality used as units. The total sample for Ivoti was 195 elderly persons of both genders, aged between 60 and 79 years, who lived independently in the municipality, which is located in the state of Rio Grande do Sul. Random simple sampling was performed. Elderly persons enrolled in all the health centers of the municipality of Ivoti were invited to participate in the study. The study was carried out in two stages. On their first visit to the health center, the elderly persons underwent blood collection, which was performed by a researcher in the area of Nursing. The anthropometric data and the data from the Short Physical Performance Battery Test (SPPB) were collected at a second appointment, also in the health center, by a Physical Education professional with a specialization qualification in this area. The inclusion criteria were age over 60 years, reside in the municipality of Ivoti, not be institutionalized or hospitalized, and have sufficient mental and health capabilities to possess the independence and autonomy to participate in the study. Dementia or frailty were used as exclusion criteria, and were identified by the professionals from the health center.

The following instruments and techniques were used in data collection:

a) Socio-demographic data: identification data addressing age, sex, nationality, birthplace, profession, schooling, marital status, diseases and general health status.

b) Anthropometric evaluation: Body mass index (BMI) was calculated by the ratio between body mass (kg) and height squared (meters). Total body mass, fat percentage, and height were measured in accordance with World Health Organization standards[12] (23.5% of fat for females and 30.9% for males), and suggested by Heyward and Wagner[13]. The Pan American Health Organization (PAHO)[14] recommends the following BMI classification in the elderly: BMI<23 = underweight; 23<BMI<28 = normal weight; 28<BMI<30 = overweight; BMI<30 = obesity. Abdominal obesity is defined by the WHO as a waist circumference >102 cm in men and >0.88 cm in women.

c) *Short Physical Performance Battery Test* (SPPB): this battery was created by Guralnik and the Brazilian version was adapted by Nakano[15]. It is a practical and effective instrument for the evaluation of physical performance and screening of elderly persons with a future risk of disability. The instrument evaluates the performance of the lower limbs in three aspects: muscular strength, gait and balance, as well as reflecting motor planning and the corresponding cognitive strategies. The instrument also allows the early identification of deficits not reported by the elderly or an individual providing information on their behalf. The total SPPB score is obtained by totaling the results of the balance, gait speed and lower limb strength tests and applies the following classification: 0 to 3 points: inability or poor performance; 4 to 6 points: low performance; 7 to 9 points: moderate performance and 10 to 12 points: good performance[16].

d) Detection of 8-OHdG: 8-hydroxy-2-deoxyguanosine (8-OHdG) was detected in serum samples. The KOG-HS10E (Jaica) 8-OHdG detection kit was employed. This is a competitive ELISA assay, which utilizes a monoclonal antibody which is highly specific for DNA damage, with a wavelength reading of 450 nm, and a standard curve interval ranging from 0.125 to 10 ng/ml[17].

Descriptive and inferential statistics were used to analyze the data. The following tests were used: the Chi-squared test to compare gender; the Mann Whitney test to compare age groups; the Spearman Correlation Coefficient to evaluate the relationships of the SPPB variables, abdominal waist classification, fat percentage, 8-OHdG and schooling. A level of significance of $p \leq 0.05$ was considered.

The study was approved by the Ethics Research Committee of the Universidade Feevale under nº. 6.0000.5348. The participants signed a Free and Informed Consent Form in accordance with the guidelines of National Health Council Resolution nº 466/12 of the Department of Health, which deals with research involving human beings.

RESULTS

The most prevalent age group in the sample was 60 to 64 years old (34.8%), and the majority of individuals were female (71.9%). In terms of marital status, the majority (57.4%) of the elderly persons were married or lived with a partner, while there was a significant number of widowers or individuals who were separated (31.1%). The majority (75.4%) of the sample had an incomplete primary education.

Both men and women had higher fat percentage indices than expected: 31.3% and 42.8%, respectively, while women had statistically significantly higher fat percentage indices than men (0.000). Thus, 71.8% of the elderly persons in question had a higher percentage of fat than expected, a worrying number (Table 1).

With regard to the body composition and age group components, there was only a significant difference in terms of the muscle mass and BMI classification results. The elderly persons aged between 60 and 69 years old had a greater percentage of muscle mass (p=0.046) and a higher BMI classification (p=0.018) than those aged between 70 and 79 years.

The mean SPPB score in this study was 7.25 points, with a standard deviation of 2.5. As can be seen in Table 2, the lower the age group, the

higher the Balance Test (p=0.019), gait velocity test (p=0.005) and total SPPB (p=0.007) scores.

The majority (45.6%) of participants in the sample of the present study achieved a moderate SPPB classification. Table 3 shows that elderly persons aged 60 to 69 years presented greater functional capacity according to SPPB classification, although there was no significant difference between the groups in terms of gender.

Table 1. Classification of body mass index and fat percentage according to gender. Ivoti, Rio Grande do Sul, 2015.

Variables	Overall n=195 (%)	Male n=55(%)	Female n=140(%)	*p*
BMI Classification				
Underweight	25 (12.9)	11 (20)	14 (10)	0.006
Normal Weight	76 (38.9)	26 (47.2)	50 (35.8)	
Overweight	30 (15.4)	10 (18.2)	20 (14.2)	
Obese	64 (32.8)	08 (14.6)	56 (40)	
Fat Percentage				
Normal	55 (28.2)	4 (7.3)	7 (5)	0.536
Higher than expected	140 (71.8)	51 (92.7)	133 (95)	

BMI: Body mass index; *p*=Chi-squared test

Table 2. Distribution of subtests of Short Physical Performance Battery (SPPB) in relation to age group. Ivoti, Rio Grande do Sul, 2015.

	Age group (years)	N	Mean (sd)	*p*
Balance Test	60 to 69	127	3.02 (±1.306)	0.019
	70 to 79	68	2.56 (±1.418)	
Gait Speed Test	60 to 69	127	3.01 (±0.877)	0.005
	70 to 79	68	2.59 (±1.040)	
Chair Stand Test	60 to 69	127	1.58 (±0.996)	0.440
	70 to 79	68	1.44 (±0.761)	
Total SPPB score	60 to 69	127	7.60 (±2.473)	0.007
	70 to 79	68	6.59 (±2.475)	

p: Mann Whitney Test.

Table 3. Short Physical Performance Battery (SPPB) classification in relation to variables of gender and age group. Ivoti, Rio Grande do Sul, 2015.

	Very poor n=18(%)	Low n=53(%)	Moderate n=89 (%)	Good n=35(%)	Total n=195(%)	*p*
Gender						
Male	4(22.3)	11(20.7)	25(28.1)	15(42.8)	55(28.2)	0.140*
Female	14(77.7)	42(79.3)	64(71.9)	20(57.2)	140(71.8)	
Age group (years)						
60 to 69	9(50)	32(60.3)	58(65.2)	28(80)	127(65.1)	0.007**
70 to 79	9(50)	21(39.7)	31(34.8	7(20)	68(34.9)	

**p*: Chi-squared test; ***p*: Mann Whitney Test.

Regarding the concentration of 8-OHdG, the present study recorded a mean of 6.89 ng/ml, with a standard deviation of 8.95 ng/ml. The result with the least oxidative damage was DNA, with 0.29 ng/ml. The maximum result found in the sample was 42.85 ng/ml.

Under the conditions of the present study, no differences were found between genders or the ages of the individuals for the concentrations of the oxidative DNA damage marker.

The variable 8-OHdG and the variables BMI (r=0.159, p=0.047) and fat percentage (r=0.177, p=0.027) had a positive correlation. This relationship indicates that among the individuals studied, a higher BMI and fat percentage was associated with a higher the concentration of 8-OHdG.

The 8-OHdG variable had a negative correlation with SPPB test results (r =-0.216, p=0.007) and schooling (r=-0.186; p=0.021), indicating that greater functional capacity was associated with greater concentrations of 8-OHdG.

DISCUSSION

Levels of oxidative DNA damage can vary according to endogenous factors such as age, and exogenous factors such as diet, physical activity and exposure to drugs and pollutants. In the present study, correlations were found between BMI, fat percentage, SPPB and schooling in a sample of elderly people of both genders, aged between 60 and 79 years of age, living in the municipality of Ivoti in the state of Rio Grande do Sul.

The BMI and fat percentage in the sample were directly correlated with the 8-OHdG levels found in the serum of the subjects sampled. This relationship, although it can vary due to environmental and/or genetic influences, represents an overall trend[18]. Consumption of diets rich in calories or fatty acids, obesity, overweight and a sedentary lifestyle are factors frequently associated with increased levels of oxidative stress in different populations[19]. The physiological mechanisms involved in this increase have not been fully elucidated but involve, to a greater or lesser extent, mitochondrial dysfunction and a cascade of metabolic reactions, such as exaggerated inflammatory response, which can lead to chronic and degenerative disorders often found in the elderly population, such as hypertension, diabetes, neoplasia and Alzheimer's disease[18].

In addition to population studies, experimental research also suggests that opposing associations are true: weight loss, consumption of less caloric diets, and regular physical exercise can reduce oxidative stress and the increased inflammatory response associated with it[19]. In addition, data from literature shows that rapid weight loss followed by surgeries for the introduction of gastric banding resulted in a decline in 8-OHdG concentrations excreted in the urine of patients undergoing this procedure[11].

It was decided to measure 8-OHdG from the serum, rather than the urine, of the participants of the present study, given the practicality of collection and reliability in the preservation of the sample. Such efficiency could not be guaranteed in the case of urine collection.

The negative correlation between SPPB and 8-OHdG levels can be interpreted as an adverse effect of weight reduction and fat percentage. With less weight, the subject becomes more agile, which is reflected in the SPPB scores. And with less weight, the individual is less subjected to the cascade of metabolic reactions related to oxidative stress. A 2014 study demonstrated that overall antioxidant capacity correlated positively with the functional performance of the upper and lower limbs among the elderly[20]. The same article suggests that low levels of hemoglobin and deficient antioxidant defenses could significantly affect functional performance, leading to the transition to a pre-frail state among elderly persons. Additionally, oxidative damage to mitochondrial DNA has been identified as one of the main factors responsible for sarcopenia and neuromuscular dysfunctions, through mechanisms such as the failure of mitophagy processes, respiratory chain defects, metabolic disorders and the pathological activation of pro-inflammatory and pro-apoptotic signals, which can contribute to the loss of muscle fibers[21].

Oxidative stress has been the subject of studies which have related it to muscular weakness, the

progressive atrophy of the musculature and to the advancement of age, in a mode dependent on cellular redox status[22].

Data from literature indicates that urinary 8-OHdG levels in community-dwelling elderly persons are associated with muscle strength, and that such a finding may be clinically relevant because of the possibility of controlling oxidative DNA damage by adopting healthy lifestyles (diet, physical activity, etc.)[10].

A significant inverse correlation between schooling and 8-OHdG levels was identified in this study, suggesting that individuals with more education and/ or access to information tend to take better care of their health, avoiding harmful behaviors or lifestyles. Although literature requires reviews that directly address the issue of level of education and oxidative stress, different authors have shown a positive correlation between low levels of schooling, smoking, a sedentary lifestyle, low consumption of antioxidant foods, and high levels of oxidative stress[19,11]. Therefore, additional studies should be performed evaluating the other variables cited in research involving 8-OHdG using samples of elderly people, as studies of this population are very scarce. It is also important to consider that the present study is not representative of the population of the municipality, as only people who were not institutionalized and did not present diagnoses of dementia processes or frailty syndrome were selected.

CONCLUSION

The data of the present study presented that, among the studied population, oxidative DNA damage is positively correlated with a tendency to obesity, as indicated by the muscle mass index (BMI) and fat percentage results, and inversely correlated with schooling, probably due to the protective effect of adopting healthy lifestyles among individuals with more access to information. The negative correlation with SPPB may indicate both a secondary effect of BMI and fat percentage on the agility and muscular strength of the subjects analyzed, and to the reduced oxidative damage to the muscular tissue of such individuals, as the loss of muscle mass is often associated with increased levels of 8-OHdG.

The subjects in the present study were not evaluated for lifestyle influences, such as smoking, alcoholism, dietary patterns, quality of life and social relations. Cognitive deficit would also be an interesting factor to evaluate, as it may hamper the adoption of a healthy lifestyle, which can reduce the observed levels of 8-OHdG. The measurement of the biomolecules malondialdehyde, triglycerides, cholesterol, and glucose could help to provide a more accurate metabolic picture of the participants of this study. Therefore, subsequent evaluations of these and other parameters may help to clarify the relative contribution of environmental, cultural and physiological factors to oxidative damage in the individuals studied.

REFERENCES

1. Mikhed Y, Daiber A, Steven S. Mitochondrial oxidative stress, mitochondrial dna damage and their role in age-related vascular dysfunction. Int J Mol Sci. 2015;16(7):15918-53.
2. Dai DF, Chiao YA, Marcinek DJ, Szeto HH, Rabinovitch PS. Mitochondrial oxidative stress in aging and healthspan. Longev Healthspan [Internet]. 2014 [acesso em 4 maio 2016];3:6. Disponível em: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4013820/pdf/2046-2395-3-6.pdf
3. Onyango IG, Dennis J, Khan SM. Mitochondrial dysfunction in Alzheimer's Disease and the rationale for bioenergetics based therapies. Aging Dis. 2016;7(2):201-14.
4. Guo X, Cui H, Zhang H, Guan X, Zhang Z, Jia C, et al. Protective effect of folic acid on oxidative DNA damage: a randomized, double-blind, and placebo controlled clinical trial. Medicine [Internet]. 2015 [acesso em 4 maio 2016];94(45):1872. Disponível em: http://journals.lww.com/md-journal/pages/articleviewer.aspx?year=2015&issue=11110&article=00010&type=abstract
5. Speakman JR, Blount JD, Bronikowski AM, Buffenstein R, Isaksson C, Kirkwood TB, et al. Oxidative stress and life histories: unresolved issues and current needs. Ecol Evol. 2015;5(24):5745-57.

6. Szczesny B, Brunyánszki A, Ahmad A, Oláh G, Porter C, Toliver-Kinsky T, et al. Time-dependent and organ-specific changes in mitochondrial function, mitochondrial DNA integrity, oxidative stress and mononuclear cell infiltration in a mouse model of burn injury. PLoS One [Internet]. 2015 [acesso em 4 maio 2016];10(12):1-26. Disponível em: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4668069/pdf/pone.0143730.pdf

7. Yadav UC, Rani V, Deep G, Singh RK, Palle K. Oxidative stress in metabolic disorders: pathogenesis, prevention, and therapeutics. Oxid Med Cell Longev [Internet]. 2016 [acesso em 4 maio 2016]. Disponível em: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4753342/pdf/OMCL2016-9137629.pdf

8. Kobayashi S, Myoren T, Oda S, Inari M, Ishiguchi H, Murakami W, et al. Urinary 8-hydroxy-2'-deoxyguanosine as a novel biomarker of inflammatory activity in patients with cardiac sarcoidosis. Int J Cardiol. 2015;190:319-28.

9. Al-Aubaidy HA, Jelinek HF. Oxidative DNA damage and obesity in type 2 diabetes mellitus. Eur J Endocrinol. 2011;164(6):899-904.

10. Muzembo BA, Nagano Y, Eitoku M, Ngatu NR, Matsui T, Bhatti SA, et al. A cross-sectional assessment of oxidative DNA damage and muscle strength among elderly people living in the community. Environ Health Prev Med. 2014;19(1):21-9.

11. Kocael A, Erman H, Zengin K, Kocael PC, Korkmaz GG, Gelisgen R, et al. The effects on oxidative DNA damage of laparoscopic gastric band applications in morbidly obese patients. Can J Surg. 2014;57(3):183-7.

12. World Health Organization. Obesity: prevention and managing the global epidemic. Report of a WHO consultation. Geneva: WHO; 2000.

13. Heyward VH, Wagner DR. Applied body composition assessment. Ilinois: Human Kinetics; 2004.

14. Lebrão ML, Duarte YAO, organizadores. SABE – Saúde, Bem-Estar e Envelhecimento. O projeto SABE no Município de São Paulo: uma abordagem inicial [Internet]. Brasília, DF: Organização Pan-Americana da Saúde; 2003 [acesso em 4 maio 2016]. Disponível em: http://www.paho.org/bra/

15. Nakano MM. Versão brasileira da Short Physical Performance Battery – SPPB: adaptação cultural e Estudo da confiabilidade [dissertação]. Campinas: Universidade Estadual de Campinas; 2007.

16. Silva TO, Freitas RS, Monteiro MR, Borges SM. Avaliação da capacidade física e quedas em idosos ativos e sedentários da comunidade. Rev Bras Clin Med. 2010;8(5):392-8.

17. Shi GX, Liu CZ, Wang LP, Guan LP, Li SQ. Biomarkers of oxidative stress in vascular dementia patients. Can J Neurol Sci. 2012;39(1):65-8.

18. Cadet J. Oxidative degradation pathways of cellular DNA: product formation and mechanistic insights. Free Radic Biol Med [Internet]. 2014 [acesso em 4 maio 2016];75(Suppl 1):1-2. Disponível em: http://www.sciencedirect.com/science/article/pii/S0891584914010995

19. Black CN, Bot M, Scheffer PG, Penninx BW. Sociodemographic and lifestyle determinants of plasma oxidative stress markers 8-OHdG and F2-Isoprostanes and associations with metabolic syndrome. Oxid Med Cell Longev [Internet]. 2016 [acesso em 4 maio 2016]. Disponível em: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4781979/pdf/OMCL2016-7530820.pdf

20. Caballero B, Rubio-González A, Potes Y, Martínez-Reig M, Sánchez-Jurado PM, Romero L, et al. Associations of the antioxidant capacity and hemoglobin levels with functional physical performance of the upper and lower bodylimbs. Age (Dordr). 2014;36(2):851-67.

21. Rygiel KA, Picard M, Turnbull DM. The ageing neuromuscular system and sarcopenia: a mitochondrial perspective. J Physiol. 2016;594(16):4499-512.

22. Powers SK, Morton AB, Ahn B, Smuder AJ. Redox Control of skeletal muscle atrophy. Free Radic Biol Med [Internet]. 2016 [acesso em 4 maio 2016];98(2016):208-17. Disponível em: http://www.sciencedirect.com/science/article/pii/S0891584916000721

Received: May 23, 2016
Reviewed: October 17, 2016
Accepted: March 09, 2017

http://dx.doi.org/10.1590/1981-22562017020.160059

Association between triglycerides and HDL-cholesterol ratio and cardiovascular risk factors among elderly persons receiving care under the family health strategy of Viçosa, Minas Gerais

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Abstract

Objective: To evaluate the association between triglycerides and HDL-cholesterol (TG/HDL-c) ratio and cardiovascular risk factors among the elderly. *Method:* A cross-sectional epidemiological study with a random sample of elderly persons (n=349) of both genders, who received care under the Family Health Strategy in the municipality of Viçosa, in the state of Minas Gerais, was performed. Cardiovascular risk was calculated by the relationship between the TG and the HDL-c levels, with values greater than 3.5 considered a risk. Social and economic variables, lifestyle, noncommunicable chronic diseases, serum glucose levels, waist circumference (WC) and body mass index were evaluated. Multiple linear regression was used to evaluate the association between the TG/HDL-c ratio and other variables. Variables associated with the dependent variable with a level of significance lower than 0.20 in univariate regression analysis were included in the final model (stepwise-forward), applying a significance level of $p<0.05$. *Results:* The highest TG/HDL-c ratio values were associated with the presence of hypertension, having been or currently be a smoker, having elevated serum glucose and an increased waist circumference. *Conclusion:* The findings reflect the importance of studies on cardiovascular risk in the elderly, as health professionals should be familiar with the parameters that classify at risk individuals. The TG/HDL-c ratio is a reliable classification method that is easy to apply and correlates closely with adverse health effects.

Keywords: Cardiovascular Risk. Chronic Disease. Health of the Elderly.

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INTRODUCTION

The Brazilian age pyramid has seen an increase in the country's elderly population, with a concomitant increase in chronic noncommunicable diseases (CNCD). Among these, diseases of the cardiovascular system are responsible for the major causes of mortality, mainly among the elderly[1,2].

Since the 1960s, cardiovascular diseases have been the leading cause of death in Brazil and have been responsible for a significant impact on the mortality and morbidity of individuals of all age groups, but especially among the elderly[3,4]. While few studies analyze the health situation of the Brazilian elderly community, it is extremely important to evaluate cardiovascular risk factors and monitor the health situation of patients. The investigation of the factors associated with cardiovascular risk is fundamental for the actions of the various actors involved, contributing, therefore, to better strategies to protect and promote the health of the elderly.

The ratio between triglycerides and HDL-cholesterol (TG/HDL-c) is used as an indicator of dyslipidemia due to its relationship with increases in cardiovascular risk. It is also considered an easy and rapid indicator to obtain, especially in the context of primary health care. Recent analyzes have shown that this ratio is a potent predictor of the development of coronary heart disease and is directly correlated with plasma B-type LDL-cholesterol levels[5-8]. As such, the objective of the present study was to evaluate the association between the TG/HDL-c ratio and cardiovascular risk factors among elderly persons receiving care under the Estratégia Saúde da Família (Family Health Strategy) (ESF) in the municipal district of Viçosa, Minas Gerais, Brazil.

METHOD

A cross-sectional epidemiological study with a probabilistic sample of elderly people (aged 60 years of age or older), of both genders, attending all 15 ESF units in the city of Viçosa, Minas Gerais, was performed. Elderly people living in Viçosa who attended the ESF from August 2011 to June 2012 were included. Those with special needs were excluded as well as those who for some reason did not undergo the biochemical examination.

The total estimated population of Viçosa[9] was 72,244 individuals, of whom 10,692 (14,8%) were aged over 60 years. The number of elderly users (6,298) of the ESF was used to calculate the sample size, considering a 95% confidence level, a prevalence of metabolic syndrome of 65% and a tolerated error of 5%. Thus, the sample was 331 elderly persons, to which was added 20% to cover possible losses, totaling 398 elderly persons to be studied. However, elderly persons with consultations already scheduled were also included, giving a final sample of 402 elderly persons.

Regular attendees of the ESF were randomly selected and contacted by health workers to attend a meeting at the ESF that served the area where they lived, at which they received information about the importance and objectives of the project and assurances about the confidentiality of data. Those elderly people who agreed to participate signed a Free and Informed Consent Form (FICF) and data collection began.

Data collection took place through the visits of the research team, which consisted of a nurse, physiotherapist, physical education professional and nutritionists, to the ESF units. A structured, standardized and pre-tested questionnaire was applied in a pilot study. The independent variables evaluated at the first meeting were: socioeconomic and demographic (age, gender, marital status, years of schooling and economic class); lifestyle (smoker, alcohol consumption and sedentary behavior) and presence of morbidities (heart disease, dyslipidemia, hypertension, diabetes, presence of depressive symptoms). Next, the anthropometric data for obesity classification (weight, height and waist circumference) were measured. At the second meeting a biochemical evaluation was performed with participants fasting for 12 hours, with serum glucose, TG and HDL-c levels analyzed.

Cardiovascular risk was calculated by the relationship between TG and HDL-c levels, with a value greater than 3.57 being considered at risk. To evaluate the consumption of alcoholic beverages, type of beverage consumed, frequency

and quantity consumed during the week prior to data collection was evaluated, to determine the grams of ethanol consumed by the elderly persons per day. The consumption of alcoholic beverages with an ethanol dosage of more than 30g/day for men and 15g/day for women was considered as a cardiovascular risk factor[10,11].

Economic class was evaluated in accordance with the Critério de Classificação Econômica da Associação Brasileira de Empresas de Pesquisa (the Economic Classification Criteria of the Brazilian Association of Research Companies) (ABEP)[12]. The Geriatric Depression Scale (GDS) was used to evaluate the presence of depressive symptoms[13]. Individuals who scored less than or equal to 5 points were considered without depressive symptoms while elderly persons who scored more than 5 points were considered to have depressive symptoms.

The anthropometric measures were performed according to the procedures recommended by Lohman et al.[14], following standardization. Weight was measured in kilograms, using a portable digital electronic scale (Tanita), properly calibrated, with a capacity of up to 150kg and a precision of 100g. Height was measured using a two-meter ruler with a precision of 0.1cm fixed to a smooth wall without skirting board, with the aid of a plumb line and wooden set square. Weight and height were measured in duplicate, with the arithmetic mean of the measurements taken as the result. Body mass index (BMI) was defined according to the criterion proposed by Lipschitz [15]. Waist circumference (WC) was obtained using a non-extensible measuring tape, placed immediately above the umbilical scar, with a reading taken at the time of expiration, using the cut-off point recommended by the World Health Organization[16]: <94 cm (normal), between 94 and 102cm (increased) and ≥102cm (substantially increased) for men and <80cm (normal), between 80 and 88cm (increased) and ≥88cm (substantially increased) for women.

To evaluate the presence of sedentary behavior, the International Physical Activity Questionnaire (IPAQ)[17] was used. Sedentary behavior was characterized by remaining sitting or lying down, including during transport, for more than two hours a day[18].

The descriptive analysis of the variables was presented by mean/median and standard deviation. The normality of the distribution of the variables was evaluated by the Shapiro-Wilk test. Data on the dependent variable were log-transformed for normal distribution. Associations with the categorical variables were performed using the Chi-squared test. For the continuous variables, the Student's t-test was used. The level of significance was 5%.

The association between cardiovascular risk and the independent variables was performed by multiple linear regression analysis. Only variables that were associated with the dependent variable with a significance level lower than 0.20 in univariate regression analysis were included in the final model. The final model was performed through stepwise-forward regression, where the variables were entered one by one in the final equation. The significance level adopted was 5%.

The study complied in its entirety with the guidelines for research involving human beings, Resolution 466/2012 of the National Health Council. The research project received the prior approval of the Human Research Ethics Committee of the Universidade Federal de Viçosa (Viçosa Federal University) (nº 04/2013).

RESULTS

Data from 349 elderly people were analyzed. The mean age of the sample was between 70 and 79 years (47.2%), and the subjects were married (68.1%), belonged to social classes CDE (84.6%), had at least one year of schooling (76.9%) and were mostly male (47.2%) (Table 1).

The characteristics related to life habits and health conditions are described in Table 2. The majority of individuals at cardiovascular risk were smokers (current and ex-smokers) (52.8%), never drink (57.1%), exhibited sedentary behavior (86.8%), did not present depressive symptoms (82.4%) and reported having dyslipidemia (53.9%) and hypertension (80.2%).

The anthropometric variables and the serum glucose levels are shown in Table 3. It was

observed that the majority of the elderly persons at cardiovascular risk had increased mean BMI, WC and serum glucose levels.

In univariate linear regression analysis, the variables that obtained a p value below 0.2 were age, marital status, economic class, schooling, heart disease, dyslipidemia, obesity, hypertension, diabetes, smoking, depressive symptoms, serum glucose levels, WC and BMI. The variables that remained statistically significant in the final multiple linear regression model are presented in Table 4. The variables arterial hypertension, smoking, serum glucose levels and WC were retained.

Table 1. Distribution of the elderly classified as with or without cardiovascular risk by the TG/HDL-c ratio. according to sociodemographic variables. Viçosa. Minas Gerais. 2011 a 2012.

Variable	Without cardiovascular risk(n=258) n (%)	With cardiovascular risk (n=91) n (%)	*p*
Gender			
Male	98 (38)	47 (51.6)	0.02 *
Female	160 (62)	44 (48.4)	
Age range (years)			
60-69	100 (38.8)	40 (44)	0.13 **
70-79	113 (43.8)	43 (47.2)	
80 or more	45 (17.4)	8 (8.8)	
Situação conjugal			
Casado	144 (55.8)	62 (68.1)	0.04 *
Sozinho	114 (44.2)	29 (31.9)	
Socioeconomic class			
AB	23 (8.9)	14 (15.4)	0.08 *
CDE	235 (91.1)	77 (84.6)	
Schooling			
Illiterate	73 (28.3)	21 (23.1)	0.33 *
≥ 1 year	185 (71.7)	70 (76.9)	

*p-value in chi-squared test; **p-value in chi-squared test for linear trend.

Table 2. Distribution of elderly persons classified as with or without cardiovascular risk based on TG/HDL-c ratio, in accordance with lifestyle and health conditions. Viçosa, Minas Gerais, 2011 to 2012.

Variable	Without cardiovascular risk (n=258) n (%)	With cardiovascular risk (n=91) n (%)	*p**
Smoking			
No	157 (60.8)	43 (47.2)	0.02
Yes	101 (39.2)	48 (52.8)	
Alcohol consumption			
No	160 (62)	52 (57.1)	0.41
Yes	98 (38)	39 (42.9)	

to be continued

continued from Table 2

Variable	Without cardiovascular risk (n=258) n (%)	With cardiovascular risk (n=91) n (%)	*p*
Sedentary behavior			
No	24 (9.3)	12 (13.2)	0.29
Yes	234 (90.7)	79 (86.8)	
Depressive symptoms			
No	188 (73.1)	75 (82.4)	0.07
Yes	69 (26.9)	16 (17.6)	
Cardiopathy			
No	228 (88.4)	75 (82.4)	0.14
Yes	30 (11.6)	16 (17.6)	
Dyslipidemia			
No	146 (56.6)	42 (46.1)	0.08
Yes	112 (43.4)	49 (53.9)	
Obesity			
No	230 (89.1)	67 (73.6)	0.001
Yes	28 (10.9)	24 (26.4)	
Arterial hypertension			
No	80 (31)	18 (19.8)	0.04
Yes	178 (69)	73 (80.2)	
Diabetes			
No	195 (75.6)	53 (58.2)	0.002
Yes	63 (24.4)	38 (41.8)	

**p*-value in chi-squared test.

Table 3. Comparison of body mass index, waist circumference and serum glucose level means of elderly persons with or without cardiovascular risk based on TG/HDL-c. Viçosa, Minas Gerais, 2011 to 2012.

Variable	Without cardiovascular risk (n=258) Mean (sd)	With cardiovascular risk (n=91) Mean (sd)	*p*
Body mass index	25.9 (±4.5)	28.3 (±4.1)	<0.001
Waist circumference	92.0 (±11.3)	98.9 (±10.2)	< 0.001
Glucose	110.9 (±28)	124.8 (±41.6)	< 0.001

* *p*-value in Student's t-test; sd: standard deviation.

Table 4. Final result of multiple linear regression model, adjusted for age. Viçosa, Minas Gerais, 2011 to 2012.

Variable	$\beta_{ajusted}$	CI95%	*p*
Arterial hypertension	0.16	0.02 - 0.31	0.02
Smoking	0.15	0.02 – 0.27	0.02
Glucose	0.003	0.001 – 0.005	<0.001
Waist circumference	0.001	0.009 – 0.022	<0.001

* *p*-value in Multiple Linear Regression model; CI: confidence interval.

DISCUSSION

Through the results, it was possible to identify cardiovascular risk from the TG/HDL-c ratio of the elderly population receiving care under the FHS of the city of Viçosa, Minas Gerais, and the associated risk factors. Because of the cross-sectional design of the study, it is possible to reflect on the situation of this population at the time of the evaluation.

Although no studies were found that evaluated cardiovascular risk and protective factors among elderly persons based on TG/HDL-c, the results identified corroborate with other studies that evaluate associations between heart disease and the same variables as the present study.

A study verified factors associated with the prevention of cardiovascular diseases among hypertensive elderly persons, emphasizing that socioeconomic factors, health characteristics and use of health services influence the practice of healthy eating habits for the prevention of cardiovascular disease[19]. Poor eating habits contribute to the development of different diseases related to cardiovascular complications, and the presence of two risk factors (hypertension and excess body fat) directly related to diet was associated with reduced functional capacity among the elderly[20,21]. The importance of diet in the prevention of cardiovascular events in the elderly population is highlighted, with a high consumption of fats and sugars and a low consumption of healthy fruits and vegetables noted among this group[22].

In a study by Ferreira et al. of elderly patients receiving care in the SUS (Unified Health Service) in the city of Goiânia in the state of Goiás, the risk factors obesity, central obesity, sedentary lifestyle and alcohol consumption were associated with the risk of heart disease[3]. The present study is similar to those mentioned above, as the variables associated with cardiovascular risk in our study were hypertension, smoking, increased glycaemia and elevated blood pressure.

Smoking is an important risk factor for cardiovascular diseases[23,24]. It is estimated that this habit is the leading cause of preventable death in the world, doubling the risk of coronary artery disease[25,26]. In a study conducted with 3,142 elderly people from 16 Brazilian state capitals, it was observed that the prevalence of smokers significantly declined with aging, while the proportion of ex-smokers increased. The factor of smoking (ex-smoker) was one of the risk factors for ischemic heart disease, corroborating with the findings of the present study[19].

Alterations in fasting glycaemia in subjects with cardiovascular risk were found, in agreement with other studies of the elderly[27,28]. In a review of literature it was observed that diabetic individuals had a three to four times greater risk of suffering a cardiovascular event and twice the risk of dying from this event than the general population[29].

Insufficient physical exercise influences the development of dyslipidemia and atherosclerosis[30]. Studies have shown that physically active adults have a higher plasma concentration of HDL-c and lower concentrations of LDL-c and TG than sedentary individuals[31,32]. Increased glucose and WC levels may be due to the absence of physical exercise, contributing to a poor prognosis in individuals with cardiovascular risk[33].

The innovative use of the TG/HDL-c ratio as an indicator of cardiovascular risk in the elderly, and the increased understanding of the problem achieved through the association with different risk factors present in the studied population, are notable features of the present study. However, a design which does not allow observation of the follow-up period of the individuals, or the establishing of causal relations between the analyzed variables, are limitations. It should be noted that while many studies consider schooling to be a risk factor for cardiovascular diseases, no significant differences were established in the present study, possibly due to the stratification criteria used. In addition, the comparison with other scientific studies was hampered by the scarcity of works that consider the cardiovascular risk classification addressed.

CONCLUSION

Cardiovascular risk based on TG/HDL-c ratio was associated with hypertensive elderly persons, smokers, and those with high glycaemia and central

obesity. Understanding the magnitude of the various risk factors for cardiopathies among the elderly is essential for the preparation of effective preventive plans, and health professionals should be familiar with the parameters that classify individuals with cardiovascular risk. The TG/HDL-c ratio is an easy, non-invasive and reliable method that assists in the promotion and prevention of the health of the elderly.

In view of the findings, it is recommended that the TG/HDL-c ratio is used in clinical practice and to perform longitudinal studies on cardiovascular risk among the elderly, in view of the high and growing cost of treating heart disease. It is also important to emphasize the importance of the development of nutrition and health education strategies, in order to combat the potential cardiovascular risk factors found.

REFERENCES

1. Instituto Brasileiro de Geografia e Estatística. Contagem Populacional [Internet]. Brasília, DF: IBGE; 2012 [acesso em 17 nov. 2012]. Disponível em: http://www.sidra.ibge.gov.br/bda/popul
2. Cabrera MAS, Andrade SM, Mesas AE. A prospective study of risk factors for cardiovascular events among the elderly. Clin Interv Aging. 2012;7:463-8.
3. Ferreira CCC, Peixoto MRG, Barbosa MA, Silveira EA. Prevalência de fatores de risco cardiovascular em idosos usuários do Sistema Único de Saúde de Goiânia. Arq Bras Cardiol. 2010;95(5):621-8.
4. Da Silva ARA, Dourado KF, Pereira PB, Lima DSC, Fernandes AO, Andrade AM, et al. Razão de TG/HDL-c e Indicadores antropométricos preditores de risco para doença cardiovascular. Rev Bras Cardiol. 2012;25(1):41-9.
5. Vieira EA, Carvalho WA, Aras Júnior R, Couto FD, Couto RD. Razão triglicérides/HDL-C e proteína C reativa de alta sensibilidade na avaliação do risco cardiovascular. J Bras Patol Med Lab. 2011;47(2):113-8.
6. Da Luz PL, Favarato D, Faria-Neto JR, Lemos P, Chagas ACP. High ratio of triglycerides to HDL cholesterol predicts extensive coronary disease. Clinics. 2008;63(4):427-32.
7. Sharma A, Vallakati A, Einstein AJ, Lavie CJ, Arbab-Zadeh A, Lopez-Jimenez F, et al. Relationship of body mass index with total mortality, cardiovascular mortality, and myocardial infarction after coronary revascularization: evidence from a meta-analysis. Mayo Clin Proc. 2014;89(8):1080-1100.
8. Oliveira SG. Perfil lipídico, indicadores antropométricos de risco cardiovascular e razão TG/HDL-c de pacientes diabéticos com e sem uso de drogas hipolipemiantes. Rev Bras Nutr Esportiva. 2012;6(36):486-94.
9. Instituto Brasileiro de Geografia e Estatística. Dados preliminares do censo 2010 [Internet]. Rio de Janeiro: IBGE; 2010 [acesso 20 jan. 2013]. Disponível em: http://www.ibge.gov.br
10. Sociedade Brasileira de Cardiologia, Sociedade Brasileira de Hipertensão, Sociedade Brasileira de Nefrologia. VI Diretrizes Brasileiras para Hipertensão. Arq Bras Cardiol. 2010;95(1):1-51.
11. Franco G. Tabela de Composição Química dos Alimentos. 9 ed. Rio de Janeiro: Atheneu; 1999.
12. Associação Brasileira de Estudos Populacionais. Critério de Classificação Econômica Brasil. Dados com base no Levantamento Sócio Econômico 2009. São Paulo: ABEP; 2011.
13. Yesavage JA, Brink TL, Rose TL, Lum O, Huang V, Adey M, et al. Development and validation of a geriatric depression screening scale: a preliminary report. J Psychial Res. 1983;17(1):37-49.
14. Lohman TG, Roche AF, Martorell R. Anthropometric standardization reference manual. Illinois: Human Kinetics Books; 1992.
15. Lipschitz DA. Screening for nutritional status in the elderly. Prim Care 1994; 21(1):55-67.
16. World Health Organization. Obesity: preventing and managing the global epidemic. Geneva: WHO; 1997.
17. Pardini R, Matsudo S, Araújo T, Matsudo V, Andrade E, Braggion G, et al. Validação do questionário internacional de nível de atividade física (IPAQ – versão 6): estudo piloto em adultos jovens brasileiros. Rev Bras Ciênc Mov. 2001;9(3):45-51.
18. Farias Junior JCD. Atividade e comportamento sedentário: estamos caminhando para uma mudança de paradigma? Rev Bras Ativ Fís Saúde. 2011;16(4):279-80.
19. Gadenz SD, Benvegnú LA. Hábitos alimentares na prevenção de doenças cardiovasculares e fatores associados em idosos hipertensos. Ciênc Saúde Coletiva. 2013;18(12):3523-33.
20. Santos VR, Gomes IC, Santos LL, Agostinete RR, Freitas Júnior IF. Associação entre fatores de risco de risco cardiovascular e capacidade funcional de idosos longevos. Medicina (Ribeirão Preto). 2013;46(1):10-6.

21. Silveira EA, Martins BB, Abreu LRS, Cardoso CKS. Baixo consumo de frutas, verduras e legumes: fatores associados em idosos em capital no Centro-Oeste do Brasil. Ciênc Saúde Coletiva. 2015;20(12):3689-99.

22. Malta MB, Papini SJ, Corrente JE. Avaliação da alimentação de idosos de município paulista: aplicação do Índice de Alimentação Saudável. Ciênc Saúde Coletiva. 2013;18(2):377-84.

23. Venturini CD, Paula Engroff P, Sgnaolin V, Kik RMEI, Morrone FB, Silva Filho IG, et al. Consumo de nutrientes em idosos residentes em Porto Alegre (RS), Brasil: um estudo de base populacional. Ciênc Saúde Coletiva. 2015;20(12):3701-11.

24. Bonotto GM, Mendoza-Sassi RA, Susin LRO. Conhecimento dos fatores de risco modificáveis para doença cardiovascular entre mulheres e seus fatores associados: um estudo de base populacional. Ciênc Saúde Coletiva. 2016;21(1):293-302.

25. Eyken EBBDOV, Moraes CL. Prevalência de fatores de risco para doenças cardiovasculares entre homens de uma população urbana do Sudeste do Brasil. Cad Saúde Pública. 2009;25(1):111-23.

26. Gus I, Fischmann A, Medina C. Prevalência dos fatores de risco da doença arterial coronariana no Estado do Rio Grande do Sul. Arq Bras Cardiol. 2002;78(5):478-83.

27. Pinho PM, Silva ACM, Araújo MS, Reis CP, Almeida SS, Barros LCA, et al. Correlação entre variáveis nutricionais e clínicas de idosos cardiopatas. Rev Bras Cardiol. 2012;25(2):132-40.

28. Gomes IC, Santos VR, Christofaro DG, Santos LL, Freitas Júnior IF. The most frequent cardiovascular risk factors in brazilian aged 80 years or older. J Appl Gerontol. 2013;32(4):408-21.

29. Siqueira AFA, Almeida-Pititto B, Ferreira SRG. Doenças cardiovascular no diabetes mellitus: análise dos fatores de risco clássicos e não clássicos. Arq Bras Endocrinol Metab. 2007;51(2):257-67.

30. Martinho KO, Dantas EHM, Longo GZ, Ribeiro AQ, Pereira ET, Franco FS, et al. Comparison of functional autonomy with associated sociodemographic factors, lifestyle, chronic diseases (CD) and neuropsychiatric factors in elderly patients with or without the metabolic syndrome (MS). Arch Gerontol Geriatr. 2013;57(2):151-5.

31. De Souza JD, Ribeiro AQ, Martinho KO, Franco FS, Martins MV, Rodrigues MG, et al. Lipid profile and associated factors among elderly people, attended at the Family Health Strategy, Viçosa/MG. Nutr Hosp. 2015;32(2):771-8.

32. Martins MV, Ribeiro AQ, Martinho KO, Franco FS, Souza JD, Morais KBD, et al. Anthropometric indicators of obesity as predictors of cardiovascular risk in the elderly. Nutr Hosp 2015;31(6):2583-9.

33. Souza RKT, Bortoletto MSS, Loch MR, González AD, Matsuo T, Cabrera MAS, et al. Prevalência de fatores de risco cardiovascular em pessoas com 40 anos ou mais de idade, em Cambé, Paraná (2011): estudo de base populacional. Epidemiol Serv Saúde. 2013;22(3):435-44.

Received: March 23, 2016
Reviewed: October 17, 2016
Accepted: March 09, 2017

http://dx.doi.org/10.1590/1981-22562017020.160137

Prevalence of intestinal parasitosis and associated factors among the elderly

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Abstract

Objective: To identify the prevalence of intestinal parasitosis and associated factors in elderly persons resident in the community. *Methods:* A cross-sectional study was performed involving 236 elderly persons in Aiquara, in the state of Bahia, Brazil, in 2015. Data were collected through a coprological survey and a questionnaire for information relating to sociodemographic characteristics, health and lifestyle. The presence of parasites in stools was verified by the Hoffman method. *Results:* The prevalence of intestinal parasites among the elderly was 30.5%. Among infected elderly persons, 26.3% had monoparasitism, 3.8% biparasitism and 0.4% polyparasitism. There was a predominance of protozoa (80.8%) over helminths (19.2%). The most prevalent parasites were Entamoeba coli (44.6%); Endolimax nana (21.7%) and Iodamoeba bütschlii (14.5%). In the population studied, the independent variables analyzed were not associated (p>0.05) with the presence of intestinal parasites. *Conclusion:* the prevalence of intestinal parasitic infections in elderly people living in the urban area of the municipal region of Aiquara, Bahia, was high and there was no association between intestinal parasites and sociodemographic characteristics, lifestyle or health.

Keywords: Elderly. Parasitic Diseases. Prevalence.

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Research funding: Ministry of Health, SUS Research Program (PPSUS), the State of Bahia Research Support Foundation (FAPESB) (SUS0055/2013).

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INTRODUCTION

The technological and scientific advances linked to greater control over health, the environment, basic sanitation, and improvements in access to health services that have occurred in recent decades have contributed to an increase in life expectancy and, consequently, an aging population[1]. These changes have altered the health profile of the population, with a reduction in deaths from infectious diseases and an increase in noncommunicable diseases. However, despite the significant reduction in mortality caused by infectious-parasitic diseases, such illnesses still have a great impact on morbidity[2].

Parasitic infections are caused by helminths and protozoa that colonize the intestines of vertebrates, and represent a major public health problem. They are geographically widely distributed, occurring in urban and rural areas, with variations depending on the environment and species of parasite involved[3].

According to data from the Department of Informatics of the Sistema Único de Saúde (the Unified Health System) (DATASUS), infectious and parasitic diseases represented the sixth biggest cause of morbidity in Brazil in 2014, totaling 776,358 hospitalizations and corresponding to 7.28% of hospital morbidity in the period. In Bahia, this proportion was even higher, with such diseases accounting for 10.33% of hospitalizations, making them the third biggest cause of hospital morbidity in the state, ahead of diseases of the circulatory system[4].

Although studies of intestinal parasitic diseases among the elderly population are limited because of the low relevance of this problem to this population, it is known that enteroparasite infections impair the nutritional status of such individuals through intestinal obstruction, malnutrition, anemia, diarrhea and malabsorption[5,6], which can result in impaired functional capacity, autonomy and reduced quality of life among this age group.

The elderly are more likely to be predisposed to these diseases than young people, due to the decline in their immune system functions, which occur naturally during the aging process[5]. The progressive decline of independence in self-care is also a factor, and results in the impairment of personal hygiene and feeding[1].

In this context, the present study aimed to identify the prevalence of intestinal parasitosis and associated factors in elderly residents living in the community.

METHODS

An analytical, cross-sectional epidemiological study was carried out based on data from a population-based household survey, entitled: *Saúde e estilo de vida de idosos* (the Health and lifestyle of the Elderly), which took place in Aiquara, in the state of Bahia, in Brazil.

The municipal region of Aiquara is located in the south-central region of the state of Bahia, and has a Human Development Index (HDI) of 0.583 and a Gini Index of 0.4393. According to data from the Intituto Brasileiro de Geografia e Estatística (the Brazilian Institute of Geography and Statistics) (IBGE), 100% of urban areas possess water supply, garbage collection and sewerage[7].

A census of the elderly population living in the urban area of the municipal region of Aiquara was carried out, and 379 elderly people were identified. Of these, 236 individuals aged 60 years and above, of both genders, who were not institutionalized and who slept at least three nights at home in the urban area, agreed to participate in the study and met the inclusion criteria, which were be able to respond to the questionnaire, collect stool specimens, and be located in at least one of three attempts at different times of the day. All participants signed a Free and Informed Consent Form (FICF) and elderly persons who did not meet these criteria were excluded from the study (n=143).

Data were collected between January and August 2015 by previously trained undergraduate and postgraduate students from the area of health. Initially, a questionnaire compiled from validated instruments was used to obtain information on sociodemographic characteristics, health conditions and lifestyle, and a blood test and cropological survey were carried out.

For the analysis, the presence of intestinal parasitosis, categorized as present or absent, was identified as a dependent variable through the parasitological examination of feces, using the

Hoffman method, based on a single sample provided by the elderly. Prior to the collection of fecal material, the elderly were advised to collect a fresh stool sample and informed that there were no prior food restrictions to be followed. They were also given a pot with a screw cap for storage. These samples were properly handled and transported, and a fresh specimen underwent laboratory diagnosis at the laboratory of the Centro de Referência em Doenças Endêmicas Pirajá da Silva (Laboratory of the Pirajá da Silva Reference Center on Endemic Diseases (PIEJ), in the municipal region of Jequié, Bahia, Brazil.

The sociodemographic conditions were evaluated through the variables gender, which was categorized into male and female; age group, which was divided into 60-69 years, 70-79 years and 80 years or more; skin color, which was defined as white or non-white (brown, black and yellow/Asian-Brazilian); living arrangement (lives alone or lives with other(s)); education (illiterate/can read and write, elementary and high school); income (up to one minimum salary and >1 minimum salary, considering the value of the minimum salary at the time (788 reais)) and currently working (referring to any paid productive activity), categorized as yes or no.

To analyze lifestyle, the variables alcohol consumption and smoking, both categorized as yes and no, were used.

Health condition was evaluated through Body Mass Index (BMI), Waist Circumference (WC), indigestion and lack of appetite in the last 30 days, anemia and functional capacity

BMI was obtained from the ratio between body mass (BM) in kilograms and height (H) in meters squared [BMI=BM (kg) / H^2 (m)]. A portable digital scale was used to measure body mass, and the elderly were asked to wear light clothes and be barefoot. In order to evaluate height, a portable stadiometer was used, with the elderly individuals instructed to go barefoot and stand in an orthostatic position, with their feet together and the posterior surfaces of their heels, buttocks, head and shoulders in contact with the wall, following the guidelines of The Frankfurt Plane. Both measurements were performed in duplicate and the mean values were used in the analyzes. For analysis, BMI was categorized as underweight (BMI<22), normal weight (BMI of 22-27) and overweight (BMI>27Kg/m^2)[8].

Waist circumference was measured with a 2 meter long flexible and inextensible anthropometric tape, which was positioned at the height of the navel. The measurements were taken in duplicate and the mean value was used to categorize the elderly as normal (WC<80 cm for women and <94 cm for men), and elevated (WC≥80 cm for women and ≥94 cm for men)[9].

Indigestion and a lack of appetite in the last 30 days were obtained through two questions from the Self-Report Questionnaire (Srq-20)[10], categorized as yes or no.

Anemia was assessed via circulating hemoglobin (Hb) concentration in grams per deciliters (g/dL). For analysis, data were categorized in accordance with criteria established by the World Health Organization (WHO) as anemia (Hb <12g/dL for women and Hb<13g/dL for men)[11] and non-anemia. The collection of blood for hemogram analysis was previously scheduled and was carried out at the Municipal Health Department by trained and experienced laboratory technicians. The elderly persons were seated with their arm in a horizontal position, and venipuncture was performed in the median ulnar vein, in the ulnar fossa, following tourniquet. A vacuum collection system in a tube containing ethylenediaminetetraacetic acid anticoagulant (EDTA K_2) was used. The blood samples were properly handled and transported to the PIEJ Laboratory, where they were processed and analyzed.

Functional ability was assessed through the Basic Activities of Daily Living (BADL) questionnaire[12] in its transcutural adaptation[13] and the Instrumental Activities of Daily Living (IADL) questionnaire[14] adapted to the Brazilian context[15]. As proposed by Hoyemans et al.[16], a scale of hierarchical functional disability was constructed, divided into three categories: independent; dependent in IADL and dependent in BADL and IADL, with those who reported dependence in BADL but not in IADL considered dependent in both dimensions. Elderly

people who reported difficulty in one or more activities were considered dependent, and those who did not describe such difficulties were considered independent.

To analyze the data, descriptive analysis was performed through the distribution of absolute and relative frequencies, mean, standard deviation and amplitude. The association between intestinal parasitosis and the independent variables was tested using bivariate logistic regression. It was not possible to perform adjusted analysis as the independent variables analyzed did not reach the criterion of significance ($p<0.20$) for inclusion in the adjusted model.

The study met ethical requirements, and was approved by the Ethics Research Committee of the Universidade Estadual do Sudoeste da Bahia (State University of South East Bahia), CAAE:10786212.3.0000.0055.

RESULTS

A total of 236 elderly people participated in the study, of whom 132 (55.9%) were female and 104 (44.1%) were male. The age of the population ranged from 60 to 95 years, with a mean age of 71.54±7.62 years. The other characteristics of the studied population are described in table 1.

Table 1. Characteristics of study population. Aiquara, Bahia, Brazil, 2015.

Variables	Response (%)	N (%)
Age group (years)	100	
60-69		97 (41.1)
70-79		97 (41.1)
≥ 80		42 (17.8)
Skin color/ethnicity	100	
White		29 (12.3)
Non-white		207 (87.7)
Living arrangements	100	
Live alone		47 (19.9)
Live with other(s)		189 (80.1)
Schooling	97.5	
Illiterate/can read and write		124 (53.9)
Elementary School		92 (40.0)
High School/Higher Education		14 (6.1)
Income (Minimum Salary)	99.2	
Up to 1		203 (86.8)
>1		31 (13.2)
Currently working	98.7	
Sim		38 (16.3)
No		195 (83.7)
Alcohol consumption	100.0	
Yes		52 (22.0)
No		184 (78.0)
Smoking	93.2	
Yes		22 (10.0)
No		198 (90.0)

to be continued

continued from Table 1

Variables	Response (%)	N (%)
Body Mass Index (Kg/m²)	88.1	
<22		41 (19.7)
22-27		76 (36.5)
>27		91 (43.8)
Waist Circumference	88.6	
Normal		61 (29.2)
Elevated		148 (70.8)
Indigestion	99.6	
Yes		41 (17.4)
No		194 (82.6)
Lack of Appetite	99.6	
Yes		78 (33.2)
No		157 (66.8)
Anemia	99.2	
Present		30 (12.8)
Absent		204 (87.2)
Functional Capacity	100.0	
Independent		79 (33.5)
Dependent in IADL		128 (54.2)
Dependent in BADL and IADL		29 (12.3)

IADL: Instrumental Activities of Daily Living; BADL: Basic Activities of Daily Living.

Among the 236 elderly patients who underwent parasitological examination of feces, the prevalence of intestinal parasitosis was 30.5%. Of these elderly, persons 26.3% suffered mono-parasitism; 3.8% bi-parasitism and 0.4% poly-parasitism (Figure 1).

The prevalence of intestinal parasitosis among the elderly is shown in Table 2. There was a predominance of protozoa (80.8%) in comparison to helminths (19.2%) and eight types of parasites were detected, the most common being *Entamoeba Coli* (44.6%); *Endolimax nana* (21.7%) and *Iodamoeba butschlii* (14.5%).

The species that presented the most interaction with others were *Entamoeba coli* and *Iodamoeba butschlii*, with the following associations identified: *Entamoeba coli* and *Endolimax nana*; *Entamoeba coli* and *Iodamoeba butschlii; Ancylostomídeos* and *Iodamoeba butschlii; Entamoeba coli, Iodamoeba butschlii* and *Strongyloides stercoralis*; and *Entamoeba coli* and *Schistosoma mansoni.*

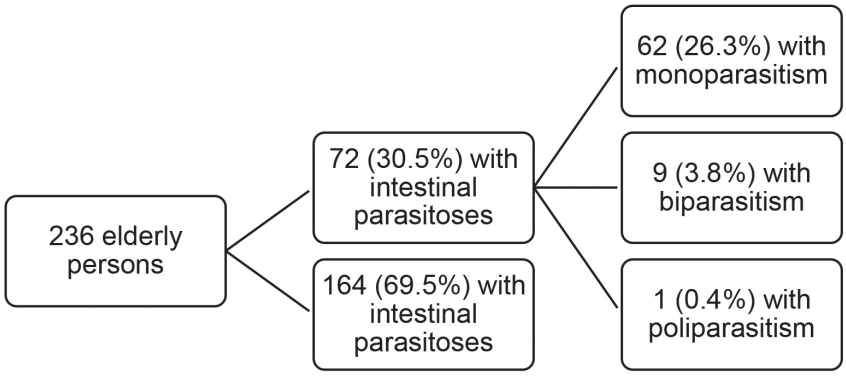

Figure 1. Profile of intestinal parasitosis among the elderly. Aiquara, Bahia, Brazil, 2015.

Table 2. Frequency of intestinal parasites among the elderly. Aiquara, Bahia, Brazil, 2015.

Intestinal parasites	N (%)
Helminths	
Schistosoma mansoni	5 (6.0)
Ancylostomídeos	4 (4.8)
Strongyloides stercoralis	4 (4.8)
Trichuristrichiura	2 (2.4)
Enterobius vermicularis	1 (1.2)
Protozoa	
Entamoeba coli	37 (44.6)
Endolimax nana	18 (21.7)
Iodamoeba butschlii	12 (14.5)
Total	83 (100.0)

Table 3 shows the prevalence of intestinal parasitosis among the elderly and their relationship with the independent variables of the study. Intestinal parasites were more frequent in elderly males, who lived alone and were illiterate. There was also a greater frequency of parasitosis among those with an income of up to one minimum wage, without a current job, who were underweight and had a normal WC, were anemic, reported a lack of appetite and were dependent for IADL. However, none of the variables were significantly associated ($p<0.05$) with intestinal parasitosis.

Table 3. Prevalence of intestinal parasites among the elderly and relationship with the independent variables of the study. Aiquara, Bahia, Brazil, 2015.

Variables	%	Crude OR	CI95%	*p*-value
Gender				
Male	32.7	1		
Female	28.8	0.83	0.48-1.45	0.518
Age group (years)				
60-69	27.8	1		
70-79	29.9	1.11	0.59-2.06	0.751
≥ 80	38.1	1.59	0.74-3.43	0.231
Skin color/ethnicity				
White	31.0	1		
Non-white	30.4	0.97	0.42-2.25	0.948
Living arrangements				
Live alone	36.2	1.38	0.70-2.20	0.347
Live with other(s)	29.1	1		
Schooling				
Illiterate/can read and write	31.5	1.15	0.34-3.88	0.826
Elementary School	29.3	1.04	0.30-3.60	0.953
High School/Higher Education	28.6	1		
Income (Minimum Salary)				
Up to 1	32.0	1.61	0.66-3.94	0.292
>1	22.6	1		

to be continued

continued from Table 3

Variables	%	Crude OR	CI95%	*p*-value
Currently working				
Sim	23.7	0.68	0.30-1.53	0.352
No	31.3	1		
Alcohol consumption				
Yes	28.8	0.90	0.46-1.78	0.768
No	31.0	1		
Smoking				
Yes	27.3	0.86	0.32-2.31	0.769
No	30.3	1		
Body Mass Index (Kg/m²)				
<22	31.7	1.50	0.64-3.48	0.350
22-27	23.7	1	0.64-2.59	0.476
>27	28.6	1.29		
Waist Circumference				
Normal	32.8	1		
Elevated	25.7	0.71	0.37-1.36	0.298
Indigestion				
Yes	29.3	0.92	0.44-1.93	0.834
No	30.9	1		
Lack of Appetite				
Yes	35.9	1.44	0.81-2.57	0.219
No	28.0	1		
Anemia				
Present	36.7	1.36	0.61-3.03	0.455
Absent	29.9	1		
Functional Capacity				
Independent	25.3	1		
Dependent in IADL	35.2	1.60	0.86-2.98	0.140
Dependent in BADL and IADL	24.1	0.94	0.35-2.53	0.900

IADL: Instrumental Activities of Daily Living; BADL: Basic Activities of Daily Living; *p*-value: Wald Test.

DISCUSSION

The present study identified a high prevalence of intestinal parasitosis in community-dwelling elderly people (30.5%), corroborating international and national studies which also evaluated community based populations, such as that by Chen et al.[17], which verified a prevalence of 30.7% in a study of 493 Chilean elderly persons, and that of Furtado and Melo[18], which identified a higher prevalence (40.5%) in Parnaíba, in the state of Piaui.

The high prevalence of intestinal parasitosis among the elderly can be explained by the immunological deficiencies that occur with aging, increasing susceptibility to such diseases[5]. Associated with this are factors such as the use of polypharmacy, which exposes the elderly to drug interactions, further assaulting the body's defense system; increased difficulty in performing self-care, which impairs personal hygiene and feeding[1] and causes a possible disconnect of elderly people from their health[18].

It is worth mentioning that many elderly people perform activities that require contact with the soil, such as gardening and yard cleaning, which facilitate contamination by increasing the risk of exposure to parasites[19]. These findings may explain the high prevalence of parasitic diseases in the analyzed municipal region, which is a small town with few economic options where many elderly persons are involved in labor activities related to agriculture.

In addition, the prevalence of intestinal parasitosis in the elderly is influenced by geographic, cultural, ethnic and behavioral issues[20], increasing in places where living conditions and basic sanitation are precarious or even non-existent[21]. Although 100% of households in Aiquara are covered by a water supply, sewage network and garbage collection, 63.7% of the population lives on an income of less than half the minimum wage and 41.4% have a schooling level of incomplete elementary education[22].

In the present study, of the elderly infected with intestinal parasites, 26.3% presented mono-parasitism, 3.8% bi-parasitism and 0.4% poly-parasitism. Other studies, conducted both in geriatric care facilities[3] and in the community[19], was also found that mono-parasitism is the most common condition among the elderly, followed by bi-parasitism and poly-parasitism.

It is noteworthy that parasites that affect individuals in isolation do not generally possess high lethality. The associated infections, however, including isolated infections, affect the nutritional state of the individual, interfering and competing with the absorption of the nutrients, potentially causing intestinal bleeding, and increasing the chance of complications[3].

In the present study, the prevalence of protozoa (80.8%) was higher than that of helminths (19.2%), a finding also evidenced in other studies[20,23]. These values can be justified by the precarious conditions of sanitation and education present in poor communities[20].

As other studies have also shown,[5,23] non-pathogenic parasites such as *Entamoeba coli* and *Endolimax nana* were the most prevalent. Although they do not represent health problems, they reveal a deficiency in hygienic issues such as hand washing after using the toilet and before meals, contaminating food and water with fecal material, leaving the elderly susceptible to pathogens[5,24].

Although some studies have identified an association between intestinal parasitosis in the elderly and socioeconomic factors (age[5], marital status, education and income[25]) and health conditions (activities of daily living[25]), in the present study, no association was found with these groups of variables, although it was observed that older elderly people (OR=1.59), who live alone (OR=1.38), were illiterate or can read and write (OR=1.15), anemic (OR= 1.36), who reported a lack of appetite (OR = 1.44) or were dependent for IADL (OR=1.60) were more likely, although not significantly so, to be affected by intestinal parasitosis.

There was also no significant association with tobacco and alcohol consumption, which reinforces the idea that environmental hygiene and health education are the main determinants of parasitic infections in the population. These variables may have functioned as confounding variables.

Corroborating the findings of the present study, a study of elderly people in Porto Alegre, Rio Grande do Sul, also found no significant association between parasitic diseases and socioeconomic, demographic and health variables, with the exception of arterial hypertension and mental problems, which were not considered in the present study. In contrast, an association with hygienic and sanitary variables was verified[26], which were also not analyzed by this study.

The high prevalence of intestinal parasitosis among the elderly verified in the present study reveals the clinical and epidemiological importance of this condition, demonstrating that it remains a major public health issue, including among older age groups. Although some authors suggest that children are the most vulnerable to this problem[27,28], this comparison could not be tested in the present study as the sample did not include this population group. However, considering the magnitude of this health problem among the elderly population, studies on the prevalence of parasitosis in other population groups are necessary.

Shakya et al.[29] indicated that intestinal parasites represent a threat for elderly people living in underdeveloped regions. Therefore, the present study warns of the need to investigate parasitic diseases in the elderly population, allowing the magnitude of the problem to be identified, and appropriate therapeutic measures to be adopted. In addition, the results of this study can be used by health authorities to guide the creation of public and social policies that improve socioeconomic, health and educational conditions, reflecting the health and quality of life of the elderly population.

Limitations of the present study include the fact that housing conditions, sanitary facilities, the destination of human waste, garbage collection, water and sewage treatment, hand washing, use of shoes and consumption of fruit and vegetables were not investigated. These factors are possibly related to the high prevalence of parasitic diseases in the elderly. A further limitation is the fact that only one stool sample was collected from each elderly person. When repeated negative fecal examinations can become positive, as in some cases positivity depends on the dynamics of the detectable stages. This may have resulted in an underestimation of the prevalence of intestinal parasitosis among the elderly found in this study.

CONCLUSION

In community-dwelling elderly people in the urban area of Aiquara, Bahia, the prevalence of intestinal parasitosis was found to be high. Among the infected elderly, those with mono-parasitism were most prevalent, followed by bi-parasitism and poly-parasitism. In terms of parasites, protozoa predominated over helminths. In the evaluated population there was no significant association between intestinal parasitosis and socio-demographic characteristics, lifestyle and health conditions.

The results of the present study demonstrate the profile of intestinal parasitosis in the elderly in a small town, highlighting its high prevalence and the necessity of adopting prevention and control measures on the part of administrators, health professionals and the community through improvements in living conditions and hygiene habits, such as washing hands before meals and following the use of the toilet, as well as respecting proper food hygiene.

ACKNOWLEDGEMENTS

The authors would like to thank the team of the Pirajá da Silva Reference Center on Endemic Diseases (PIEJ).

REFERENCES

1. Matos AS, Murai HC. Prevalência de parasitoses intestinais por helmintos e protozoários em idosos. Rev Enferm UNISA. 2005;6:9-14.
2. Araújo JD. Polarização epidemiológica no Brasil. Epidemiol Serv Saúde. 2012;21(04):533-38.
3. Macharetti H, Norberg NA, Martins JSA, Oliveira JTM, Santa Helena AA, Maliska C, et al. Protozoários e helmintos em interação com idosos albergados em lares geriátricos no Estado do Rio de Janeiro, Brasil. Rev UNIABEU. 2014;7(16):103-12.
4. BRASIL. Departamento de Informática do Sistema Único de Saúde [Internet]. Brasília, DF: DATASUS; 2008- . Morbidade Hospitalar do SUS – Brasil; 2015 [acesso em 16 nov. 2015]. Disponível em: http://tabnet.datasus.gov.br/cgi/deftohtm.exe?sih/cnv/nruf.def
5. Ely LS, Engroff P, Lopes GT, Werlang M, Gomes I, De Carli GA. Prevalência de enteroparasitos em idosos. Rev Bras Geriatr Gerontol. 2011;14(4):637-46.
6. Larré AB, Bürgie CD, Engroff P, De Carli GA. Prevalência de parasitoses em idosos residentes e trabalhadores de instituições de longa permanência na região metropolitana de Porto Alegre e na região serrana do Rio Grande do Sul. Mundo Saúde. 2015;39(1):84-91.
7. Instituto Brasileiro de Geografia e Estatística [Internet]. Rio de Janeiro: IBGE; [1995-]. Cidades; 2016 [acesso em 04 jul. 2016]. Disponível em: http://cidades.ibge.gov.br/xtras/perfil.php?lang=&codmun=290060&search=bahia|aiquara.

8. American Academy of Family Physicians, American Dietetic Association, National Council on the Aging. Nutrition screening e intervention resources for healthcare professionals working with older adults. Nutrition Screening Initiative [Internet]. Washington: American Dietetic Association; 2002.

9. Han TS, Van Lee EM, Seidell JC, Lean MEJ. Waist circumference action levels in the identification of cardiovascular risk factors: prevalence study in a random sample. Br Med J. 1995:311:1401-5.

10. Gonçalves DM, Stein AT, Kapczinski F. Avaliação de desempenho do Self-Reporting Questionnaire como instrumento de rastreamento psiquiátrico: um estudo comparativo com o Structured Interview for DSM-IV-TR. Cad Saúde Pública. 2008;24(2):380-90.

11. World Health Organization. Worldwide prevalence of anaemia 1993–2005: WHO global database on anemia. Geneva: WHO; 2005.

12. Katz S, Ford AB, Moskowitz RW, Jackson BA, Jaffe MW. Studies of illness in the aged. The index of ADL: a standardized measure of biological and psychosocial function. JAMA. 1963;185:914-9.

13. Lino VTS, Pereira SEM, Camacho LAB, Ribeiro Filho ST, Buksman S. Adaptação transcultural da Escala de Independência em Atividades da Vida Diária (Escala de Katz). Cad Saúde Pública. 2008;24(1):103-12.

14. Lawton MP, Brody EM. Assesment of older people: self-maintaining and instrumental activities of daily living. Gerontologist. 1969;9(3 part 1):179-86.

15. Santos RL, Virtuoso Júnior JS. Confiabilidade da versão brasileira da escala de atividades instrumentais da vida diária. Rev Bras Promoç Saúde. 2008;21(4):290-6.

16. Hoeymans N, Feskens EJ, Van den Bos GA, Kromhout D. Measuring functional status: cross-sectional and longitudinal associations between performance and self-report (Zutphen Elderly Study 1990-1993). J Clin Epidemiol. 1996;49(10):1103-10.

17. Chen SH, Codoceo A, Carrasco O, Torres YM. Enteroparasitosis en la poblacion de la tercera edad consultante en centros medicos de la Pontificia Universidad Catolica de Chile, 1997. Parasitol Día. 1998;22(34):114-6.

18. Furtado LFV, Melo ACFL. Prevalência e aspectos epidemiológicos de enteroparasitoses na população geronte de Parnaíba, Estado do Piauí. Rev Soc Bras Med Trop. 2011;44(4):513-5.

19. Hurtado-Guerrero AF, Alencar FH, Hurtado-Guerrero JC. Ocorrência de enteroparasitas na população geronte de Nova Olinda do Norte-Amazonas, Brasil. Acta amaz. 2005;35(4):487-90.

20. Santos CS, Souza PSA, Frizzo MN, Mallet EKV, Pedroso D. Prevalência de enteroparasitoses e sua relação com eosinofilia e anemia em pacientes do município de Santo Ângelo, Rio Grande do Sul, Brasil. Rev Saúde Integ. 2015;6(11-12):293-307.

21. Andrade ED, Leite ICG, Rodrigues VDO, Cesca MG. Parasitoses intestinais: uma revisão sobre seus aspectos sociais, epidemiológicos, clínicos e terapêuticos. Rev APS. 2010;13(2):231-40.

22. Brasil. Departamento de Informática do Sistema Único de Saúde [Internet]. Brasília, DF: DATASUS; 2008. Informações da Saúde. Demográficas e socioeconômicas; 2016 [acesso em 04 jul. 2016]. Disponível em: http://www2.datasus.gov.br/DATASUS/index.php?area=0206.

23. Almeida F, Silva R, Medeiros J. Ocorrência de helmintos e protozoários intestinais em idosos. J Biol Pharm Agric Manage. 2015;10(2):78-82.

24. Lima Junior OAD, Kaiser J, Catisti R. High occurrence of giardiasis in children living on a'landless farm workers' settlement in Araras, São Paulo, Brazil. Rev Inst Med Trop São Paulo. 2013;55(3):185-8.

25. Naves MM, Costa-Cruz JM. High prevalence of Strongyloides stercoralis infection among the elderly in Brazil. Rev Inst Med Trop São Paulo. 2013;55(5):309-13.

26. Engroff P. Prevalência de infecções enteroparasitárias e soroprevalência de Toxoplasma Gondii em idosos atendidos pela Estratégia Saúde da Família de Porto Alegre [tese]. Rio Grande do Sul: Pontifícia Universidade Católica do Rio Grande do Sul; 2014.

27. Lodo M, Oliveira CGBD, Fonseca ALA, Caputto LZ, Packer MLT, Valenti VE, et al. Prevalência de enteroparasitas em município do interior paulista. Rev Bras Crescimento Desenvolv hum. 2010;20(3):769-77.

28. Gonçalves ALR, Belizário TL, Pimentel JDB, Penatti MPA, Pedroso RDS. Prevalence of intestinal parasites in preschool children in the region of Uberlândia, State of Minas Gerais, Brazil. Rev Soc Bras Med Trop. 2011;44(2):191-3.

29. Shakya B, Rai SK, Singh A, Shrestha A. Intestinal parasitosis among the elderly people in Kathmandu Valley. Nepal Med Coll J. 2006;8(4):243-70.

Received: July 27, 2016
Reviewed: January 29, 2017
Accepted: April 12, 2017

http://dx.doi.org/10.1590/1981-22562017020.160095

Assessment of hospital environments and policies: seeking an age-friendly hospital

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Abstract

Functional decline is one of the main problems arising from the hospitalization of elderly persons. Hospital environments and policies focused on functionality are crucial for diminishing disabilities associated with hospitalization. This observational study was performed in four internal medicine services and aimed to evaluate the hospital environment and policies as an integral step in implementing the Function-Focused Care (FFC) programme being established in Portugal. The results of the hospital environment analysis suggest that design and product support, while present, are limited given the needs, complexities and specificities of hospitalized elderly persons. Policy evaluation indicated the existence of institutional projects that reflect a concern with functionality. However, more than half of the criteria evaluated need to be developed further in order to integrate the FFC programme. These results highlight that, while these services aim to be more "age-friendly environments", a number of initiatives can and should be undertaken in order to guide the FFC implementation process. This will benefit patients and their families, professionals and institutions.

Keywords: Elderly. Hospitals. Environment. Policy.

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INTRODUCTION

Data from the last Portuguese census (2012) indicate that 19% of the population is 65 years or older[1]. This group has the highest hospital admission rates of all age ranges[2]. The negative impact of hospitalization has been described in literature, and is entitled "hospitalization associated disability (HAD)"[3]. At least 30% of people aged 70 years or older are discharged with disability in an activity of daily living that they did not have prior to hospitalization[4]. The HAD model is considered a geriatric syndrome, with concentric and interactive risk factors. This syndrome can occur before (onset of acute illness), during and after hospitalization. The following risk factors have been identified: reduced functional reserve due to acute disease (old age, decline in physical function, decline in cognitive function, geriatric syndromes, depression and lack of social support)[3,5,6], the severity of the acute disease; hospitalization factors (a stressful physical environment which is not adapted for the elderly, restriction of mobility, malnutrition, forced dependence); and post-hospitalization factors (quality of discharge planning, housing conditions, economic and social resources, and community support). Based on the intrinsic and extrinsic etiology of the risk factors for HAD, Resnick et al.[7] developed Function Focused Care (FFC) which aims to promote and achieve the highest degree of functionality and prevent physical and cognitive deconditioning. FFC is based on the Social-Ecological Model that frames the interrelationship between intrapersonal, interpersonal, environmental and political factors, which may contribute to the impact of hospitalization on the elderly[8]. The use of this model is also fundamental in guiding the implementation process of FFC to benefit these users[8]. This process includes four steps: a) assessment of policies and environment; b) education; c) setting goals/objectives for FFC; and d) motivation and mentoring. The study "Promotion of FFC of Hospitalized Elderly Persons" was carried out in four internal medicine services in an academic hospital in the central region of Portugal. A quasi-experimental study was carried out, with two wards in the case group (normal care) and two in the control group (implementation of the FFC program). Stage A of the implementation is based on the framework of the "age-friendly hospital" which seeks to promote safety, minimize functional decline and mitigate adverse medical and social outcomes for elderly persons[9]. As such, this brief communication aims to report the results of this first phase of the study on FFC.

METHOD

A descriptive observational study was developed in four internal medicine units of a hospital located in the central region of Portugal. Initially, the study was presented to the service director of the internal medicine units and to the respective head nurses, and the visit to the services was formalized (March 2016).

The evaluation of the policies and environments that promoted functionality and physical activity was based on the checklists developed by Resnick et al.[8]. These were translated and adapted by the researchers (JT, LG and LN). The service/institution policy checklist includes 15 items that evaluate policies/protocols that optimize functionality and physical activity (e.g., physical restraints, constraints, and walking). The environmental checklist includes 18 items that evaluate the environmental factors that promote or inhibit FFC (e.g. unobstructed walking areas, suitable lighting of spaces, height of chairs, beds and toilets). For each of the items of these checklists the presence (1 point) or absence (zero points) of measures favoring FFC is indicated. The sum of the answers is then calculated. The higher the scores, the more the environment and the policies of these services are "age-friendly" and promoters of functionality.

Data collection was performed through an open interview with the head nurses/heads of the services and a guided tour of the units by the three investigators (external). These had an average duration of 1 hour and 30 minutes and were based on the checklists. We attempted to minimize bias by familiarizing the researchers with the items on the checklists, and specific characteristics were defined for each of the items. Each researcher individually completed the checklists. The responses were then analyzed, and 100% agreement was obtained for all items.

The present study was approved by the Ethics Commission of the Hospital, under approval Nº CHUC-065-14.

RESULT

The results of the evaluation of environments and policies that promote FFC are shown in Table 1. The environmental scores varied between five and nine points, with a mean of 6.8±1.7. This contrasted with the policies/protocols scores, which had a mean of 7±0, with each unit scoring seven. In general, the heights of the beds, chairs and toilets were adequate, night lights were provided, and there were pleasant common areas (lounges), although there were occasional differences between services. Support products are scarce and focused on wheelchairs, walkers, crutches, transfer lifts, electric folding beds with trapezes for mobilization and wheelchair work desks. The footwear (bedroom slippers) made available by the institution did not make walking easy, and support tables did not facilitate eating out of bed. It was found that the areas of the units are managed according to space and the need to hold equipment. Due to space constraints, free areas that promote functionality (walking, gait training) are limited and unsafe.

Analysis of the policies/protocols indicated the existence of institutional projects, such as the prevention of pressure ulcers, performance evaluation and a computerized nursing documentation system, reflecting a concern for functionality. However, more than half of the evaluation items (e.g., physical restraints, constraints, Foley catheter, and walking, among others) require development if FFC is to be integrated.

Table 1. Outcomes of the evaluation of the environment and policies promoting Function-Focused Care in four internal medicine services in a central hospital. Coimbra, Portugal, 2016.

Service	Environment (18 ítems) n (%)	Policies (15 ítems) n (%)
1	7 (38.9%)	7 (46.7%)
2	9 (50%)	7 (46.7%)
3	5 (27.8%)	7 (46.7%)
4	6 (33.3 %)	7 (46.7%)

DISCUSSION

This evaluation is part of the first step of implementing a program to promote functionality[7], based on the assumptions of the Social-Ecological Model. In this sense, the model is not limited to the development of care, but also analyzes how environment (services) and policies (institution) should be mobilized and oriented in order to promote functionality. The results indicate that the hospital environment and policies should focus on promoting independence in order to prevent and/or mitigate HAD. The hospital environment has an impact on the mobility of the elderly[10]. When this environment is unfamiliar, with technical equipment, frequent jargon and the disruption of routines and habits, it becomes a stress generator for such individuals, challenging their adaptive capacities and preventing their recovery[9]. It is important to consider that the hospital under analysis was designed in the 1950s and built in the 1980s, when demographic, epidemiological and social transition had not taken place in Portugal. As such, the indoor and outdoor areas do not reflect the current concerns of "age-friendly" hospitals. Additionally, the shortage of support products, notably food, clothing, hygiene and walking related, can make it difficult to practice FFC[7].

Hospitals with gerontic-geriatric sensibility, based in the physical design and policies/protocols, can compensate for the decline of the capacities of this population. A functionality-centric view can protect this age group, maximize its independence, and ameliorate the changes associated with primary aging, compensating for cognitive, sensory, and physical decline.

The greater variability in the environment scores may be the result of the existing resources, the management of the spaces and the focus that is given to the physical activity and promotion of independence of hospitalized elderly persons. The homogeneity in the policies/protocols scores stems from the fact that projects are institutional, reinforcing the idea that the more guidelines that seek to reflect the functionality or the prevention of HAD, the greater the impact on the elderly.

This evaluation was limited to a visit to four services, and generalization to other units in the same institution was impossible. A longer evaluation period could allow more profound analysis of some of the items studied, and permit observance of the interaction between the environment and the development of care. The checklists used focus on general aspects, and therefore other, more specific instruments with a multidimensional perspective should be considered[8]. Finally, this study only considered the internal areas of the hospital, while an adjusted environment should also include external areas.

CONCLUSION

The results of the present study emphasize that although these units are moving towards being more "age-friendly", a number of initiatives can and should be undertaken so that hospitalization does not represent a loss of functionality. It was demonstrated that, although some good institutional practices were in place, it is important to incorporate other protocols/procedures that focus on walking, spaces that promote functionality, and physical restraints, among other policies. The focus on the prevention of complications resulting from the hospitalization of the elderly should direct the hospital administration, since it is possible to improve care for the patient/family, the professionals and the institution. This study, under the aegis of the Nursing Directorate, denotes increasing concern regarding this issue among the organization.

ACKNOWLEDGEMENTS

The author would like to thank the Director of Nursing of the Centro Hospitalar e Universitário de Coimbra (Coimbra Hospital and University Center) (CHUC), António Marques.

REFERENCES

1. Instituto Nacional de Estatística. Censos 2011. Lisboa: INE; 2012.
2. Direção Geral da Saúde. Centros de Saúde e Unidades Hospitalares: Recursos e produção do SNS: ano de 2008. Lisboa: Direcção-Geral da Saúde; 2009. p. 122.
3. Covinsky KE, Pierluissi E, Story THEPS. Hospitalization-Associated Disability " She Was Probably Able to Ambulate , but I ' m Not Sure ." J Am Med Assoc. 2011;306(16):1782-93.
4. Covinsky KE, Palmer RM, Fortinsky RH, Counsell SR, Stewart AL, Kresevic D, et al. Loss of independence in activities of daily living in older adults hospitalized with medical illness: Increased vulnerability with age. J Am Geriatr Soc. 2003;51:451-8.
5. Da Cunha FCM, Cintra MTG, Da Cunha LCM , Giacomin KC, Couto EAB. Fatores que predispõem ao declínio funcional em idosos hospitalizados . Rev Bras Geriatr Gerontol. 2009;12(3):475-87.

6. Hoogerduijn JG, Schuurmans MJ, Korevaar JC, Buurman BM, De Rooij SE. Identification of older hospitalised patients at risk for functional decline, a study to compare the predictive values of three screening instruments. J Clin Nurs. 2010;19(9-10):1219-25.

7. Res J Clin Nurs.nick B, Boltz M, Galik E, Pretzer-Aboff I. Restorative care nursing for older adults. New York: Springer Publishing Company; 2012.

8. Boltz M, Resnick B, Capezuti E, Shuluk J, Secic M. Functional decline in hospitalized older adults: can nursing make a difference? Geriatr Nurs. 2012;33(4):272-9.

9. Parke B, Friesen K. Code Plus: Physical design components for an elder friendly hospital. 2nd ed. Fraser H, Parke B, Friesen K, editors. Alberta: Fraser Health; 2015.

10. Zisberg A, Syn-Hershko A. Factors related to the mobility of hospitalized older adults: a prospective cohort study. Geriatr Nurs. 2016;37(2):96-100.

Received: June 16, 2016
Reviewed: January 05, 2017
Accepted: March 28, 2017

http://dx.doi.org/10.1590/1981-22562017020.160077

Trajectories of social participation in old age: a systematic literature review

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Abstract

Objective: the present study aimed to identify patterns of social participation in old age and the theories used to explain them. *Method:* A systematic review was performed using the Medical Literature Analysis and Retrieval System Online (MEDLINE / PUBMED), Scientific Electronic Library Online (Scielo) and Web of Science (ISI Web of Knowledge) databases. The keywords used were: social participation, social engagement, social involvement and social activities; combined with seniors, the elderly, older adults, older people and aging. Research was performed between January and February. *Results:* thirty-one longitudinal studies on social participation among old and healthy middle-aged adults were included for analysis. In three studies social engagement levels increased, especially at the beginning of old age (up to 75 years). Twenty-one studies presented results that described the reduction of social engagement levels in old age, and five studies found that there was no change in levels of social involvement. The most used theories were: the activity theory, the social disengagement theory, the continuity theory and the theory of socioemotional selectivity. *Conclusion:* the results point to the need for reflection on what is envisioned and what is practiced in terms of policies and practices aimed at achieving successful aging. Future attempts should include not only incentives to remain active, but a description of factors that influence the social disengagement associated with poor adaptation in old age.

Keywords: Personal Satisfaction. Social Networkings. Interpersonal Relations. Health of Elderly. Aging.

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Study financing: Conselho Nacional de Desenvolvimento Científico e Tecnológico (the National Council for Scientific and Technological Development) (CNPq) and the Ministério da Ciência e Tecnologia (the Department of Science and Technology) (MCT), process Nº 555087/2006-9.

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INTRODUCTION

The search for successful aging has motivated the development of several social and psychological theories in the field of gerontology[1,2]. The first conceptual models, such as the social disengagement theory, were predominantly negative and emphasized the inevitability of functional decline and dependence in old age[3]. According to this theory, successful aging involves mutual distancing between the individual and society, resulting from the decline of skills and the shortening of remaining life.

Nowadays, literature on the aging experience is replete with considerations on productivity and success, and adopts a more positive approach in relation to the experience of aging. Its main foundations are the theories of activity[4], continuity[5] and socioemotional selectivity[6].

The activity theory emerged from the observation of the positive relationship between greater levels of social involvement and satisfaction with life among the elderly[4]. According to this theory, a person is most likely to succeed in old age if they continue to be active and take on productive roles in society, replacing those that have been lost. These productive roles include community-based social activities, such as paid work, volunteering, and participation in social or religious groups[4].

The activity theory brings together an extensive amount of empirical data that corroborates practical applications such as policies to encourage health promotion through the practice of physical activities, voluntary work and, more recently, the active aging policy proposed by the World Health Organization (WHO)[1].

The continuity theory postulated that, although individuals adapt to the aging process by adjusting the duration, mode, and distribution of activities, they tend to participate in similar activities and to continue the lifestyles adopted in adult life and middle-age. Therefore, social participation patterns remain relatively stable during one's life course[5]. Therefore, dynamism in the patterns and levels of social engagement is accepted, and includes as determinants personal motivations and preferences for activities and institutional factors.

Following the life course perspective, Carstensen[6] argues that people actively modify their social network in old age, selecting relationships and activities that are meaningful and sources of support, pleasure, and satisfaction, and setting aside relationships and activities that are burdensome, complex, stressful or the source of negative affect. This selection process is an important mechanism of adaptation in the sense of preserving emotional well-being, which is why it is known as socioemotional selectivity theory.

These important theoretical changes, accompanied by the dissemination of empirical data, have driven conceptual transitions in the field of Gerontology, challenging scholars and practitioners to deal with aging as a complex and heterogeneous process. In this context, engagement or social participation has become an important object of study. Defined as the involvement of the elderly in social activities practiced in the community, social participation is associated with a lower risk of morbidities[7,8], disability[9-12], cognitive decline[8,12,13] and death[14,15], and as a determinant of good quality of life and well-being in old age[16,17].

As people age, various aspects of their lives are modified, including the quantity and composition of their social networks, as well as the frequency of their participation in social activities. In addition, social behavior is influenced by personal aspects (health, gender, income, schooling), contextual (social support, physical barriers and opportunities), as well as by common events of old age that characterize socially transient moments, for example, retirement and widowhood[18-25].

The objective of the present study was to identify trajectories of social participation in old age and the theories used to explain them.

METHOD

A systematic review of literature was performed, designed to identify and analyze publications that answer the questions: Do elderly persons reduce, increase or maintain levels of social participation as they grow older? Which theories are most used to explain social participation in old age?

The databases consulted were the Medical Literature Analysis and Retrieval System Online (MEDLINE/PubMed), the Scientific Electronic Library Online (SciELO) and the Web of Science (ISI Web of Knowledge). The following descriptors were used: *social participation*, *social engagement*, *social involvement* and *social activities*; combined with *seniors*, *elderly*, *older adults*, *older people* and *aging*. The search was carried out between January 1, 2016 and February 1, 2016.

The inclusion criteria were longitudinal studies; year of publication after 2001; publications in the Portuguese, English or Spanish languages and investigation of the social participation of healthy elderly persons and healthy middle-aged adults. Studies with caregivers and with institutionalized or hospitalized elderly persons were excluded; as were studies with other designs (such as review, cross-sectional, qualitative, and instrument validation studies). Studies that were repeated in more than one database were considered only once, according to the criteria mentioned.

The selection of articles was carried out separately by two researchers, based on the title and abstract. When there was disagreement, a third researcher was asked to decide whether to include or exclude the study. Subsequently, the researchers read the articles in full and extracted the relevant information for this study. In this stage, new exclusions were required, as demonstrated in Figure 1.

Thirty-one longitudinal studies on social participation among healthy elderly and middle-aged adults were included for analysis. Table 1 shows the relevant characteristics of the studies, such as follow-up time, sample characteristics, and the instruments and indicators used to assess social participation.

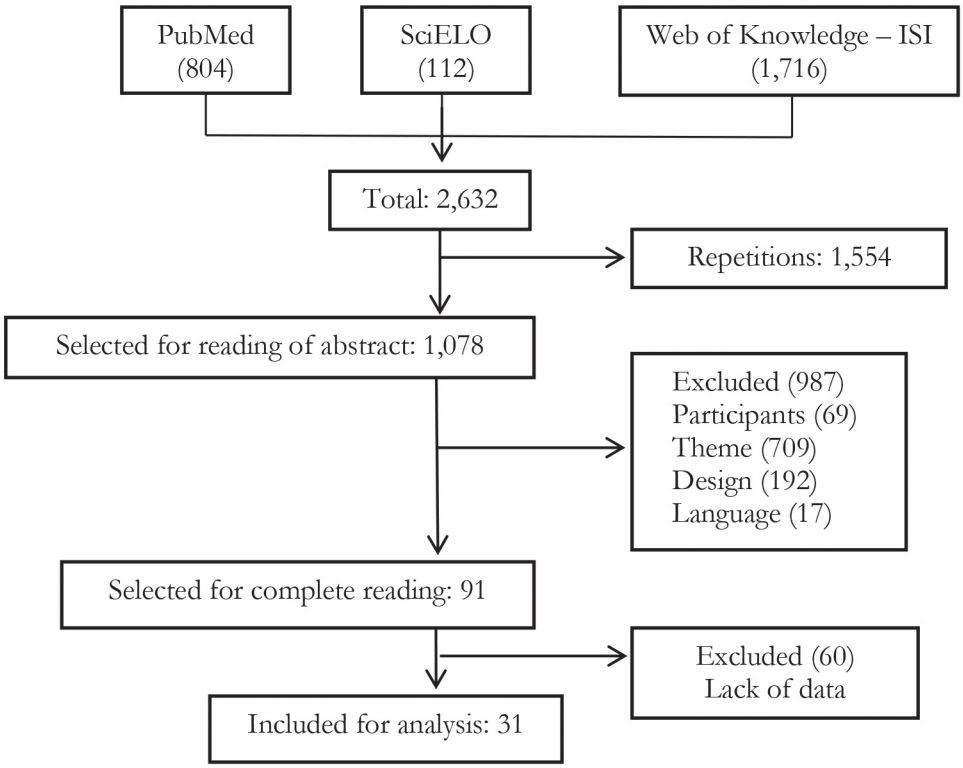

Figure 1. Flowchart of article search. Campinas, São Paulo, 2016.

Table 1. Characteristics of studies investigating trajectories of social participation in old age, based on information relating to follow-up, participants, indicators of social participation and results of interest. Campinas, São Paulo, 2016.

Author, year, country	Duration and participants	Participation indicators	Results of interest
Agahi et al.[22], 2013, Sweden	36 years, 5 phases, 729 elderly persons or middle aged individuals.	Make and receive visits.	Reduction in levels of social engagement associated with the advance of age and incapacity.
Avlund et al.[9], 2004, Denmark	3 years, 2 phases, 1,396 elderly persons aged 75 years and above; 51% men.	Make and receive visits and participate in activities outside the home.	Levels of social participation declined as individuals aged for both genders. Higher SP levels were associated with lower risk of disability.
Benjamins et al.[7], 2003, USA	3 years, 2 phases, 2,958 elderly persons; 2/3 were women, average age 73 years.	Religious activities.	Elderly persons reduced their levels of social participation due to health problems. However, these levels tended to subsequently stabilize.
Bennett[14], 2002, UK	5 years, 2 phases, 406 elderly persons, average age 72.8 (±3.9), 65.7% women.	BASE (Brief Assessment of Social Engagement) which includes religious and civic activities, holidays, and passive leisure.	Social participation diminished with advancing age and this decline was a predictor for mortality. Reduced levels of SP can signal subclinical health problems which are not otherwise recognized by professionals. SP can be a marker for health and mortality elderly persons. The results corroborate the activity theory.
Buchman et al.[10], 2009, USA	2-11 years (mean 5 years), 2 phases, 906 elderly persons.	Inventory with 6 items including cultural, religious, volunteer and group activities, trips and visits.	Levels of social activity were inversely proportional to increasing age. Lower levels of social engagement were associated with faster motor and functional decline among elderly persons.
Bukov et al.[24], 2002, Germany	4 years, 3 phases, 516 elderly persons.	Inventory with 11 activities cultural, political, leisure and voluntary.	Elderly persons who performed more complex activities also carried out less complex activities. This cumulative effect remained stable during old age. After the age of 90, more than 30% of elderly persons are socially inactive. Productive and political activities become rarer, particularly among women.
Chiao et al.[26], 2011, China	18 years, 6 phases, 1,388 elderly persons; 63.3% men.	Inventory with 6 cultural/leisure, religious, and political activities, groups for retirees and voluntary groups.	Excluding elderly persons who had never taken part in social activities, 35.5% began to participate in such activities from the age of 70; 26% interrupted activities before the age of 70 and 38.4% interrupted social activities after the age of 70. A little social involvement is better for the mental health of the elderly than no such involvement.
Curl et al.[23], 2014, USA	12 years, 7 phases, individuals aged 50 years or more.	Paid and voluntary work and frequency of contact with neighbors.	The decline in levels of social engagement was more accentuated among elderly persons who gave up driving than among those who continued to drive.

to be continued

continued from Table 1

Author, year, country	Duration and participants	Participation indicators	Results of interest
Donnelly and Hinterlong[18], 2009, USA	8 years, 3 phases, 228 elderly persons.	Cultural, leisure, and religious activities, frequency of contact with family members and friends.	Levels of social participation remained the same or increased following the death of a spouse in an attempt to compensate for the loss. Current levels were associated with previous levels of engagement.
Fairfall et al.[27], 2014, Australia	2 years, 1,327 men aged 70 years or over; Average age: 76.3 (±5.1).	Scale with 20 items constructed from four known instruments (*Physical Activity Scale for the Elderly, Older Americans Resource Scale for Instrumental Activities of Daily Living, Duke Social Support Index* and *Short Form-SF12*)	In two years, social participation declined in 47.3% of men, remained the same in 20.7% and increased in 32%. In general, there was a significant reduction in levels of social participation.
Hank and Erlinghagen[25], 2009, Germany	3 years, 2 phases, 18,057 elderly persons.	Voluntary or charity.	As they get older, the chance of people engaging in voluntary activities decreases. Commonly, elderly persons become less socially involved, because of the lack of environmental and personal resources.
Hong et al.[8], 2009, USA	6 years, 3 phases, 5,294 elderly persons aged 70 years or older; 57.7% women; Average age 77 years.	Inventory with eight activities involving voluntary and paid work, physical, leisure, cultural and religious activities.	The average age of elderly persons with a greater degree of engagement was lower, and was also lower among elderly persons with a lower degree of social engagement; 47.5% of elderly persons were involved in more complex social activities. Greater levels of engagement were associated with a lower risk of depression.
Hoppmann et al.[28], 2008, Australia	11 years, 4 phases, 565 couples with a mean age of 76 years.	Four items from the *Adelaide Activity Profile* were used. These considered domestic visits, telephone conversations, participation in social groups and activities outside the home.	Wives with greater social engagement tended to reduce their participation over time. The trajectories of social activities were similar between spouses.
Hughes et al.[12], 2013, USA	3 years, 2 phases, 816 elderly persons aged 65 years or older; 62.4% women, average age 68.1 (±7.4).	Inventory with four activities including religious and family and social activities, centers for the elderly, and voluntary work.	Social engagement declined with age and is associated with cognitive decline.
Huxhold et al.[29], 2013, Germany	6 years, 3 phases, 4,862 individuals aged 40 to 85 years; 47.9% women, average age: 73.7 years	Make visits, cultural, physical and leisure activities, meetings with social groups.	Advanced age was related to a more accentuated reduction in the structure of the network and social engagement. Levels of social engagement and emotional support were predictors of changes in health and satisfaction with life.

to be continued

continued from Table 1

Author, year, country	Duration and participants	Participation indicators	Results of interest
Huxhold et al.[16], 2014, Germany	6 years, 2 phases, 2,034 elderly persons aged 65 years or older; 47.9% women.	Frequency of contact with social network + inventory with nine activities including cultural, political and sporting activities.	The influence of aging on the development of social network characteristics is in keeping with the idea that the overall size of these networks, at more advanced ages, tends to decrease, while close relationships are maintained.
James et al.[30], 2011, USA	5 years, 954 elderly persons aged 65 years or older; 74.7 women, average age 79.6 (±7.2) years.	Scale with six items including leisure, visits, voluntary activities, participation in groups for elderly persons.	Younger individuals had the highest levels of participation. Older, more socially active people are less likely to become incapacitated.
Kanamori et al.[31], 2014, Japan	4 years, 12,951 elderly persons aged 65 years or more, 51.2% women, average age 72,7 (±5,9) years.	Participate in associations, religious, voluntary, sporting, and leisure activities, and paid work.	Social participation reduces the risk of disability. Younger elderly persons and men tend to participate more in organizations.
Kim et al.[32], 2013, North Korea	3 years, 2 phases, 2,565 women aged between 45-64 years and 2,356 women aged 65 years or older.	Participate in religious, productive, recreational, political and voluntary activities.	Currently, more elderly women are involved in social activities, and such activities appear to have a positive influence on their state of health in both middle age and old age.
Kim et al.[33], 2014, USA	8 years, 965 subjects aged 55 years or older.	Two questions regarding the decline in engagement in social, religious and occupational activities.	Fewer than half of those interviewed described a decline in their social engagement, without stress. The proportion of respondents experiencing social isolation and social decline with distress declined over time. Older individuals (>85) appeared less frequently among those who suffered social isolation. Age and cohort were significantly associated with the decline of social participation.
Lancee and Radl[20], 2012, Germany	24 years, 10,225 workers aged 55 years or older.	Frequency of contact with friends and family members; participation in community activities.	65% of participants did not take part in community activities. Most met with friends and family at least once a month. A greater frequency of social contact leads to early retirement, while participation in community activities has the opposite effect in individuals under 60 years of age. Those who are heavily involved in civic life retire later.
Mendes de Leon et al.[11], 2003, USA	9 years, 9 phases, 2,761 elderly persons; 45% aged 75 years or older and 58,4% women.	Social and productive activities.	The protective effect of engagement on disability declines over time.

to be continued

continued from Table 1

Author, year, country	Duration and participants	Participation indicators	Results of interest
Lodi-Smith and Roberts[34], 2012, USA	3 years, 159 elderly persons aged 60 years or older; 58.4% women; average age 72.4 (±7.5) years.	Inventory with 7 items including religious, recreational and voluntary activities.	Engagement diminishes with age, accompanied by reciprocal changes in personality traits.
Min et al.[19], 2012, North Korea	2 years, 1,531 men aged 55 years and older; average age 63.7 years	Participation in family reunions, leisure, cultural, political, and religious activities.	Older elderly persons are more often unemployed and such status is closely related to low social engagement.
Minagawa and Saito[15], 2014, Japan	10 years, 5 phases, 13,225 elderly persons.	Educational, leisure and sporting activities.	Age was inversely related to social engagement. Greater engagement is associated with reduced risk of death.
Morrow-Howel et al.[35], 2014, USA	2 years, 4.593 elderly persons; 59% women; average age 69.4 (±8.9) years	Composition of social network, social support and passive leisure.	41% of elderly persons exhibited trajectories characterized by moderate or low levels of activity. Social activities are most affected.
Allyn et al.[17], 2015, USA	40 years, 4 phases, 4,000 individuals.	Volunteering.	Participation in voluntary organizations increased over 17 years and declined over 12 years. Volunteering was associated with well-being.
Sabbath et al.[21], 2015, USA	12 years, 2 phases, 10,692 individuals; 81.3% men; 32.8% aged 62 years or older.	*Berkman Social Network Index* (marital status, family ties and friendship and participation in social organizations).	The earlier that retirement occurs, the more positive changes were observed in relation to participation in social activities. Frequency of contact with friends and family did not change, however.
Small et al.[36], 2012, USA	12 years, 5 phases, 952 elderly persons; 66.9% women, average age 69.2 years.	Cultural activities and visiting friends.	Worse cognitive status was related to declining future social engagement. Continuing a lifestyle allows the maintenance of cognitive functions with advancing age.
Saczynski et al.[13], 2006, Hawaii (USA)	32 years, 2,513 men.	Marital status, home arrangement, participation in community groups, contacts with friends, and the existence of a relationship of trust.	Older men were less socially involved. Fifteen percent of participants decreased their level of social engagement from middle to advanced age; 32% increased their level of social engagement; 12% had a high level of social engagement in both middle and advanced age; And 10% had low engagement at both times.
Zunzunegui[37], 2003, Spain	4 years, 2 phases, 964 elderly persons aged 65 years or older.	Participation in social, church and community center organizations.	Social participation is a protector against cognitive decline and dementia. The levels and characteristics of social involvement were similar after the follow-up period.

RESULTS

Most of the studies were published between 2009 and 2015 and mainly in the United States and Germany. No Brazilian study fulfilled the inclusion criteria for the analysis proposed in this study. Approximately half of the studies adopted the increase, decrease or maintenance of the incapacity to participate socially and of cognitive decline or dementia as their outcome or variable dependent. Other outcomes investigated were mortality, depression, well-being and retirement (Table 1).

Trajectories of social participation in old age

In order to answer the first research question, regarding the reduction, increase or maintenance of levels of social participation as people grow older, the results of the studies included were analyzed. It was found that in three studies levels of social engagement increased, especially in the onset of old age (up to 75 years). Twenty-one studies presented results that described a decrease in levels of social engagement as people age. Five studies reported the absence of significant changes in levels of social involvement between middle age and old age, suggesting the continuity of activities based on previous experiences accumulated during the life course of an individual (Table 2).

Use of theories

With regard to the use of theories to explain social participation in old age and its effects, we identified five theoretical reasonings that were grouped according to the best-known theories: activity, social disengagement, continuity and socioemotional selectivity. Each theory was classified based on studies that mentioned it explicitly and those that did not explicitly refer to any theory, but used their principles implicitly to explain its results. Only one study explained the use of the activity theory, while 16 studies used its principles implicitly. Studies that presented data and arguments about the positive effects of social engagement on functional, health, cognition and mortality outcomes were included in this group. Only one study implicitly used the theory of social disengagement, and none applied it explicitly. The continuity theory was explicitly mentioned in one study and implicitly addressed in two studies. The socioemotional selectivity theory was explicitly addressed in six studies and no study referred to it implicitly (Table 3). These findings relate to the second question proposed for this study.

Table 2. Report of studies analyzed in terms of the trajectories of social participation of elderly persons over time. Campinas, São Paulo, 2016.

Studies that identified an increase in the social participation of elderly persons over time.
Kim et al., 2013[32]; Allyn et al., 2015[17]; Sabbath et al., 2015[21]
Studies that identified a reduction in the social participation of elderly persons over time.
Agahi et al., 2013[22]; Avlund et al., 2004[9]; Benjamins et al., 2003[7]; Bennett, 2002[14]; Chiao et al., 2011[26]; Curl et al., 2013[23]; Fairfall et al., 2014[27]; Hank and Erlinghagen., 2010[25]; Hoppmann et al., 2008[28]; Hughes et al., 2013[12]; Huxhold et al., 2014[16]; Huxhold et al., 2013[29]; Kanamori et al., 2014[31]; Kim et al., 2014[33]; Mendes de Leon et al., 2003[11]; Lodi-Smith and Roberts, 2012[34]; Min et al., 2012[19]; Minagawa and Saito, 2014[15]; Morrow-Howell et al., 2014[35]; Small et al., 2012[36]; Saczynski et al., 2006[13].
Studies that identified a continuation of the social participation of elderly persons over time.
Bukov et al., 2002[24]; Donnelly e Hinterlong, 2010[18]; Lancee e Radl, 2012[20]; Sabbath et al., 2015[21]; Zunzunegui, 2003[37]

Table 3. Report of studies analyzed, based on gerontological theories used to explain trajectories of social participation in old age. Campinas, São Paulo, 2016.

Explicit	Implicit
Activity Theory	
Bennett, 2002[14]	Agahi et al., 2013[22]; Avlund et al., 2004[9]; Chiao et al., 2011[26]; Curl et al., 2013[23]; Fairfall et al., 2014[27]; Hughes et al., 2013[12]; Kanamori et al., 2014[31]; Kim et al., 2013[32]; Mendes de Leon et al., 2003[11]; Min et al., 2012[19]; Minagawa and Saito, 2014[15]; Allyn et al., 2010[17]; Morrow-Howell et al., 2014[35]; Small et al., 2012[36]; Saczynski et al., 2006[13]
Disengagement Theory	
---	Benjamins et al., 2003[7]
Theory of continuity/lifecourse	
Lancee and Radl, 2012[20]	Sabbath et al., 2015[21]; Zunzunegui, 2003[37]
Socioemotional Selectivity Theory	
Donnelly and Hinterlong, 2010[18]; Hoppmann et al., 2008[28]; Huxhold et al., 2014[16]; Huxhold et al., 2013[29]; Kim et al., 2014[33]; Lancee and Radl, 2012[20]	---

DISCUSSION

According to the information obtained and set out in Table 1, there was significant heterogeneity among the studies regarding publication location, sample characteristics and the methods by which social participation was evaluated. The cultural and socioeconomic aspects determined by the country of origin of the study samples may have influenced the profile of the participants in terms of age, gender and living conditions. The proportion of elderly women and men differed among countries, influencing their representation in the samples of the studies. While studies on aging generally involve more women than men, the present review identified a number of studies with a higher proportion of men than women[9,16,21,26]. In addition, some studies investigated only women or only men[19,28-32]. These aspects may influence the results presented by these studies especially in relation to the social engagement of the elderly persons.

It is known that the profile and characteristics of social participation are closely related to culture, beliefs and socially acceptable habits, as well as the opportunities and resources available in the community[24,33-35]. The same characteristics are also influenced by gender and age. Thus, the place of origin of the elderly may imply greater or lesser participation, in spite of personal aspects related to aging. In some European and North American countries, volunteering is a widespread activity practiced by the majority of adults and elderly persons throughout their lives, while it is little practiced in Latin America and the Caribbean[25]. The same applies to regard to sports, religious and educational activities. This explains the variety of indicators used in literature to assess social participation. These aspects should be considered in the interpretation of the results and in the conclusions of these studies.

Important information can be obtained from the review proposed in this study. A careful reading of the work allowed us to identify the trajectories of social participation in old age, or in other words, whether people reduce or maintain levels of social engagement as they grow older. It also allowed us to identify how gerontological theories have been used to explain this phenomenon in this phase of life. These observations contribute to gerontological theory and practice in the sense of understanding the functioning and social behavior of the elderly. As a result, researchers will have greater clarity regarding the most suitable and reliable theoretical applications to support the results of their research. Professionals can use this knowledge in the field

of health and social sciences to understand the mechanisms involved in the behaviors observed in practice and the implications for the health and well-being of the elderly.

The most frequently observed trajectory of social participation was the identification of diminished participation in social actions or the reduction of contact with friends and family, especially among older age groups. Several studies have identified reduced levels of social participation associated with age[22]. This trajectory has been observed for both men and women[9], but with different characteristics. While men tend to disengage from political and organizational activities and work, women discontinue community activities and volunteer work. This disengagement is most pronounced at age 75, and maybe influenced by common events in old age, such as widowhood, retirement, health problems, and functional decline[10,18,30,31,33,36,37]. Benjamins et al.[7] observed that acute events such as hip fractures, cancer and cerebrovascular accidents compromise participation in social activities. According to Buchman et al.[10], levels of social activity are inversely proportional to the advancement of age. Lower levels of social engagement lead to more rapid motor and functional decline among the elderly. In addition, reduced social connections, the limited frequency of participation in social activities and social disengagement are predictors of cognitive decline[36,37] and dementia[12].

Less frequent was the observation that levels of social engagement remain stable throughout life, including in old age[18,20,21,24,37]. The results of these studies point to the existence of continuity in relation to the social behaviors that are constructed and nourished throughout life and therefore influence outcomes in old age. This rationale has important practical implications. Considering that social behavior in old age is determined by previous events and experiences, the approach of these individuals to promote health and well-being through social engagement must begin in stages of life prior to old age. This implies that collective efforts must be employed to enable young people and adults to engage socially and to maintain these relationships and activities for longer, in such spaces as school, university, community and work.

According to Bukov et al.[24], old age can bring a mixture of stability, reactivation and the reduction of social participation. The results of this study showed that 87% of elderly persons who performed activities in groups in the first phase of the study, continued to perform them after four years of follow-up, and 11 out of 20 socially inactive people at the beginning of the study had begun social activities by the end of the follow-up period. However, the number of participants in political and productive activities declined by half from one measurement time to another. According to the authors, when selection occurs in advanced age, it will probably be in favor of less demanding activities, and participation in more demanding activities will be interrupted. The cumulative pattern of social participation is maintained even after such selection. This argument reinforces the idea of continuity from a life course perspective.

The trajectory of increasing levels of social engagement in old age was described by three studies[17,21,32]. These results may have been influenced by the methods used to measure social participation, as depending on the social activity or instrument used, certain trajectories may be favored. For example, if the study considers participation in a remunerated activity as an indicator of social engagement, elderly populations will probably reveal a declining trend, as it is common for such individuals to retire and, therefore, to abandon such activities. However, in studies in which voluntary activity was adopted as an indicator of social participation, trajectories of increased social engagement were observed. After retirement older people are likely to enjoy more free time to engage in pleasurable and optional activities, such as volunteering[18]. The increase in social participation after retirement is a sign of selection and adaptation, to achieve or maintain favorable levels of functioning and active aging[20].

The activity theory was the concept that was most considered by the studies, albeit implicitly. In general, studies that provided results on the benefits of participation in social activities for physical and cognitive functions and those that described an increased risk of mortality associated with declining social engagement tend to justify their results by reinforcing the idea that "the more active the better",

or the notion that inactivity and disuse entails a loss of skills. These precepts were contemplated by this theory and have guided important public policies for active and healthy aging[1]. It is true that evidence of the benefits of social participation for health and well-being is robust and has been repeatedly demonstrated in several studies [16,26,28,29]. Empirical data have pointed out that elderly people with worse cognition are less engaged than their peers whose cognition is preserved[12,36,37]. This suggests that social involvement may be an early marker of cognitive loss and that engaging in social activities provides protection against the progression of moderate cognitive impairment to a more serious condition[12]. People with higher levels of social engagement not only live longer but also have lower risks of health and disability issues. Other findings have stated that facilitating social activities in old age, as well as in the transition between middle age and old age, may help delay functional disability[25], especially in relation to mobility[10].

Although most studies identified levels of the decline of social engagement in old age, the theory of social disengagement was mentioned by only one study, and even then implicitly. This contradiction may be due to criticisms of the theory, which accuse it of suggesting that such disengagement is an inevitable, reciprocal, normative and beneficial development process for both the elderly and society. This argument was not univocally confirmed by subsequent research, and although the theory is supported by real-life data, it was discredited and practically excluded from literature until the 1990s. From that time on, new theoretical efforts, such as the socioemotional selectivity theory, have contributed important conceptual advances in the field of gerontology[2].

Today the social disengagement observed in old age is largely explained by the socioemotional selectivity theory, which proposes that, in old age, changes in the composition of the social network, family structure, work and leisure relations, and especially in social roles, influence social behavior. The social needs of old age are different from those of young adults and, therefore, social networks assume other functions among the elderly. These individuals need more social and emotional support and fewer contacts that generate recognition and social status, which is why they select a more restricted, but significant and positively affective social network[18]. Donnelly and Hinterlong[18] found that widows exhibited greater levels of participation than non-widowers and widowed women were more likely to describe greater degrees of social participation than widowed men. Elderly widowers did not exhibit lower levels of participation in voluntary work than married elderly people, as was expected. The explanations for this are based on the socioemotional selectivity theory, which postulates that, in old age, there is a greater emphasis on the fulfillment of emotional and social goals.

The composition of a social network has less influence on health outcomes in middle age than in old age[33,35]. In the former period, activities practiced with friends are more significant and more frequently described as sources of pleasure than activities practiced with family members. In contrast, Huxhold et al.[16] found that with increasing age, elderly persons reduce their level of social activity with relatives more than they do with friends. Informal social activities with friends were associated with the reduction of negative affect, but social and mandatory activities with family members were associated with increased negative affect[16].

Elderly persons perform fewer social activities than middle-aged adults even after controlling for health, education and partner status. These data are in line with the theory that engaging in social activities requires resources. Elderly persons are not only less healthy than middle-aged adults but also have fewer cognitive and motivational resources that enable them to engage in activities. In advanced old age, involvement with friends may be reduced due to the need for resources to maintain these relationships. On the other hand, friends who remain in the social network at more advanced ages may have been selected according to the emotional needs of the elderly persons. The nature of activities with family members may also change in old age, when the family is the main source of social support. In advanced old age, the social support of the family may become more important than the practice of leisure activities. Thus, the composition of the social network in old age is closely related to the emotional and social needs of the elderly, as well as the personal resources available[6,28,29].

The socioemotional selectivity theory argues that focusing on affectively close relationships is an important method of improving emotional well-being, and is often associated with a reduction in the size of a social network. However, this strategy may inhibit the maintenance or development of some aspects of successful aging if such reductions occur at the expense of social commitment. This possibility posits the assumption that prioritizing close relationships, decreasing network size, and maintaining close network partners is universally adaptive. Probably the most adaptive factor for development in old age is a balance of social network characteristics that offer both emotional support and adequate levels of stimulation, challenge and activity. Theoretical and empirical studies on the socioemotional selection theory indicate a need for caution regarding adopting a negative view of the decline of social engagement in old age. Kim et al.[32] argue that it is fundamental to distinguish voluntary disengagement from the forced social disengagement that is associated with psychic suffering.

The composition of the social network and the practice of social activities in the community configure social behavior, which influences the health and well-being of the elderly. It is a continuous, dynamic, complex and multifaceted process, which assumes diverse trajectories throughout life and in old age, according to personal and contextual factors. In this sense, some theoretical postulations are pertinent: a) social disengagement is the predominant process among aging individuals; b) this process is often associated with negative outcomes, so that being socially active is a way of preserving physical, cognitive and emotional abilities and functions, and avoiding death; and, c) contrastingly, this process may be the result of a selective, compensatory and adaptive process that promotes emotional well-being in old age.

The present study contributes to gerontological literature through a critical analysis of the main studies published on the topic in the last fifteen years. However, it is noted that the study of social participation in old age, especially in emerging countries, is little explored. Generally, this phenomenon integrates comprehensive concepts such as quality of life and well-being, which hinders its characterization and understanding. In this sense, the conclusions of this article must be interpreted carefully. Possibly, the trajectories described reflect the behavior of the elderly persons, which includes certain personal and contextual attributes that influence their participation in social activities. Thus, subsequent studies should explore these factors in order to understand the determinants of social participation in old age.

CONCLUSION

The most commonly described social participation trajectory in literature is the reduction of social networks and the reduction of participation in social activities, or in other words, of social disengagement, both in terms of its negative value as an intentional and adaptive selection process. The theories most present in the literature were the activity (implicitly) and socioemotional selectivity (explicitly) theories. These results point to the need for more careful reflection on what is idealized and what is practiced in terms of policies and practices to achieve successful aging. Future efforts should include not only incentives to remain active, but also factors that influence the social disengagement associated with the poor adaptation of the elderly.

The knowledge revealed by the present study can contribute to gerontological practice and research by helping researchers and professionals to understand the social behavior of the elderly.

REFERENCES

1. World Health Organization. Active Ageing: a Policy Framework [Internet]. Geneva: WHO; 2001. [acesso em 16 jan 2016]. Disponível em: http://apps.who.int/iris/bitstream/10665/67215/1/WHO_NMH_NPH_02.8.pdf.

2. Achenbaum WA, Bengtson VL. Re-engaging the disengagement theory of aging: on the history and assessment of theory development in gerontology. Gerontologist. 1994;34(6):756-63.

3. Cumming E, Henry W. Growing old. New York: Basic Books; 1961.
4. Knapp MRJ. The activity theory of aging: an examination in the English context. Gerontologist. 1977;17(6):553-9.
5. Atchley R. A Continuity Theory of Normal Aging. Gerontologist. 1989;29(2):183-90.
6. Carstensen LL. Social and emotional patterns in adulthood: support for socioemotional selectivity theory. Psychol Aging. 1992;7(3):331-8.
7. Benjamins MR, Musick MA, Gold DT, George LK. Age-related declines in activity level: the relationship between chronic illness and religious activities. J Gerontol Ser B Psychol Sci Soc Sci. 2003;58(6):377-85.
8. Hong SI, Hasche L, Bowland S. Structural relationships between social activities and longitudinal trajectories of depression among older adults. Gerontologist [Internet]. 2009 [acesso em 01 fev 2016]. 49(1):1-11. Disponível em: https://www.ncbi.nlm.nih.gov/pubmed/19362999
9. Avlund K, Lund R, Holstein BE, Due P. Social relations as determinant of onset of disability in aging. Arch Gerontol Geriatr. 2004;38(1):85-99.
10. Buchman AS, Boyle PA, Wilson RS, Fleischman DA, Leurgans S, Bennett DA. Association between late-life social activity and motor decline in older adults. Arch Intern Med [Internet]. 2009 [acesso em 01 fev 2016] 169(12):1139-46. Disponível em: https://www.ncbi.nlm.nih.gov/pubmed/19546415
11. Mendes de Leon CF, Glass TA, Berkman LF. Social engagement and disability in a community population of older adults: the New Haven EPESE. Am J Epidemiol. 2003;157(7):633-42.
12. Hughes TF, Flatt JD, Fu B, Chang CCH, Ganguli M. Engagement in social activities and progression from mild to severe cognitive impairment: the MYHAT Study. Int Psychogeriatr. 2013;25(4):587-95.
13. Saczynski JS, Pfeifer LA, Masaki K, Korf ESC, Laurin D, White L, et al. The effect of social engagement on incident dementia: the Honolulu-Asia Aging Study. Am J Epidemiol . 2006;163(5):433-40.
14. Bennett KM. Low level social engagement as a precursor of mortality among people in later life. Age Ageing. 2002;31(3):165-8.
15. Minagawa Y, Saito Y. Active social participation and mortality risk among older people in Japan: results from a nationally representative sample. Res Aging. 2015;37(5):481-99.
16. Huxhold O, Miche M, Schüz B. Benefits of having friends in older ages: Differential effects of informal social activities on well-being in middle-aged and older adults. J Gerontol Ser B Psychol Sci Soc Sci. 2014;69(3):366-75.
17. Allyn J, Siegl E, Piliavin JA. Health Benefits in the Wisconsin of Volunteering Longitudinal Study. J Health Soc Behav. 2015;48(4):450-64.
18. Donnelly EA, Hinterlong JE. Changes in social participation and volunteer activity among recently widowed older adults. Gerontologist. 2010;50(2):158-69.
19. Min J, Lee K, Park J, Cho S, Park S, Min K. Social engagement, health, and changes in occupational status: analysis of the Korean Longitudinal Study of Ageing (KLoSA). PLoS ONE. 2012;7(10):1-7.
20. Lancee B, Radl J. Social connectedness and the transition from work to retirement. J Gerontol Ser B Psychol Sci Soc Sci. 2012;67(4):481-90.
21. Sabbath EL, Lubben J, Goldberg M, Zins M, Berkman LF. Social engagement across the retirement transition among "young-old" adults in the French GAZEL cohort. Eur J Ageing. 2015;12(4):311-20.
22. Agahi N, Lennartsson C, Kåreholt I, Shaw BA. Trajectories of social activities from middle age to old age and late-life disability: a 36-year follow-up. Age Ageing. 2013;42(6):790-3.
23. Curl AL, Stowe JD, Cooney TM, Proulx CM. Giving up the keys: how driving cessation affects engagement in later life. Gerontologist. 2014;54(3):423-33.
24. Bukov A, Maas I, Lampert T. Social participation in very old age: cross-sectional and longitudinal findings from BASE: Berlin Aging Study. J Gerontol Ser B Psychol Sci Soc Sci. 2002;57(6):510-7.
25. Hank K, Erlinghagen M. Dynamics of volunteering in older Europeans. Gerontologist. 2010;50(2):170-8.
26. Chiao C, Weng LJ, Botticello AL. Social participation reduces depressive symptoms among older adults: an 18-year longitudinal analysis in Taiwan. BMC Public Health. 2011;11:1-9.
27. Fairhall N, Sherrington C, Cameron ID, Blyth F, Naganathan V, Clemson L, et al. Predicting participation restriction in community-dwelling oldermen: the Concord Health and Ageing in Men Project. Age Ageing. 2014;43(1):31-7.
28. Hoppmann CA, Gerstorf D, Luszcz M. Spousal social activity trajectories in the Australian Longitudinal Study of Ageing in the context of cognitive, physical, and affective resources. J Gerontol Ser B Psychol Sci Soc Sci [Internet]. 2008 [acesso em 23 fev 2016] 63(1): 41-50. Disponível em: https://www.ncbi.nlm.nih.gov/pubmed/18332195
29. Huxhold O, Fiori KL, Windsor TD. The dynamic interplay of social network characteristics, subjective well-being, and health: the costs and benefits of socio-emotional selectivity. Psychol Aging [Internet]. 2013 [acesso em 23 fev 2016] 28(1):3-16. Disponível em: https://www.ncbi.nlm.nih.gov/pubmed/23066804

30. James BD, Boyle PA, Buchman AS, Bennett DA. Relation of late-life social activity with incident disability among community-dwelling older adults. J Gerontol Ser A Biol Sci Med Sci. 2011;66(4):467-73.

31. Kanamori S, Kai Y, Aida J, Kondo K, Kawachi I, Hirai H, et al. Social participation and the prevention of functional disability in older Japanese: JAGES cohort study. PLoS ONE. 2014;9(6):1-10.

32. Kim JH, Kim M, Kim J. Social activities and health of korean elderly women by age groups. Educ Gerontol. 2013;39(9):640-54.

33. Kim J, Yamada N, Heo J, Han A. Health benefits of serious involvement in leisure activities among older Korean adults. Int J Qual Study Health Well-being [Internet]. 2014 [acesso em 23 fev 2016]; 9:1-9. Disponível em: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4110381/pdf/QHW-9-24616.pdf

34. Lodi-Smith J, Roberts BW. Concurrent and prospective relationships between social engagement and personality traits in older adulthood. Psychol Aging. 2012;27(3):720-7.

35. Morrow-Howell N, Putnam M, Lee YS, Greenfield JC, Inoue M, Chen H. An investigation of activity profiles of older adults. J Gerontol Ser B Psychol Sci Soc Sci. 2014;69(5):809-21.

36. Small BJ, Dixon RA, McArdle JJ, Grimm KJ. Do Changes in Lifestyle Engagement Moderate Cognitive Decline in Normal Aging? Evidence from the Victoria Longitudinal Study. Neuropsychology. 2012;26(2):144-55.

37. Zunzunegui M. Social networks, social integration, and social engagement determine cognitive decline in community-dwelling Spanish older adults. J Gerontol Ser B Psychol Sci Soc Sci. 2003;58(2):93-100.

Received: April 30, 2016
Reviewed: December 29, 2016
Accepted: March 11, 2017

http://dx.doi.org/10.1590/1981-22562017020.160102

Risk of death in elderly persons based on the frailty phenotype and the frailty index: a review study

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Abstract

Objective: to systematize studies evaluating the relationship between frailty and mortality in community-dwelling elderly persons. *Method:* Frailty was defined according to the frailty phenotype proposed by Fried et al. and the frailty index described by Rockwood et al. The study included epidemiologic population-based studies, cohort surveys, systematic reviews and meta-analyses published in English between 2006 and March 2016 based on the use of the terms: "frail elderly" and "mortality". Only study samples that exclusively comprised adults 65 years old or older who lived in the community were included. Studies investigating hospitalized and institutionalized elderly persons, and those examining the relationship between frailty and mortality through a disease-specific target were excluded. *Results:* a total of 244 studies were identified, of which 17 met the inclusion criteria. Thirteen studies used the frailty phenotype and four studies used the frailty index. *Conclusion:* both assessment measures found that frail elderly persons have a higher risk of death than robust elderly persons.

Keywords: Frail Elderly. Mortality. Review.

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INTRODUCTION

Frailty is defined as a biological state of increased vulnerability to internal and environmental stressors, due to the loss of functional reserves associated with aging[1,2]. Although it is a relatively recent concept, it has been widely discussed in Geriatrics and Gerontology in an attempt to obtain consensus on an operational definition, which may be useful for making valid predictions regarding the condition of the elderly population and the implementation of specific health care programs for this growing age category. The focus is on defining the phenomenon and establishing simple and valid measures to allow the early identification of the syndrome and the use of effective prevention and rehabilitation measures[3-6].

The first discussions about the concept of frailty occurred in the 1980s and associated the condition with the decline of physiological functions, disability, the presence of multiple diseases and death, but did not necessarily relate it to aging[7,8]. In 1991, Winograd e et al.[9] published the results of a cohort study involving 985 elderly people, investigating the relationship between adverse health outcomes and the presence of the so-called geriatric syndromes (disability, incontinence, postural instability, iatrogenesis and social isolation). The authors classified the elderly without functional loss as non-frail; those with chronic disabling diseases, depression, falls, immobility, incontinence, malnutrition, polypharmacy or sensory losses as frail, and the terminally ill or those with dementia as severely disabled. A survival analysis applied to the sample showed that those with the highest risk of death were the severely disabled and the frail.

Today, the models of frailty most used in the literature are accumulated deficit[10,11] and the frailty phenotype[12,13]. The phenotype model defines frailty as a clinical syndrome resulting from the functional decline of the physiological systems associated with aging. The main changes underlying the syndrome are neuromuscular disorders, mainly sarcopenia; dysfunction of the immune system and neuroendocrine dysregulation.

The frailty phenotype developed by Fried et al.[12] is operationalized by five criteria: a) unintentional weight loss; greater than 4.5 kg or over 5% of body weight in the last year; b) self-reported fatigue; c) reduction of hand grip strength, measured with a dynamometer and adjusted for gender and body mass index (BMI); d) low level of physical activity measured by weekly energy expenditure in kcal (based on self-reports of domestic activities and physical exercises performed), adjusted according to gender; e) low gait speed indicated by the time in seconds that the elderly person takes to travel a distance of 4.5 m in a straight line with usual gait, adjusted for gender and height. Elderly persons with three or more components of the phenotype are considered frail, and those with one or two components are classified as pre-frail[12].

The accumulated deficit model is not based on a specific set of signs and symptoms present in old age, but on the cumulative effect of age-related disorders. To characterize frailty, an index was created that represents the sum of the individual deficits present at the moment of the evaluation divided by the number of deficits considered in the protocol. The frailty index is based on the quantification of changes observed in a variety of physiological, psychological and functional conditions among the elderly, and in the search for relationships between these and adverse outcomes. The levels of frailty are expressed on a continuous scale ranging from zero to one[11,13-15].

Today, the concept of frailty is consensual among researchers[2]. However, the same cannot be said for the evaluation criteria[4]. In recent years researchers have investigated the accuracy of frailty measures for the prediction of adverse health events. The validity and reliability of frailty measures is one of the aspects still being debated in literature. Malmstrom et al.[16] compared four models, FRAIL[17], SOF[18], the frailty phenotype[12] and the frailty index[14]. The parameters were disabilities for instrumental and basic activities of daily living (IADL and BADL) and mortality, both measured over 3 and 9 years. The FRAIL, SOF, frailty phenotype and frailty index models were more effective in predicting the incidence of disability at 3 and 9 years; while the FRAIL models and the frailty index were better predictors of mortality at 9 years. In the *Korean Longitudinal Study of Aging* (KLoSHA)[19] three measures of frailty were compared: the KLoSHA model developed for the study, the SOF[18] and the frailty phenotype. The SOF model estimated the prevalence of frailty at 9.2%, the phenotype at 13.2%, and the KLoSHA model

at 15.6%. The KLoSHA model was more effective at predicting mortality and disability than the frailty phenotype; and the KLoSHA model and the phenotype were better predictors of hospitalization than the SOF. In the systematic review study carried out by Sternberg et al.[20], the main outcomes related to frailty described in literature are mortality (13.8%), functional disability in activities of daily living (7.4%) and institutionalization (6.2%). The frailty phenotype and frailty index measures exhibited moderate correlation (r=0.65)[14].

Frailty assessment measures are important tools for distinguishing individuals who are most vulnerable to adverse health events. From this perspective, the present study aimed to present the results of a literature review on the relationship between frailty and mortality in elderly residents living in the community based on the operational models of the frailty phenotype and the frailty index.

METHODS

A bibliographic review was carried out to identify articles published in the English language indexed with the descriptors "frail elderly" and "mortality". The PubMed and Scielo databases were consulted. The period of data collection and analysis was from April to July 2016. All abstracts were read, and when necessary, the full articles were identified from the descriptors. The inclusion criteria were: articles published from 2006 to March 2016; complete articles; population-based studies; longitudinal studies; systematic reviews and meta-analyzes; studies with elderly individuals aged 65 years or older resident in the community. Studies that included institutionalized and hospitalized elderly persons, as well as those with the objective of evaluating the relationship between frailty and mortality for specific diseases (example: kidney failure, heart disease) were excluded. The PRISMA Guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) were followed for this review study.

RESULTS

A total of 244 articles were initially identified, of which 17 were evaluated as they fulfilled the inclusion criteria (Figure 1). Sixteen articles corresponded to population-based longitudinal studies[18,21-35]. Of these studies, one was a review and meta-analysis[36]. Thirteen studies used the frailty phenotype as an operational model[18,21-26,30-34,36] and four used the frailty index[27-29,35]. In studies that used the frailty phenotype the samples ranged from 654 to 6724 individuals. Two studies included only women[18,23], two included only men[21,25] and the others had samples composed of both genders. Two studies based on the phenotype stratified the samples by gender[26,34] and two stratified them by age[18,21]. The sample sizes for the studies that used the frailty index ranged from 1016 to 4082 individuals. One of the studies was composed only of men[35] and the others contained men and women (Table 1).

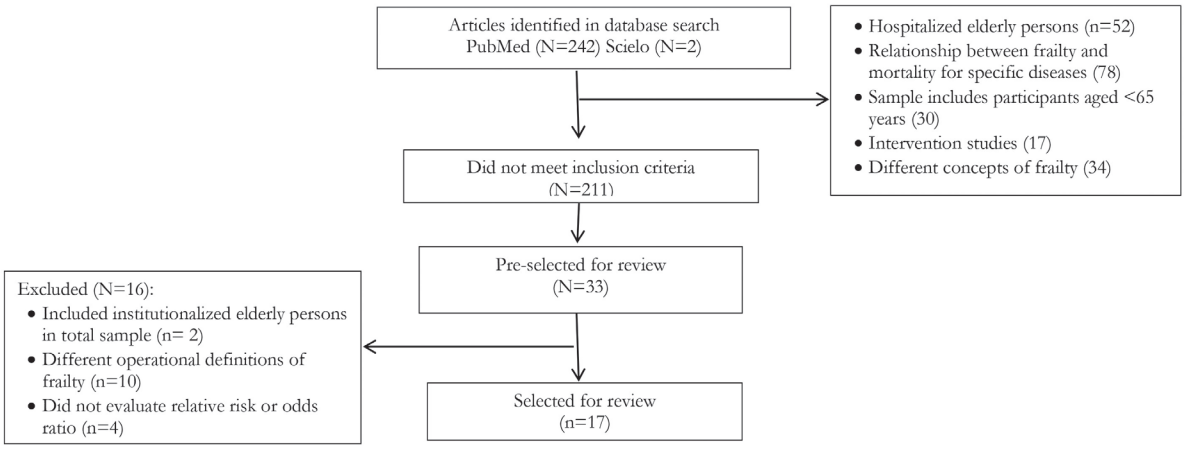

Figure 1. Flowchart of stages of selection of articles for review. São Paulo, 2016.

Table 1. Characteristics of 17 studies published between 2006 and 2016 relating to the relationship between frailty and mortality in community-dwelling elderly persons using the frailty index and frailty phenotype measures. São Paulo, 2016.

Author (year)/ country	Study	Sample (deaths)	Gender	Age	Follow-up period	Frailty measure	Relative risk (95% CI)	Control variables
Ensrud et al. (2007)[18], USA	Study of Osteoporotic Fracture (SOF)	6724 (2520)	F	≥69	9.2 (±3) years	Frailty phenotype	Total sample: Robust: 1 Pre-frail: 1.32 (1.18-1.48); Frail: 1.82 (1.56 -2.13) Subgroup: <80 years: Robust: 1 Pre-frail: 1.24 (0.97-1.58); Frail: 1.65 (1.09-2.49) ≥80 years: Robust: 1 Pre-frail: 1.59 (1.09-2.31); Frail: 1.72 (1.08-2.75)	Age; smoking; use of estrogen; schooling; history of fractures; diagnosis of stroke, diabetes, hypertension, Parkinson's disease, dementia, coronary disease, chronic obstructive pulmonary disease, and cancer (except for skin); history of falls; depressive symptoms; cognitive function; functional disability in activities of daily living; body mass index; and bone mineral density of the femoral neck
Cawthon et al. (2007)[21], USA	The Osteoporotic Fractures in Men (MrOS) Study	5993 (669)	M	≥65	4.7 years	Frailty phenotype	Total sample: Robust: 1 Pre-frail: 1.36 (1.14-1.63); Frail: 2.05 (1.55-2.72) Subgroup: <80 years: Robust: 1 Pre-frail: 1.45 (1.16-1.81); Frail: 2.46 (1.63-3.72) ≥80 years: Robust: 1 Pre-frail: 1.34 (0.99-1.80); Frail: 2.13 (1.44-3.15)	Age; Functional disability in activities of daily living; diabetes; Parkinson's; acute myocardial infarction; cardiac insufficiency; chronic obstructive pulmonary disease; cancer; postural instability; perception of health, smoking; cognitive function

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Author (year)/ country	Study	Sample (deaths)	Gender	Age	Follow-up period	Frailty measure	Relative risk (95% CI)	Control variables
Avila-Funes et al. (2008)[22], France	The Three-City Study	6078 (316)	M/F	≥65	4 years	Frailty phenotype	Robust: 1 Pre-frail: 1.14 (0.98-1.31); Frail: 1.36 (1.01-1.81)	Gender; schooling; income, smoking; alcoholism; number of chronic diseases; perception of health; CES-D (Center for Epidemiologic Studies-Depression scale) score; MMSE score; disability in basic and instrumental activities of daily living and mobility
Ensrud et al. (2008)[23], USA	Study of Osteoporotic Fracture (SOF)	6701 (2751)	F	≥69	9.6 years	Frailty phenotype	Robust: 1 Pre-frail: 1.54 (1.40-1.69); Frail: 2.75 (2.46-3.07)	Age
Graham et al. (2009)[24], USA	Hispanic Established Populations Epidemiologic Studies	1996 (892)	M/F	≥65	10 years	Frailty phenotype	Robust: 1 Pre-frail: 1.25 (1.0-7-1.46); Frail: 1.81 (1.41-2.31)	Age; Gender; marital status; body mass index; smoking; heart attack; stroke; hypertension; cancer; hip fracture; disability in basic and instrumental activities of daily living; cognitive function; depressive symptoms and perception of health
Ensrud et al. (2009)[25], USA	The Osteoporotic Fractures in Men (MrOS) Study	3132 (204)	M	≥67	3.2 (±0.5) years	Frailty phenotype	Robust: 1 Pre-frail: 1.77 (1.17–2.68); Frail: 3.51 (2.21–5.57)	Age
Berges et al. (2009)[26], USA	Hispanic Established Populations Epidemiologic Studies	1996 (892)	M/F	≥65	10 years	Frailty phenotype	Men: Robust: 1 Pre-frail: 1.46 (1.17-1.83); Frail: 3.04 (2.16-4.28) Women: Robust: 1 Pre-frail: 1.29 (1.05-1.60); Frail: 1.92 (1.39-2.65)	Age; Gender; marital status; body mass index; smoking; heart attack; stroke; hypertension; cancer; hip fracture; diabetes

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Author (year)/ country	Study	Sample (deaths)	Gender	Age	Follow-up period	Frailty measure	Relative risk (95% CI)	Control variables
García-Gonzalez et al. (2009)[27], Mexico	The Mexican Health and Aging Study	4082 (279)	M/F	≥65	710 (±111) days	Frailty Index	FI = 0-0.07: 1 FI = 0.07-0.14: 0.93 (0.58-1.50) FI = 0.14-0.21: 1.56 (1.00-2.44) FI = 0.21-0.35: 2.20 (1.42-3.41) FI >0.35: 6.45 (4.10-10.14)	Age; Gender
Lucicesare et al. (2010)[28], Italy	The Conselice Study of Brain Ageing	1016	M/F	≥65	4 years	Frailty Index	Frail (FI≥0.25): 5.26 (1.05-26.42)	Age; Gender; Conselice Study of Brain Aging Score
Song et al. (2010)[29], Canada	Canadian National Population Health Survey	2740 (1208)	M/F	≥65	10 years	Frailty Index	FI≤0.08: 1 FI≥0.25: 1.57 (1.41-1.74)	Age; Gender
Masel et al. (2010)[30], USA	Hispanic Established Populations Epidemiologic Studies	1008 (176)	M/F	≥74	2 years	Frailty phenotype	Robust: 1 Pre-frail: 0.74 (0.42-1.32); Frail: 2.72 (1.45-5.08)	Age; Gender; schooling; marital status; income; chronic diseases; smoking; body mass index
Jacobs et al. (2011)[31], Israel	Jerusalem Longitudinal cohort study	840 (194)	M/F	≥85	5 years	Frailty phenotype	Robust: 1 Pre-frail: 1.01 (0.64-1.59); Frail: 1.67 (0.96-2.09)	Gender; schooling; MMSE score; smoking; diabetes; hypertension; cardiac disease; poor perception of health; disability in basic activities of daily living
Cano et al. (2012)[32], USA	Hispanic Established Populations Epidemiologic Studies	1815 (690)	M/F	≥67	10 years	Frailty phenotype	Robust: 1 Pre-frail: 1.39 (1.17-1.64); Frail: 1.97 (1.53-2.55)	Age; gender; schooling; marital status; diabetes; myocardial infarction; stroke; cancer; hip fraction; hypertension; arthritis

to be continued

continued from Table 1

Author (year)/ country	Study	Sample (deaths)	Gender	Age	Follow-up period	Frailty measure	Relative risk (95% CI)	Control variables
Abizanda et al. (2013)[33], Spain	FRADEA	993 (105)	M/F	>70	5 years	Frailty phenotype	Robust: 1 Pre-frail: 3.4 (1.0–12.8); Frail: 5.5 (1.5-20.2)	Age; Gender; Barthel index; Chalson index
Kumala et al. (2014)[34], Finland	Geriatric Multidisciplinary Strategy for the Good Care of the Elderly	654 (173)	M/F	≥75	4 years	Frailty phenotype	Total sample: Robust: 1 Pre-frail: 1.3 (0.8-2.0); Frail: 2.7 (1.6-4.5) Subgroup: Men Robust: 1 Pre-frail: 1.4 (0.7-3.0); Frail: 2.4 (1.0-5.9) Women: Robust: 1 Pre-frail: 1.1 (0.6-1.8); Frail: 2.8 (1.5-5.3)	Age; groups (intervention v control); schooling; smoking; comorbidity index; functional capacity (Barthel index); number of medications
Chang et al. (2015)[36], Taiwan	Meta-analysis	35538 (7994)	M/F	≥65	6.5 (±3.05) years	Frailty phenotype	Robust: 1 Pre-frail: 1.33 (1.26-1.41); Frail: 2.00 (1.72-2.31)	
Armstrong et al. (2015)[35], USA	The Honolulu-Asia Aging Study	3801 (3455)	M	≥71	5 years	Frailty Index	FI≤0.05: 1 FI=0.05-0.15: 1.61 (1.36-1.91) FI=0.15-0.25: 3.24 (2.69-3.91) FI=0.25-0.35: 4.68 (3.80-5.76) FI=0.35-0.50: 5.81 (4.76-7.09) FI>0.50: 6.38 (5.29-7.69)	Age

F=Female; M=Male; CI=Confidence Interval.

DISCUSSION

Most of the studies selected for this review used the Fried frailty phenotype measure as an operational criterion. This confirms the survey conducted by Bouillon et al.[13], who carried out a review study of articles indexed in Medline under the term frailty, published between 1948 and 2011. Of a universe of 448 articles identified by the authors, studies related to the derivation of evidence of reliability and validity for frailty measurements were selected. In a universe of 150 articles that fulfilled this criterion, 69% used the frailty phenotype model of Fried et al.[12], 12% used the frailty index[11] and 19% adopted the remaining 25 instruments. The two frailty measures were the only ones that had their criteria validated in more than three samples, in addition to the participants of the original studies.

Frail elderly persons had worse survival rates than the robust elderly. According to Shamlyian et al.[37], the increase in relative risk for mortality in the frail elderly is 50% based on the frailty phenotype, and 15% according to the cumulative deficit model. The risk rises according to the number of criteria of the frailty phenotype and the number of accumulated deficits. However, in some studies that used the frailty phenotype, no relationship was found between the pre-frailty condition and mortality[22,31,34]. Different environmental contexts can influence health variability and outcomes in the elderly population.

In a study by Avila-Funes et al.[22] there was a higher prevalence of older women, with a greater number of chronic diseases, more depressive symptoms, worse health perception and lower MMSE scores among elderly persons classified as frail than among pre-frail and robust elderly individuals. The accumulated mortality in the four-year period was 11.5% for the frail, 5.5% for the pre-frail and 4.4% for the robust. In univariate analysis, the frail had a higher risk of death than robust individuals. However, when the analysis model was adjusted by sociodemographic variables, health conditions and functional capacity, the frailty phenotype measure lost statistical significance in the prediction of a risk of mortality (OR=1.14, 95% CI=0.98-1.31). There was no relationship between the pre-frailty and mortality condition in both models. In the study by Kulmala et al.[34] multivariate analysis showed that the mortality risk estimate was positive only for the frail.

Similar results were found in the Jerusalem Longitudinal Cohort Study. Jacobs et al.[31] evaluated the impact of frailty and cognitive decline on the survival of 840 community dwelling individuals aged 85 years and over. The frail corresponded to 19.5% of the total sample, pre-frail individuals to 56%, and robust individuals to 24.5%. In five years, there were 194 deaths (23.4%). Mortality rates among the frail, pre-frail and robust elderly were 44.5%, 20.4%, and 13.6%, respectively. According to the Kaplan-Meier analysis, the survival curve was lower for the frail, regardless of cognitive status. In the gender-adjusted model, the risk for mortality was higher for both the frail (RR=4.52) and pre-frail (RR=1.63) than for the robust elderly. The risk for mortality remained only for the frail when socio-demographic variables, Mini Mental State Exam (MMSE) score, smoking, health conditions and functionality were added to the model.

Cano et al.[32] evaluated a cohort sample of 1815 elderly people, aiming to investigate the relationship between frailty, cognitive decline and mortality. Three adjustment models were used in Cox regression analysis. In the first model, the elderly with cognitive decline had a 1.26 higher risk of death than those with preserved cognitive function, after adjusting for sociodemographic variables and health conditions. The next model showed that the frail and pre-frail had a higher risk for mortality than robust individuals (RR=2.03 and RR=1.40, respectively) after controlling for socio-demographic variables and health conditions. In the third model, in which cognitive decline and frailty were grouped, being frail and pre-frail remained a risk factor for mortality although the magnitude of the effect was lower (RR=1.97 and RR=1,39, respectively). No statistically significant associations were found between cognitive decline and frailty.

In Frailty and Dependence in Albacete (FRADEA) the risk of death among frail elderly persons was five times higher than among the non-frail; Among the pre-frail, the risk was three times higher than that observed for robust individuals[33]. Similar results

were observed in the longitudinal study Hispanic Established Populations Epidemiologic Studies (EPESE). According to the baseline classification of the study, in the robust elderly the survival rate was 73%, while 61% of pre-frail and 27% of frail individuals survived the 10-year follow-up period. In multivariate regression analysis, both pre-frail and frail individuals had a higher risk of death than robust individuals[24].

Remaining with the EPESE, researchers investigated the effect of quality of life on the association between frailty phenotype and survival of the elderly. The study consisted of 1008 subjects, of whom 176 died within two years of baseline measurement. Compared to being robust, being frail increased the risk of mortality 2.7 times. When the items that make up the physical domain of the Medical Outcomes Study (MOS) Short Form-36 (SF-36) were added to the analysis model, the risk for mortality was reduced from 2.7 to 1.6. This difference was not found when the mental health components of the scale were added[30].

In the meta-analysis of Chang and Lin[36] both frailty and pre-frailty were risk factors for mortality. The risk increased substantially as the elderly moved from the robust to the pre-frail category. The study by Fried et al.[12] showed that the elderly classified as frail by the indicators of the frailty phenotype had a greater number of chronic conditions, including cardiovascular diseases, pulmonary disease and diabetes, than robust individuals. Garcia-Garcia et al.[38] observed a strong association between frailty and cardiovascular diseases (coronary disease, stroke and peripheral arterial disease). These data suggest that frailty and comorbidities may have associated etiologies, exposing the individual to a condition of greater vulnerability to adverse health events.

Some of the studies selected for this review investigated the relationship between frailty and mortality, considering the gender variable. In the Study of Osteoporotic Fractures (SOF)[18], 6724 elderly women were evaluated to investigate the predictive capacity of the frailty phenotype in relation to negative health events (recurrent falls, fractures and mortality). Mortality data was obtained through four-month consultations and confirmed by death certificates for approximately nine years. During this period there were 2520 deaths. Cox regression analysis showed that the elderly women classified as pre-frail and frail had a 1.3 and 1.8 times greater risk of mortality, respectively, than women classified as robust.

Subsequently, the SOF23 researchers compared the frailty phenotype with the SOF index, which characterizes frailty by the presence of two or more of the following: unintentional weight loss equal to or greater than 5% of body weight in the previous year; inability to stand up from a chair five times without using arms for support, and fatigue assessed by a depression screening scale, indicated by the statement that on three or more days in the previous week the elderly had difficulty with or failed to perform their usual tasks. Compared to the non-frail elderly, women defined as frail by the phenotype had a 2.37 times greater risk of mortality, while pre-frail women had a 1.44 greater risk. Both models were sensitive for the detection of vulnerability to adverse health events.

In the Osteoporotic Fractures in Men Study, one of the objectives of Cawthon et al.[21] was to validate the frailty phenotype measurement for the prediction of mortality in a sample composed of American men aged 65 years and over. At baseline, 56% of the participants were classified as robust; 40% as pre-frail and 4% as frail. In multivariate analysis, the risk of death of frail elderly persons was twice as high as in robust individuals. Pre-frail individuals had a 36% higher risk of death than robust elderly men. In comparative analysis with the SOF index, the use of the indicators of the frailty phenotype resulted in a three times greater risk of death for frail men than non-frail men[25].

In the Geriatric Multidisciplinary Strategy for the Good Care of the Elderly (GeMS)[34] the objectives were to investigate whether there were differences between men and women regarding the relationship between frailty and mortality, and to evaluate the effect of changes in frailty status on the incidence of death. In total, there were 173 deaths (27%) in four years of follow-up. The mortality rate per 100 people was 20 for frail individuals (20 men and 21 women); six for pre-frail (9 men and 5 women); and four for robust (3 men and 4 women). Among those who died, there was a higher prevalence of older elderly persons, who used more medications, were smokers, had more chronic diseases, greater body mass indexes and worse functional capacity. In Kaplan-Meier

survival analysis, cumulative mortality was higher at baseline for both men and women classified as frail than for pre-frail or robust individuals. Among pre-frail men, cumulative mortality was higher than among pre-frail women.

Also in the GeMS study[34], regression analysis showed that being frail at baseline increased the risk for mortality, both in the model adjusted for age and when the other control variables were included (sociodemographic, intervention versus control, smoking, comorbidities, number of medications, and functional capacity in basic and instrumental activities of daily living). The association was stronger for women, even after adjusting for the control variables. In pre-frail and frail men, the highest risk of death was observed only in the age-adjusted model. Two years later, the participants were submitted to a second evaluation stage. The authors observed that the change from robust to pre-frail (RR=8.1, 95% CI 2.0-32.5), and from pre-frail to frail (RR=3.6, 95% CI 1.4-9.1) resulted in an increased risk of mortality. In stratification by sex, the highest risk of death was observed in men who were robust at baseline and changed to frail within two years (RR=8.0; 95% CI 1.3-48.2); and for pre-frail men and women who changed to frail (Men: RR=6,1; 95% CI 1.6-23.7; Women: RR=4.2; 95% IC 1.3-13.1)[34]. In the study by Berges et al.[26], both frail men and frail women had a higher risk of death. However, this association was more robust in men than in women. Data from the survey by Chang and Lin[36] suggest that the risk of death is higher for men, both frail and pre-frail.

Only two studies based on the frailty phenotype stratified the samples by age, using the age of 80 as the cut-off point for analysis. The results showed that frail and pre-frail elderly in both age categories had a higher risk of death than robust individuals[18,21]. For Chang and Lin[36] further studies will be needed to determine a cutoff point for age that separates elderly persons with a higher and lower risk of death.

Four studies evaluated the power of the frailty index to predict mortality. García-González et al.[27] studied 34 variables related to signs, symptoms, diseases and disabilities in the construction of the index. The mean frailty index was 0.16±0.11 with a range from 0 to 0.65. In the period of 710 days there were 279 deaths among the 4082 elderly people involved in the study. The risk for mortality was 2.2 times higher for elderly persons with scores between 0.21 and 0.35, and 6.4 times higher for those with scores above 0.35, compared to elderly persons with lower scores in the frailty index. For men, the risk of death was higher among those who scored above 0.21. For women, the risk was higher among those who scored above 0.35. The increase in age corresponded to a 5% increase in the risk of death.

Lucicesare et al.[28] compared the validity of the frailty index described by Rockwood et al.[14] and the score used in The Conselice Study of Brain Aging (CSBA), which consists of seven variables (physical activity, instrumental activities of daily living, sensory deficits, gait and balance, calf circumference, and perception of health). A total of 43 variables were used to make up the frailty index, with a cutoff point >0.25. In the multivariate regression analysis the frailty index of Rockwood et al.[14] was a more robust predictor of mortality than the frailty score used in the CSBA, irrespective of gender and age.

The study by Song et al.[29] also used the accumulated deficit model as an operational measure of frailty. The authors evaluated the prevalence of frailty and the validity of the measure in the prediction of negative health events. The survey involved 2740 elderly Canadians who were monitored for 10 years. The mean values of the frailty index were 0.004 (±0.003) for robust elderly persons (FI<0.08), 0.156 (±0.004) for the pre-frail (0.08-0.24), and 0.310 (±0.008) for elderly persons classified as frail (≥0.25)]. The mean value of the frailty index was higher among elderly persons who died (0.195±0.135) than in the survivors (0.119±0.102). The probability of survival of the frail elderly was 27% versus 70% of those considered robust at the baseline of the study. The analysis of the area under the curve (AUC) in the time period showed high specificity of this measure for the prediction of mortality in 10 years.

In the Honolulu-Asia Aging Study, 3801 elderly persons were monitored for 20 years and underwent periodic evaluations every two or three years. The aim was to evaluate the maximum score that each individual achieved in the frailty index by the time of their deaths. There was a moderate increase in the mean value of the frailty index ranging from 0.14 at baseline to 0.22 at the final assessment. The maximum score achieved was 0.65. The mean age

of the final stage was 90.9 years. The accumulated mortality in 20 years was 90.9% over the total sample. Higher frailty index values resulted in a lower survival rate. Over the five-year period the relative risk for mortality in the group composed of the frailest elderly persons was six times higher than among robust elderly individuals. Age also accounted for the increased risk for mortality in this sample. Older people aged 80 years of age and with a frailty index between 0.35 and 0.50 were associated with a risk of death three times greater than those aged 70 years with scores <0.05[35].

In this bibliographic review no complementary searches were carried out on the selected articles with the aim of tracking references that could add to the scientific evidence gathered. Only English studies were selected. Data collection was based on PRISMA guidelines for bibliographic review studies. However, the present study was limited to presenting the quantitative data of the selected studies[39,40]. Most of the studies were conducted in developed countries, and it is known that the indicators of frailty can vary due to the environmental context. There is therefore a need for studies involving elderly people in developing countries with the objective of validating operational models of frailty.

CONCLUSION

Frailty assessment measures provide important clinical information on the survival of elderly residents in the community. Both the measures of frailty assessed in the present study are able to predict mortality. Older people are at a higher risk of death than younger people. The risk of death is higher for men than for women. This result illustrates the so-called paradox of morbidity and mortality, in which, despite presenting worse health conditions, women have better survival rates than men. There is evidence of a need for a gender-based approach to health conditions and death in aging.

The phenotype model defines frailty as a clinical syndrome indicated by specific signs and symptoms. It distinguishes between the frailty of illnesses and disabilities, and has demonstrated reproducibility in different environmental contexts. The use of phenotypic models may help with the comparison of different cohorts, as well as the identification of correlates of frailty. It is important to understand the relationship between biological, clinical and environmental factors in the etiology of frailty.

The frailty index model is based on the accumulation of deficits that result in frailty. The number of deficits, however, do not constitute a clinical syndrome. The measure is sensitive for the identification of individuals who are most vulnerable to negative outcomes, as it uses a gradual scale of risk stratification. However, there is still no consensus on the cutoff point for classifying frailty based on this model. The data from studies show that higher scores on the frailty index are associated with negative health outcomes. However, further studies are needed to investigate the interaction of deficits in different environmental contexts. It is well known that some items that make up the index have a causal relationship with death, such as cardiovascular diseases and cancer. It is necessary to identify the weight of each variable in relation to the frailty indicated by the index and mortality.

Measures to assess frailty can assist in the development of actions of intervention. Changes in frailty status should also be considered when planning care for the elderly, as these changes may indicate a rapid decline in health status and greater vulnerability to adverse events.

REFERENCES

1. Walston JD, Hadley EV, Ferrucci L, Guralnik JM, Newman AB, Studenski SA, et al. Research agenda for Frailty in older adults: toward a better understanding of physiology and etiology: summary from the American Geriatrics Society/National Institute on Aging Research Conference on Frailty in older adults. J Am Geriatr Soc. 2006;54(6):991-1001.
2. Morley JE, Vellas B, Van Kan A, Anker SD, Bauer JM. Frailty consensus: a call for action. J Am Med Dir Assoc. 2013;14:392-7.
3. Fairhall N, Langron C, Sherrington C, Lord SR, Kurrle S, et al. Treating frailty : a practical guide. BMC Med. 2011;9:83.

4. Rodriguez-Mañas L, Féart C, Mann G, Viña J, Chatterji S. Searching for an operational definition of frailty: a Delphi method based consensus statement. The frailty operational definition consensus conference project. J Gerontol Ser A Biol Sci Med Sci. 2013;68(1):62-7.

5. Kelaiditi E, Van Kan A, Cesari M. Frailty: a role of nutrition and exercise. Curr Opin Clin Nutr Metab Care. 2014;17(1):32-9.

6. Turner G, Clegg A. Best practice guidelines for the management of frailty: a British Geriatrics Society, Age UK and Royal College of General Practitioners report. Age Ageing. 2014;43:744-77.

7. Woodhouse KW, Wynne H, Baillie S, James OFW, Rawlins MD. Who are the frail elderly? Q J Med. 1988;68(255):505-6.

8. Markle-Reid M, Browne G. Conceptualizations of frailty in relation to older adults. J Adv Nurs. 2003;44(1):58-68.

9. Winograd CH, Gerety MB, Chung M, Goldstein MK, Dominguez Jr F, Vallone R. Screening for frailty: criteria and predictors of outcomes. J Am Geriatr Soc. 1991; 39(8):778-84.

10. Rockwood K, Fox RA, Stolle P, Robertson D, Beattie L. Frailty in elderly people: an evolving concept. Can Med Assoc J. 1994;150(4):489-95.

11. Mitnitski AB, Mogilner AJ, Rockwood K. Accumulation of deficits as a proxy measure of aging. Sci World J. 2001;1(8):323-36.

12. Fried LP, Tangen C, Walston J, Newman AB, Hirsch C, Gottdiener J, et al. Frailty in older adults: evidence for a phenotype. J Gerontol Ser A Biol Sci Med Sci. 2001;56(3):146-56.

13. Bouillon K, Kivimaki M, Hamer M, Sabia S, Fransson EI, Singh-Manaoux A, et al. Measures of frailty in population based studies: an overview. BMC Geriatr. 2013;13:64.

14. Rockwood K, Andrew M, Mitnitski A. Comparison of two approaches to measuring frailty in elderly people. J Gerontol Ser A Biol Sci Med Sci. 2007;62(7):738-43.

15. Searle SD, Mitnitski AB, Gahbauer EA, Gill TM, Rockwood K. A standard procedure for creating a frailty index. BMC Geriatr. 2008; 8:1-10.

16. Malmstrom TK, Miller DK, Morley JE. A comparison of four frailty models. J Am Geriatr Soc. 2014;62:721-6.

17. Morley JE, Malmstrom TK, Miller DK. A simple frailty questionnaire (FRAIL) predicts outcomes in middle aged African Americans. J Nutr Health Aging. 2012;16(7):601-8.

18. Ensrud KE, Ewing SK, Taylor BC, Fink HA, Stone KL, Cauley JA, et al. Frailty and risk of falls, fracture, and mortality in older women: the study of osteoporotic fractures. J Gerontol Ser A Biol Sci Med Sci. 2007;62(7):744-51.

19. Jung HW, Kim SW, Ahn S, Lim JY, Han JW, KiM TH, et al. Prevalence and outcomes of frailty in Korean elderly population: comparison of a multidimensional frailty index with two phenotype models. PLoS ONE. 2014;9(2):1-8.

20. Sternberg SA, Schwartz AW, Karunananthan S, Bergman H, Clarfield AM. The identification of frailty: a systematic literature review. J Am Geriatr Soc. 2011;59(11):2129-38.

21. Cawthon PM, Marshall LM, Michael Y, Dam TT, Ensrud KE, Barrett-Connor E, et al. Frailty in older men: prevalence, progression, and relationship with mortality. J Am Geriatr Soc. 2007;55(8):1216-23.

22. Ávila-Funes JA, Helmer C, Amieva H, Barberger-Gateau P, Le Goff M, Ritchie K, et al. Frailty among community-dwelling elderly people in France: the Three-City Study. J Gerontol Ser A Biol Sci Med Sci. 2008;63(10):1089-96.

23. Ensrud KE, Ewing SK, Taylor BC, Fink HA, Cawthon PM, Stone KL, et al. Comparison of 2 frailty indexes for prediction of falls, disability, fractures, and death in older women. Arch Intern Med. 2008;168(4):382-9.

24. Graham JE, Snih SA, Berges IM, Ray LA, Markides KS, Ottenbacher KJ. Frailty and 10-year mortality in community-living Mexican American older adults. Gerontology. 2009;55(6):644-51.

25. Ensrud KE, Ewing SK, Cawthon PM, Fink HA, Taylor BC, Cauley JA, et al. A comparison of frailty indexes for the prediction of falls, disability, fractures, and mortality in older men. J Am Geriatr Soc. 2009;57(3):492-98.

26. Berges IM, Graham JE, Glenn VO, Markides KS, Ottenbacher KJ. Sex differences in mortality among older frail Mexican Americans. J Womens Health. 2009;18(10):1647-51.

27. García-González JJ, García-Peña C, Franco-Marina F, Gutiérrez-Robledo LM. A frailty index to predict the mortality risk in a population of senior Mexican adults. BMC Geriatr. 2009;9:1-8.

28. Lucicesare A, Hubbard RE, Fallah N, Forti P, Searle SD, Mitnitski A, et al. Comparison of two frailty measures in the Conselice Study of Brain Ageing. J Nutr Health Aging. 2010;14(4):278-81.

29. Song X, Mitnitski A, Rockwood K. Prevalence and 10-year outcomes of frailty in older adults in relation to deficit accumulation. J Am Geriatr Soc. 2010;58(4):681-7.

30. Masel MC, Ostir GV, Ottenbacher KJ. Frailty, mortality, and health-related quality of life in older Mexican Americans. J Am Geriatr Soc. 2010;58(11):2149-53.

31. Jacobs JM, Cohen A, Ein-Mor E, Maaravi Y, Stessman J. Frailty, cognitive impairment and mortality among the oldest old. J Nutr Health Aging. 2011;15(8):678-82.

32. Cano C, Samper-Ternent R, Al Snih S, Markides K, Ottenbacher KJ. Frailty and cognitive impairment as predictors of mortality in older Mexican Americans. J Nutr Health Aging. 2012;16(2):142-7.

33. Abizanda P, Romero L, Sánchez-Jurado PM, Martínez-Reig M, Gómez-Arnedo L, Alfonso SA. Frailty and mortality, disability and mobility loss in a Spanish cohort of older adults: the FRADEA study. Maturitas. 2013;74(1):54-60.

34. Kulmala J, Nykänen I, Hartikainen S. Frailty as a predictor of all-cause mortality in older men and women. Geriatr Gerontol Int. 2014;14(4):899-905.

35. Armstrong JJ, Mitnitski A, Launer LJ, White LR, Rockwood K. Frailty in the Honolulu-Asia Aging Study: deficit accumulation in a male cohort followed to 90% mortality. J Gerontol Ser A Biol Sci Med Sci. 2015;70(1):125-31.

36. Chang SF, Lin PL. Frailty phenotype and mortality prediction: a systematic review and meta-analysis of prospective cohort studies. Int J Nurs Stud. 2015; 52:1362-74.

37. Shamlyian T, Talley KM, Ramakrishnan R, Kane R. Association of frailty with survival: a systematic literature review. Ageing Res Rev. 2013; 12(2):719-36.

38. Garcia-Garcia FJ, Avila GG, Alfaro-Acha A, Amor Andres MS, De Los Angeles De La Torre Lanza M, Escribano Aparicio MV, et al. The prevalence of frailty syndrome in an older population from Spain. The Toledo Study for Healthy Aging. J Nutr Health Aging. 2011;15(10):852-56.

39. Walston JD, Bandeen-Roche K. Frailty: a tale of two concepts. BMC Med. 2015;13:1-8.

40. Theou O, Brothers TD, Rockwood MR, Haardt D, Mitnitiski A, Rockwood K. Exploring the relantioship between national economic indicators and relative fitness and frailty in middle-aged and older Europeans. Age Ageing. 2013;42(5):614-9.

Received: June 09, 2016
Reviewed: January 14, 2017
Accepted: March 30, 2017

http://dx.doi.org/10.1590/1981-22562017020.160053

Care and management demands of long-term care facilities for the elderly in Brazil: an integrative review (2004-2014)

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Abstract

Objective: to analyze the care and management demands of Long-Term Care Facilities for the Elderly (LTCFs) in Brazil. *Method*: an integrative review of literature was carried out, organized into six stages: a) elaboration of a guiding question; b) online search of LILACS, SciELO, PubMed, the CAPES Portal and the Brazilian Society of Geriatrics and Gerontology databases; c) article selection, following the exclusion and inclusion criteria, with the sample composed of 17 articles; d) commented analysis of the selected articles; e) deliberation on the results obtained, formulated from the synthesis and interpretation of the selected studies; f) presentation of the results of the review. *Results:* the care demands identified are related to the process of caring and assume a working team with geriatric and gerontological knowledge, while the management demands include the means and resources needed so the care can be provided effectively. However, the LTCFs were found to rely on professionals who are unprepared to provide care or to assume an organizational management role, meaning care for the elderly is restricted to the essentials for their basic needs. *Conclusion:* the care demands were easily identified in the analyzed publications, however, there is a lack of research that evaluates management demands in a broader and more in-depth manner. It is suggested that studies aiming to broaden theoretical knowledge of the care and management demands of LTCFs are carried out, to stimulate effective and positive actions in the practices of these institutions, seeking to offer top quality care to elderly persons that live in these facilities, that responds to the real needs of their current stage of life.

Keywords: Homes for the Aged. Health Management. Institutionalized Elderly.

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Research funding: State of Minas Gerais Research Support Foundation (FAPEMIG).

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INTRODUCTION

The growth of the elderly population has resulted in uncertainty in relation to the care provided to elderly persons, as aging takes place in a context of socioeconomic and cultural changes to the value systems and family arrangements of elderly persons[1]. In addition, longevity is not synonymous with healthy aging, as it may be accompanied by an increase in chronic-degenerative diseases and functional and/or cognitive disabilities, requiring a third party to take responsibility for the required care[2].

Such care was traditionally largely attributed to women, but due to a greater insertion in the labor market they now encounter difficulties in reconciling their roles, which include providing care for the elderly. The meeting of such needs in the family context has therefore been hampered, either by the unavailability of a family member, or by family conflicts and/or the absence of a caregiver in the home of the elderly persons[2,3]. As a result of these developments, which are a major concern for society, residence in Long Term Care Facilities for the Elderly (LTCFs) has emerged as an alternative to be considered.

Even though Brazilian laws guarantee the rights of elderly persons in their family and the community, many depend on the care offered by LTCFs, defined, according to the resolutions of the Agência Nacional de Vigilância Sanitária (the National Agency of Sanitary Surveillance) (ANVISA)[4], as "governmental or non-governmental institutions of a residential nature, intended to provide the collective domicile of persons aged 60 or over, with or without family support, in conditions of freedom, dignity and citizenship". As they are institutions for the elderly population, it is essential to understand their possible care and management demands.

Demand, in the context of care, is understood as the "*quantum* of a given product or service that is collectivity required or sought, or which, by means of forecasts, it is estimated that will be required and sought by a certain date"[5]. Care consists of the "assiduity in the accompaniment of an individual and providing them with care"; as well as "a set of activities of care to those in need, carried out by specialized organizations or institutes"[5].

In addition to care demands, LTCFs have management needs which are specific to the services offered by these institutions, as well as potential particularities in the management of this type of organization. Management is taken here to mean the "action of managing, directing or administering"[5] an institution.

In this context, there is a tendency for the need for LTCFs to increase in the near future, meaning greater knowledge of the reality of these institutions, and how they organize themselves to meet the requirements of elderly persons, is vital. Thus, the question that guided the present study was: "What are the care and management demands of LTCFs?". The objective of the research was therefore to analyze the care and management demands of LTCFs, in the period 2004-2014.

METHOD

In view of the proposed objective, which was to analyze the care and management demands of LTCFs in the period 2004-2014, an integrative literature review was carried out. This method consists of the synthesis of the knowledge and the incorporation of the applicability of results of significant studies in this area[6]. Thus, the present review was divided into six stages, as recommended by literature[6].

In the first stage, the guiding question of the study, presented in the Introduction, was elaborated. The second stage consisted of a search of publications. Before beginning, a consultation was made of the Descriptors in Health Sciences (DeCS), provided by the Virtual Health Library (VHL) portal, and "LTCF", "Administration of Human Resources in Health", "Quality Management", "Health Management", "Management Indicators", "Clinical Governance" and "Health Manager" were adopted as search items.

The searches of the databases were carried out in the first six months of 2015. The following online sources were used: Literatura Latino-Americana e do Caribe em Ciências de Saúde (Latin American and Caribbean Health Sciences Literature) (LILACS), Scientific Electronic Library Online (SciELO), Biblioteca Virtual em Saúde (the Virtual Health Library) (BVS–BIREME), the US National Library

of Medicine and National Institutes of Health (PubMed/NCBI) and the Publications Portal of the Centro de Aperfeiçoamento do Pessoal de Nível Superior (the Center for the Improvement of Higher Education Personnel) (CAPES). The portal of the Sociedade Brasileira de Geriatria e Gerontologia (the Brazilian Geriatrics and Gerontology Society) (SBGG) was also consulted.

In the third stage, the publications of interest for the study were selected. The following inclusion criteria were applied: articles with abstracts and complete texts available in the data sources consulted, in Portuguese, English and Spanish, published between 2004 and 2014. The definition of the period was based on the dates of the main legislation related to the care of the elderly and the functioning of LTCFs in Brazil, especially the International Plan of Action on Aging of the United Nations (UN) and Collegiate Board of Directors Resolution (RDC) n. 283 of ANVISA[4], in 2005.

At first, only the descriptor "Long Term Care Facility for the Elderly" was used, allowing an overview of all the types of study involving LTCFs in Brazil. In this stage, the SciELO database was included, in which 60 articles were identified, while the BVS search identified 11,885 publications, giving a total of 11,945 studies. After applying the inclusion criteria, 110 publications were obtained.

Subsequently, this descriptor was crossed with the others, using the "and" descriptor or the "or" descriptor, thus refining the scope of this review. Data were classified by data sources: 60 publications in SciELO, 110 in Lilacs, four in BVS, six in PubMed, 37 in the Capes Portal and seven in the SBGG Portal, with 224 publications selected in this stage.

The fourth step was devoted to the critical analysis of the 224 studies. This was carried out rigorously and, to continue the selection of the publications, a careful reading was performed in search of evidence related to the guiding question of the research, considering title and summary. Theses, dissertations and monographs were excluded in order to ensure the uniformity of studies. In order to identify the properties of the articles that composed the review, the TREND Statement evaluation instrument was applied. This is a checklist composed of 59 criteria distributed in five sections: title and abstract; introduction; methodology; results; discussion, and the expertise of the authors in the subject. It was verified that 70.4% of the articles considered topics related to the title and abstract section; 88.25%, the largest percentage, dealt with the topics of the introduction section; 58.8% covered the topics of the methodology section of the checklist; 53.6% met the criteria related to results; while 80.4% of the articles met the requirements of the discussion section of the evaluation instrument.

A total of 56 articles were identified in this phase. However, it was found that some were duplicates, and these were removed. With a new, careful re-reading of the abstracts and a reading of the introductions of the articles, the 17 articles that composed the present review were selected.

The fifth stage was devoted to the discussion of the results, elaborated from the synthesis and interpretation of the 17 selected studies. The central ideas of the authors and their studies were demarcated and/or underlined, aiming at a better understanding and elaboration of the synoptic framework. This enabled the organization and presentation of the data, including: title of the article, authors, periodical/year of publication, objective/participants/sample of the study, and the type of care and/or managerial demands identified.

The sixth stage included the clear and complete presentation of the review, which was carried out, as recommended by the literature, in order to reach the objectives proposed by the authors and the critical evaluation of the results by the reader[6].

RESULTS

The articles were inserted in the synoptic table, presented below, according to the year of publication, from the most recent to the oldest.

Table 1. Synoptic table of articles that comprised the integrative review, 2015

Articles and Authors	Publication and Year	Objective and Participants/Study Sample	Care and/or management demands identified and type of LTCF.
Degree of dependence of elderly persons resident in Long Term Care Facilities. Marinho et al.[7]	Revista Gaúcha de Enfermagem (Gaúcha Nursing Journal) 2013	Identify the degree of dependence of institutionalized elderly persons. 125 elderly persons resident in three LTCFs /Montes Claros, Minas Gerais.	Care. Non-profit LTCF*.
Satisfaction of elderly persons and nursing professionals with care provided in a LTCF. Castro et al.[8]	Journal of Research Fundamental Care (On-line) 2013	Identify the level of satisfaction of elderly persons with the quality of health care provided by nursing professionals and the level of satisfaction of these professionals with the activities they perform. 23 elderly persons and eight nursing professionals from an LTCF/ Maringá, Paraná.	Care and management. Type of LTCF not described.
Indicators of institutionalization of elderly persons: study of cases and controls. Del Duca et al.[9]	Revista de Saúde Pública (Public Health Journal) 2012	Identify the indicators and causes of the institutionalization of elderly persons. 991 elderly persons, 393 of whom were institutionalized in 24 LTCFs and 598 non-institutionalized elderly persons /Pelotas, Rio Grande do Sul.	Care. LTCFs registered with Sanitary Surveillance. Type not described.
Perception of health professionals regarding the care of institutionalized elderly people. Piexak et al.[10]	Revista Brasileira de Geriatria e Gerontologia (Brazilian Journal of Geriatrics and Gerontology) 2012	Identify the meaning that health professionals attribute to the care of institutionalized elderly people. 14 health professionals: nurses, pharmacist, physiotherapist, physician, nutritionist and nursing technicians of an LTCF/in the central region of the state of Rio Grande do Sul.	Care. Type of LTCF not described.
Evaluation of Long Term Care Facilities for elderly persons in the city of Olinda, Pernambuco. Angelo et al.[11]	Revista Brasileira de Geriatria e Gerontologia (Brazilian Journal of Geriatrics and Gerontology) 2011	To analyze the organization and functioning of an LTCF, through the application of a specific instrument of Sanitary Surveillance, prepared in 2007, verifying that the institutions comply with the regulations of the Ministry of Health. Seven private, public and charitable LTCFs /Olinda, Pernambuco.	Management. Charitable, public and private LTCFs.
Structural linkages of Long Term Care Facilities for the Elderly with surrounding societal systems. Creutzberg et al.[12]	Revista Gaúcha de Enfermagem (Gaúcha Nursing Journal) (Online) 2011	Analyze how the internal organizational system of the LTCF maintained structural linkages with surrounding societal systems. Six LTCFs from three regions of Brazil (South, Southeast and Northeast).	Management. LTCFs serving low income elderly persons. Type of LTCFs not described.

to be continued

continued from Table 1

Articles and Authors	Publication and Year	Objective and Participants/Study Sample	Care and/or management demands identified and type of LTCF.
Structural alterations in a Long Term Care Facility for the Elderly aimed at the prevention of falls. Santos et al.[13]	Revista Rene de Fortaleza (Northeast Network Nursing Journal) 2011	Propose alterations to the physical structure of the LTCF, with the aim of preventing falls among elderly residents. One LTCF / Rio Grande do Sul.	Care and Management. Charitable LTCF.
Research in LTCF: necessary and possible contributions. Creutzberg and Gonçalves[14]	Revista Brasileira de Geriatria e Gerontologia (Brazilian Journal of Geriatrics and Gerontology) 2010	To identify the structural linkages of the LTCF with the scientific system, through the perception of directors on research in these settings, observing the communication and the resonances in the institution. Seven directors of three LTCFs / Porto Alegre, Rio Grande do Sul.	Management. Public and private non-profit LTCFs.
Hospitalization and associated factors among residents of Long Term Care Facilities for the Elderly. Del Duca et al.[15]	Caderno de Saúde Pública (Public Health Notebook) 2010	To assess the prevalence of hospital admissions in a one-year period and associated factors based on a census among LTCF residents. 466 elderly persons from 24 LTCF/ Pelotas, Rio Grande do Sul.	Care and Management. LTCFs registered with Sanitary Surveillance. Type of LTCF not described.
Process of care in Long Term Care Facilities: view of formal caregivers of elderly persons. Ribeiro et al.[16]	Revista Brasileira de Enfermagem (Journal of Brazilian Nursing) 2009	Evaluate the care provided in charitable and private LTCFs, according to the elderly person/ caregiver relationship, their training, satisfaction, difficulties with the role and activities performed. 181 caregivers of elderly persons/ Belo Horizonte, Minas Gerais.	Care. Charitable and private LTCFs.
Residences for older adults: basic criteria for suitable choices. Vergara RS.[17]	Revista do Hospital das Clínicas da Universidade do Chile (Journal of Clinical Hospital of University of Chile) 2008	Indicate basic factors to be considered in the selection and choice of LTCFS. Carried out with official data from the Ministry of Health of Chile, relating to LTCFs in that country.	Care. Type of LTCF not described.
Long Term Care Facilities for the Elderly: the image that remains. Creutzberg et al.[18]	Texto e Contexto Enfermagem (Nursing Text and Context) 2008	Identify the structural linkages of the LTCFs with the societal system, observing the communication and the resonances in the institution. Seven directors and 52 LTCFs (South, Southeast and Northeast)	Management. Public and private LTCFs.

to be continued

continued from Table 1

Articles and Authors	Publication and Year	Objective and Participants/Study Sample	Care and/or management demands identified and type of LTCF.
The mechanisms of health in the elderly: a study with institutionalized elderly persons. Pestana and Espírito Santo[19]	Revista da Escola de Enfermagem da Universidade de São Paulo (USP) (The Journal of the Nursing School of the University of São Paulo) 2008	Describe the health situation of the elderly in an institutionalized context and identify how they perceive their health. 17 elderly persons from a LTCF/Rio de Janeiro.	Care. Charitable LTCF.
Profile of caregivers of elderly persons in Long Term Care Facilities in Belo Horizonte, Minas Gerais. Ribeiro et al.[20]	Ciência de Saúde Coletiva 2008 (Public Health Science)	Evaluate the profile of caregivers of elderly persons from charitable and private LTCFs. 181 caregivers of elderly persons/ Belo Horizonte, Minas Gerais.	Care and Management. Charitable and private LTCFs.
The quality of life of the institutionalized elderly person in homes. Almeida and Rodrigues[21]	Revista Latino-Americana de Enfermagem (Latin-American Nursing Journal) 2008	To describe the quality of life and factors that influence it and to identify the degree of dependence in basic activities of daily living of institutionalized elderly persons. 93 elderly persons from four LTCFs/ City of Lamego, Portugal.	Care. Type of LTCF not described.
The meaning attributed to 'being elderly' by workers from Long-Term Care Facilities. Reis and Ceolim[22].	Revista da Escola de Enfermagem da Universidade de São Paulo (USP) (The Journal of the Nursing School of the University of São Paulo) 2007	Identify the meaning attributed to "being elderly" by workers who provide direct nursing care to institutionalized elderly persons. 50 professionals from five LTCFs/ Campinas, Sao Paulo.	Care. LTCF registered with the city council.
The economic survival of Long Term Care Facilities for Poor Elderly Persons. Creutzberg et al.[23]	Revista Latino-Americana de Enfermagem (Latin-American Nursing Journal) 2007	Identify structural linkages of LTCFs with the economic system, to maintain institutions that provide accommodation to poor Brazilian elderly persons. Seven directors, eight elderly persons and 52 LTCFs, Brazil.	Management. Public and private non-profit LTCFs.

Data from survey (2015); *Long Term Care Facility for Elderly Persons.

Most articles were published in 2008, followed by 2011 with three, 2013, 2012, 2010 and 2007 with two articles each, and 2009 with one.

In the articles of this review the interest of researchers in describing the reality of the institutions from the point of view of the professionals who work in LTCFs and of the elderly individuals is evident. Of the 17 articles selected, 47.05% used the interview as a tool for data collection. A total of 50% of such interviews were with professionals of the LTCF, 25% were with managers, 12.5% were with elderly persons, and 12.5% were with both professionals working in the LTCF and elderly persons. Nine articles (52.95%) used statistical, demographic and epidemiological data.

The last column of Table 1 shows the type of demand identified in the articles, whether care and/or management related, and the type of LTCF. Care demands predominated, with eight articles providing content associated with the care needs of the elderly, five describing content relevant to LTCF management issues, and four involving both types of demands. In terms of the type of LTCFs, private non-profit institutions appeared three times, private institutions, four times, public facilities, five times, and charitable institutions, six times. The type of LTCF was not described in seven studies.

A total of 108 institutions were included along with 1728 elderly persons, seven directors and 203 professionals (Table 1).

DISCUSSION

An opening finding regarding issues related to LTCFs is the aim of changing the negative aspects of these organizations, which are sometimes referred to pejoratively as "asylums". The transformation begins by changing the nomenclature itself, as they become LTCFs. The studies analyzed showed that efforts are being made by those involved in the care of institutionalized elderly persons to provide them with better living conditions.

There was a predominance of female residents in the LTCFs in all the studies, with the exception of one of the articles surveyed[8]. The explanation for the predominance of women is consensual among the authors.

The transformations that have been taking place in the population pyramid indicate greater survival rates among women than men, as they are less exposed to occupational risks and adopt fewer behaviors of risk[9]. Men occupy more jobs that require greater physical effort, and have a greater consumption of alcoholic beverages and tobacco, in addition to presenting higher mortality rates due to external causes, such as situations of violence, which especially affect young people[9]. In turn, women tend to take better care of themselves and to use health services more assiduously[9].

Therefore, the reasons that lead to greater life expectancy of the female population affect the profile of institutionalized elderly women, who have characteristics such as being widowed and having a low educational level. This variable is related to historical and cultural factors, as women have less access to formal education, and their activities are more restricted to the domestic space[9,19].

The causes of institutionalization can be hierarchized at four levels (Figure 1).

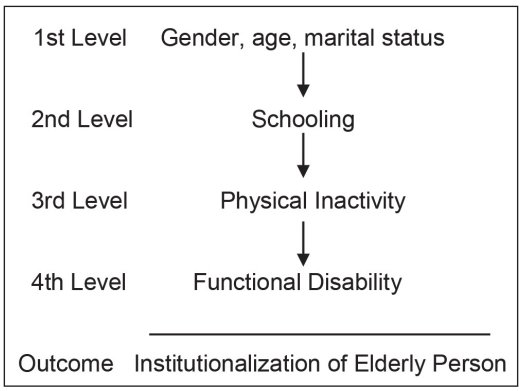

Figure 1. Causes of institutionalization by hierarchical level, Pelotas, Rio Grande do Sul, 2008.

Adapted from Del Duca et al.[9].

The family has a fundamental role in the process of institutionalization. In the family dynamic, the loss of a spouse is a determining factor for the surviving elderly person to move to an LTCF, as the mere existence of the family does not guarantee the permanence of such individuals in the family nucleus. The imminence of widowhood has psychological and economic repercussions for the life of the elderly, influencing when one opts for institutionalization[19].

The study by Angelo et al.[11] states that:

> Institutionalization can bring countless consequences, since any change, however simple, implies both positive and negative factors. The main change is adaptation to institutionalized life, because however comfortable an elderly person is with the idea of living in an institution, they have their hobbies, habits, tasks, and their role as a grandfather/grandmother, father or mother. The family is considered the natural habitat for human beings. In it we are more natural, more ourselves, more understood for our defects and our qualities, without social masks.

Another study points out that adaptation is more difficult for men, who are more critical of life in the "asylum"[19]. They adopt a posture that suggests they will never adapt or as though they are there unwillingly, due to a lack of options. Women provide a more accepting discourse, although they criticize some of the practices of the institution.

Only one study[21] describes the number of cases of institutionalization that occur due to the decision of the family or based on the initiative of the elderly persons themselves. Of the 93 elderly individuals in the study, 46.2% reported having moved to the LTCF of their own account, 30.1% due to a decision by their children and the remainder (23.7%) for other reasons related to the family context. The authors also argue that elderly persons should remain in the family unit[21]. In addition, the type of LTCF reflects the social and economic characteristics of the residents and, therefore, the reason for institutionalization.

Considering that the choice of an LTCF should be made by the family, with the participation of the elderly person as this decision will affect them directly, some criteria of this process can be considered, such as: verifying the proximity of the institution to the homes of relatives; the availability of vacancies; scheduling visits, checking the records and business license of the facility and evaluating the physical structure and the professional team; requesting a conversation with the director of the LTCF and addressing issues such as emergency medical care, the routine of the institution and whether the objects used by the elderly person will be personal or shared. After selecting the LTCF, the elderly person should be visited frequently, without prior notice, evaluating their physical and mental state, in addition to observing compliance with what was agreed at the time the individual entered the facility[17].

Particular care should be given to the degree of dependency of the elderly persons and issues that reflect their quality of life. In addition to being one of the causes for hospitalization, this interrelationship is a determinant for the type of care they require and serves as the basis for defining the infrastructure and organization of the LTCF.

Therefore, the focus of the institutional organization is to prioritize the quality of life of elderly people. Quality of life is defined by the World Health Organization (WHO)[24] as the "individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns". It should be noted that in the aging process quality of life is linked to the satisfaction an individual feels in the environment in which they live. In this way, elderly persons seek comfort and well-being in the amorous and social relationships that they establish, and their quality of life is strongly associated with their capacity to maintain autonomy, perform tasks and make decisions[25].

In the view of elderly persons, health is not related to the absence of diseases and pathologies, but to not feeling the symptoms provoked by these conditions and/or, as is the case with the majority of people, for example, some type of chronic disease, hypertension or diabetes[19]. Negative feelings such as loneliness, abandonment, dependence, and unproductiveness trigger a state of illness, from which the sensations of bodily pain arise[19]. One study pointed out that 60% of elderly persons presented degrees of dependence for Activities of Daily Living (ADL), with the most impaired activities being dressing, bathing and personal hygiene[7].

Among the professionals who provide care for elderly people in LTCFs, the most important are the caregivers and nursing professionals, most notably the nursing assistants. Of the 50 professionals interviewed in a survey, 94% were women, 36% were aged from 31 to 40 years old; 42% did not complete elementary education and 90% were not trained to care for the elderly, having acquired experience for such work through life and/or care of relatives.

A survey[20] with 181 caregivers showed that 87.8% were women, 87.3% were less than 50 years old, and 42% had less than four years of schooling. In the discourses of the interviewees, the researchers identified a subtle association with a depreciative image of older people, who were seen as fragile, rejected by society and infantilized, which contributed to a reduced incentive to respect their autonomy and independence. "The lack of training of these professionals often leads to erroneous practices linked to stereotypes associated with aging"[20]. In another study[16] with similar results, the authors reported that, despite the lack of training, the caregivers revealed that they felt satisfied with their work[16].

In the context of LTCFs, the formation of a multidisciplinary team is considered essential and can stimulate interdisciplinary action, which is the possibility of transforming the reality in which one acts through the union of theoretical knowledge and practice with a common objective[10]. In the same study, LTCF professionals reported being aware of the importance of this type of action, but declared they were unable to adopt it for various reasons, among them problems with the management of the LTCF[10].

Remaining with the subject of multidisciplinary teams, another survey[11] identified that 100% of such groups featured an administrator, 57.1% included medical and social care services, 85.7% had a nutritional service, 71.4% had nursing technicians and 42.8% had a secretary, psychologist and nurse[11].

In general, the LTCFs managed to maintain only basic teams, disregarding the importance of having the support of multi-professional teams, composed of physiotherapists, speech therapists, physical educators and dentists, despite the fact the group action of these professionals provides integral care for the elderly, helping to prevent diseases, the promotion and recovery of health and the maintenance of life.[22,24].

There is a passing mention of dental services in the study by Vergara[17]. Although there are no direct citations of physical trainers, the performance of complementary physical and other activities, such as recreation, leisure, culture and religion is described in all the works analyzed. These are considered vital for the well-being of the elderly and an incentive to their greater independence and autonomy, although are only opportune when structural conditions allow. The presence of volunteer professionals is an alternative for these activities that has been identified by LTCFs, although there is no standardization of

the services offered by such individuals and/or their provision in a systematic manner[10].

Nutrition services are provided by some of the LTCFs[10,11], where six meals are served daily with the aim of adapting the menu to the diet of elderly persons, but without their participation in the choice. It was found by researchers that these LTCFs lacked effective hygiene and food preparation and storage practices, increasing the chances of contamination or food poisoning[10,11].

Some studies[12,15] elucidate important points related to limited financial resources: a staffing shortfall and insufficiently trained professionals, an unsuitable physical structure and a deficit of self-help equipment, increasing the risk of falls, the cost of residing in the facility and/or leading elderly persons to hospitalization.

When institutionalized elderly persons are compared with those who are resident in the community from the same age range, a greater rate of hospitalization is found among the former[15]. In the 24 LTCFs studied, elderly persons with functional and/or cognitive incapacity for the performance of ADL were 2.5 times more likely to be hospitalized than those who were able to perform such activities. Among those who suffered falls, the rate of hospitalization was 80% greater for elderly persons who resided in LTCFs[15].

Regarding the integration of LTCFs with the health care network, one study[12] showed that of six LTCFs studied, two did not have any link with the basic public health service; two established a link only during vaccination campaigns; five had agreements with private health services, but also used the access to hospitalization of the Sistema Único de Saúde (the Unified Health System) (SUS); one had a partner hospital, and some elderly persons used health insurance. Four reported that the care of the elderly persons in the final stage of life were provided internally, even without a suitable infrastructure; in one physical restructuring was carried out to provide palliative care. In all LTCFs, access to medication was partially guaranteed.

Another study[13] showed that none of the professionals that worked in the LTCF were aware of ANVISA RDC n. 283, the directive that regulates LTCFs in Brazil, while administrators denied there were failings in compliance with legislation. In this study, researchers cited Decision n. 006/2009 of the Conselho Regional de Enfermagem do Rio Grande do Sul (the Regional Nursing Council of Rio Grande do Sul) (CRE/RS), which states that it is the responsibility of the nurse to request from the institution the physical infrastructure that meets the needs of the elderly residents. The authors of the same study proposed actions aimed at the prevention of falls in light of RDC n. 283 (Table 2).

Table 2. Proposed actions aimed at the prevention of falls among institutionalized elderly persons. Rio Grande do Sul, 2010.

Use of side barriers in beds of elderly persons.
Maintain floors clean, dry and unwaxed.
Resurface external floors, keeping them flat.
Use of handrails in all corridors and ramps.
Use of signage and non-slip mechanisms on ramps and stairs.
Remove mats and decorative items that interfere with the movement of elderly persons.
Install safety lights in the bedrooms, corridors and bathrooms of the LTCF.
Install at least one alarm button per room, next to the bed of the most autonomous elderly person.
Use safety rails in all toilets.
Register all episodes of falls in medical records and notify the health authorities.

It is important to stress that LTCFs are organizations that are established in a social context as part of the public health care network for the elderly[12]. They have undergone a process of transformation from asylum type care, becoming institutions that provide integral and quality care, in order to meet the expectations of elderly persons and society[12].

To fulfill their role with quality and effectiveness, LTCFs must professionalize their management structure, despite often lacking resources to do so. One study[23] escribed that the monthly cost per elderly person was, on average, R$500,00 in 2007, representing 131.6% of the minimum salary at the time (MS), which was R$380.00[27]. Updating these values with the Citizen's Calculator[26], which adopts the General Market Price Index (IGP-M) of the Getúlio Vargas Foundation (FGV), in November 2015, the monthly cost of an elderly person in an LTCF was R$839.00, which corresponds to 95.3% of the MS (R$880.00) in that year. This result, however, does not explain whether the reduction of costs resulted in an improvement in the quality and effectiveness of services. Using the same index, the cost of purchasing medication would be approximately R$20,000.00 per month per LTCF in November 2015, revealing the high cost of medications in this phase of life.

To meet expenses, LTCFs rely on various sources of income[27,28]. The pension of the elderly persons is the most significant, with institutions absorbing part or all of such income. The Statute of the Elderly allows that part of the income of the elderly can be assumed by the LTCFs, provided that the elderly person retains a percentage and the value absorbed by the LTCF does not exceed 70% of the income. The majority of elderly persons, however, stated that they were denied this right[23]. Other income sources of LTCFs are public funds, which are usually received late and in smaller values than requested, as well as partnerships with private initiatives, donations and volunteering[23].

In general, charitable and public LTCFs rely heavily on fairs, bazaars, raffles, public holiday celebrations and events and projects with other LTCFs[18,19,23]. The type of administration is a *sine qua non* factor for the undertaking of these activities. LTCFs also represent a means for elderly persons to socialize. It should be noted that the significant number of scientific investigations in LTCFs often causes discomfort, undue exposure and the invasion of the privacy of elderly persons, with the return to institutions limited or even non-existent[14,18].

Figure 2 summarizes the care and management demands of the LTCFs identified in this review. The external part of the circle includes a synthesis of the studies on which this work is based, allowing comparison between the real and the desirable.

The exclusion of articles with access linked to payment was a limitation of the present study, summarized in Figure 2, as PubMed's English-language publications were not included. Such exclusion may have restricted a more comprehensive review of LTCF management and care demands from 2004 to 2014.

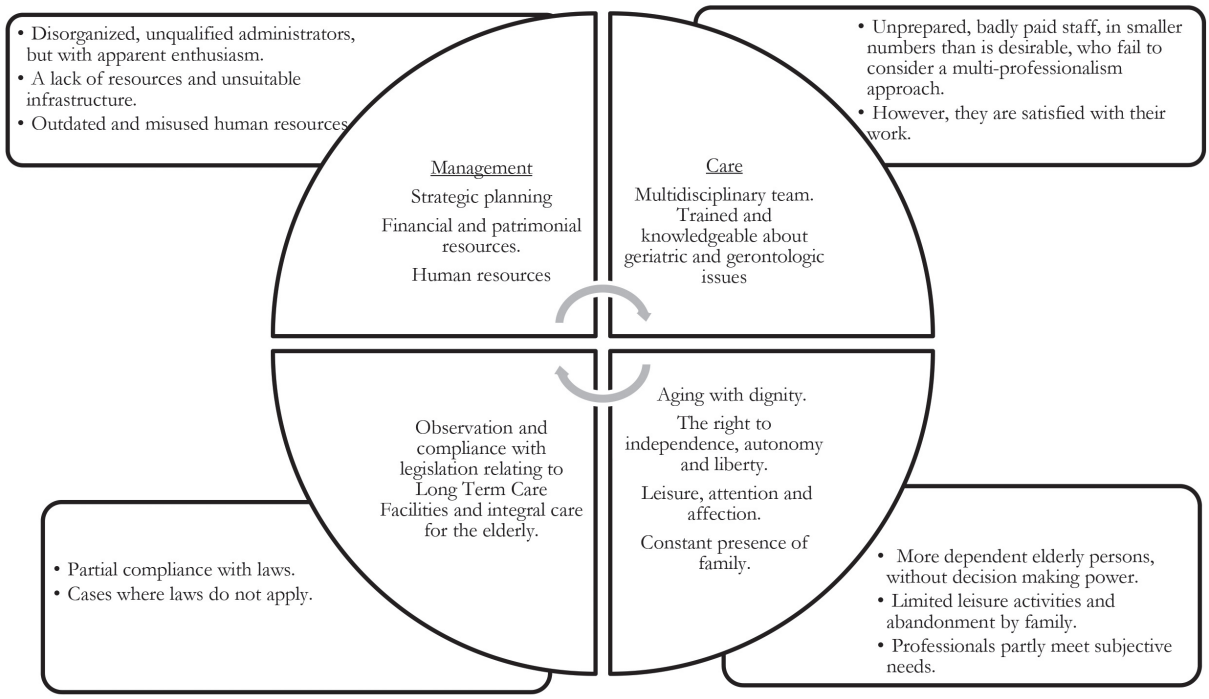

Figure 2. Management and care demands of Long Term Care Facilities for Elderly Persons identified in this integrative review. Belo Horizonte, Minas Gerais, 2015

CONCLUSION

In response to the objectives of this study, it can be concluded that the care demands identified in Brazil from 2004 to 2014 are related to the provision of care and the need for teams with geriatric and gerontological knowledge, capable of offering comprehensive care, while the management demands are related to the resources required for the effective provision of care.

Most of the studies concentrated on the medical and clinical aspects of the elderly persons residing in LTCFs. The publications that made up the sample of this study often discussed care demands. There was a shortage of studies that addressed the management demands of the LTCFs in a specific and detailed manner, which could have provided an insight into the organizational practices adopted by these institutions, as well as advances and challenges in the management of these organizations.

The majority of the LTCFs featured in the researched articles were of charitable origin, with the others described as being either private and private nonprofit in origin. There was also a study of a public LTCF and those registered with public organs. Seven articles did not describe the type of LTCF. In general, the care and management demands identified did not differ significantly based on the nature of the LTCF, a finding which should be investigated in future studies.

The staff of the majority of the LTCFs studied were unprepared for the performance of their roles, both in terms of providing care to the elderly and for managing the institution, meaning that the services offered are restricted to the essentials needed to guarantee the survival of the elderly residents.

It is hoped that the results of this study will alert scholars to the need for investment in descriptive research in LTCFs in Brazil and another countries,

so that the theoretical knowledge acquired can foster positive actions in the practices of these organizations. The professionalization of management in LTCFs is an urgent need if the elderly persons who reside in them are to be provided with effective, quality care that meets their needs in this phase of life.

In view of the implications of the phenomenon of population aging in Brazil, the need for LTCFs in the near future is evident. While they will not replace the value and importance of elderly persons living with their family, they can represent an extension of the family unit if there is positive synergy, love and commitment among those involved, as well as sufficient investment to allow the provision of a dignified life for the elderly population of Brazil and another countries.

ACKNOWLEDGEMENTS

The authors would like to thank the State of Minas Gerais Research Support Foundation (FAPEMIG) for financial support.

REFERENCES

1. Camarano AA, Kanso S. As instituições de longa permanência para idosos no Brasil. Rev Bras Estud Popul. 2010;27(1):232-5.
2. Pollo SHL, Assis M. Instituições de longa permanência para idosos – ILPIS: desafios e alternativas no município do Rio de Janeiro. Rev Bras Geriatr Gerontol [Internet]. 2008 [acesso em 01 ago. 2014];11(1):29-44. Disponível em: http://www.redalyc.org/pdf/4038/403838777004.pdf
3. Oliveira JM, Rozendo CA. Instituição de longa permanência para idosos: um lugar de cuidado para quem não tem opção? Rev Bras Enferm. 2014;67(5):773-9.
4. BRASIL. Agência Nacional de Vigilância Sanitária. Resolução RDC nº 283, de 26 de setembro de 2005. Aprova Regulamento Técnico para o Funcionamento das Instituições de Longa Permanência para Idosos. Diário Oficial da União, 27 set. 2005.
5. Michaellis: dicionário de português online [Internet]. São Paulo: Melhoramentos; 2014 [acesso em 28 jul. 2014]. Disponível em: http://michaelis.uol.com.br/moderno/portugues/index.php?lingua=portugues-portugues&palavra=assistencia
6. Souza MT, Silva MD, Carvalho R. Revisão integrativa: o que é e como fazer. Einstein. 2010;8(1):102-6.
7. Marinho LM, Vieira MA, Costa SM, Andrade JMO. Grau de dependência de idosos residentes em instituições de longa permanência. Rev Gaúch Enferm. 2013;34(1):104-10.
8. Castro VC, Derhun FM, Carreira L. Satisfação de idosos e profissionais de enfermagem com o cuidado prestado em uma instituição asilar. J Res Fundam Care [Internet]. 2013 [acesso em 28 jul. 2014];5(4):493-502. Disponível em: http://www.seer.unirio.br/index.php/cuidadofundamental/article/view/2282/pdf_912
9. Del Duca GF, Silva SG, Thumé E, Santos IS, Hallal PC. Indicadores de institucionalização de idosos: estudo de casos e controles. Rev Saúde Pública. 2012;46(1):147-53.
10. Piexak DR, Freitas PH, Backes DS, Moreschi C, Ferreira CLL, Souza MHT. Percepção de profissionais de saúde em relação ao cuidado a pessoas idosas institucionalizadas. Rev Bras Geriatr Gerontol. 2012;15(2):201-8.
11. Angelo BHB, Silva DIB, Lima MAS. Avaliação das instituições de longa permanência para idosos do município de Olinda-PE. Rev Bras Geriatr Gerontol. 2011;14(4):663-73.
12. Creutzberg M, Gonçalves LHT, Santos BL, Santos SSC, Pelzer MT, Portella MR, et al. Acoplamento estrutural das instituições de longa permanência para idosos com sistemas societais do entorno. Rev Gaúch Enferm. 2011;32(2):19-25.
13. Santos SCS, Vidal DAS, Gautério DP, Silva ME, Rosales RA, Pelzer MT. Alterações estruturais numa ILPIs visando prevenção de quedas. Rev Rene. 2011;12(4):790-7.

14. Creutzberg M, Gonçalves LHT. Pesquisa em instituições de longa permanência para idosos: contribuições necessárias e possíveis. Rev Bras Geriatr Gerontol. 2010;13(3):361-7.

15. Del Duca GF, Nader GA, Santos IS, Hallal PC. Hospitalização e fatores associados entre residentes de instituições de longa permanência para idosos. Cad Saúde Pública. 2010;26(7):1403-10.

16. Ribeiro MTF, Ferreira RC, Magalhães CS, Moreira AN, Ferreira EF. Processo de cuidar nas instituições de longa permanência: visão dos cuidadores formais de idosos. Rev Bras Enferm. 2009;62(6):870-5.

17. Vergara RS. Residencias para adultos mayores: criterios básicos para su adecuada selección. Rev Hosp Clín Univ Chile. 2008;19:356-60.

18. Creutzberg M, Gonçalves LHT, Sobottka EA. Instituição de longa permanência para Idosos: a imagem que permanece. Texto & Contexto Enferm. 2008;17(2):273-9.

19. Pestana LC, Santo FHE. As engrenagens da saúde na terceira idade: um estudo com idosos asilados. Rev Esc Enferm USP. 2008;42(2):268-75.

20. Ribeiro MTF, Ferreira RC, Ferreira EF, Magalhães CS, Moreira AN. Perfil dos cuidadores de idosos nas instituições de longa permanência de Belo Horizonte, MG. Ciênc Saúde Coletiva. 2008;13(4):1285-92.

21. Almeida AJPS, Rodrigues VMCP. A qualidade de vida da pessoa idosa institucionalizada em lares. Rev Latinoam Enferm. 2008;16(6):1025-31.

22. Reis PO, Ceolim MF. O significado atribuído a 'ser idoso' por trabalhadores de instituições de longa permanência. Rev Esc Enferm USP. 2007;41(1):57-64.

23. Creutzberg M, Gonçalves LHT, Sobottka EA. A sobrevivência econômica de instituições de longa permanência para idosos empobrecidos. Rev Latinoam Enferm. 2007;15(n. esp.):147-54.

24. WHOQOL Group. The World Health Organization quality of life assessment (WHOQOL): position paper from the World Health Organization. Soc Sci Med. 1995;41(10):1403-9.

25. Arantes RC. Diretrizes para a gestão do envelhecimento ativo e com qualidade de vida para idosos brasileiros. In: Lina F, Calábria L, Alves W, organizadoras. Envelhecimento: um olhar interdisciplinar. São Paulo: Hucitec; 2016. p.188-214.

26. Banco Central do Brasil [Internet]. Calculadora do cidadão: correção de valores. Brasília, DF: BC; 2015. [acesso em 09 dez 2015]. Disponível em: https://www3.bcb.gov.br/CALCIDADAO/publico/exibirFormCorrecaoValores.do?method=exibirFormCorrecaoValores

27. BRASIL. Lei nº 10741 de 01 de outubro de 2003. Dispõe sobre o Estatuto do Idoso e dá outras providências. Diário Oficial da União, 03 out. 2003.

28. Brasil, Lei nº 1074/2003. Estatuto do Idoso. Brasília: Distrito Federal, Outubro de 2003.

Received: March 16, 2016
Reviewed: October 13, 2016
Accepted: March 14, 2017

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