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REVIEW ARTICLES

Vaccination and Longevity

Between 1940 and 1998 life expectancy at birth in Brazil increased by around 30 years, mainly as the result of the reduction of deaths due to vaccine-preventable infectious diseases. The vaccination of children, which reduced not only cases of illness but also the circulation of infectious agents among the population, had a positive impact on the health of adults and the elderly (collective protection).

The initial decline in mortality, substantially impacted by the reduction in deaths from infectious diseases and the aging of the population, has since seen an increase in cases of chronic and degenerative diseases. Diseases have changed from an acute process that ends in cure or death to a chronic state where people suffer for long periods of life and which when not adequately controlled can generate disabilities, significantly compromising the quality of life of these individuals.

In the process of Latin American epidemiological transition, unlike in developed nations, the increase in chronic and degenerative diseases (typical of aging) has overlapped with infectious diseases which are not yet fully controlled in these countries. In this way, the increase in the number of deaths due to diseases of the circulatory system, among others, has resulted in a scenario in which the proportion of infectious and parasitic diseases differs considerably from that of developed countries. This "double burden of disease" squeezes the already scarce resources of public health to the limit.

Moreover, while celebrating the extra years gained, it must be recognized that greater longevity without quality of life is a hollow prize, or in other words, health expectancy is as or more important than life expectancy. The prevention of infectious diseases is part of this situation, allowing the reduction of morbidity.

Elderly persons are among the most vulnerable to the serious outcomes caused by infectious diseases: hospitalizations; deaths; decompensation due to underlying illnesses such as diabetes, heart disease and chronic lung disease; increased risk for myocardial infarction or stroke; sequelae that negatively impact quality of life on the loss of independence and the incapacitation of the individual. Vaccines can be considered important tools for the successful adaptation of the body to occurrences that threaten its functions and viability in aging.

Current gains in our understanding of immunizations have allowed a series of innovations, with the availability of new vaccines and strategies geared toward the health of the elderly. This knowledge, combined with the changing epidemiology of infectious agents, has led to a rapid cycle of updates in vaccination schedules, to align current clinical practice with scientific progress.

The Brazilian Immunization (SBIm) and Geriatrics and Gerontology (SBGG) societies recommend the routine vaccination of the elderly with the following vaccines: influenza, Pneumococcal 13-valent conjugate, 23-valent pneumococcal polysaccharide, herpes zoster, hepatitis B and pertussis (whooping cough).

While vaccination is one of the most effective public health measures for preventing disease, vaccine coverage rates in the adult population remain below target, even when vaccines are offered for free. The main barriers to adult vaccination are thought to be misguided beliefs and low awareness among patients and insufficient knowledge and negative attitudes on the part of doctors. The lack of medical prescription is described in literature as the main reason for non-vaccination among adults.

Brazil has aged and policies to increase adult immunization are required. These should seek to: include the theme of immunization in medical education programs and the training of all health professionals; engage civil society in raising public awareness; establish or improve surveillance systems to determine and monitor the burden of vaccine-preventable diseases in adults; bring together different recommendations and protocols; create immunization records for adults and integrate these into electronic medical records.

Isabella Ballalai

President of the Brazilian Immunization Society (SBIm)

Characterization of long-term care facilities for the elderly in the metropolitan region of Belo Horizonte

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Abstract

Objective: to characterize Long Term Care Facilities for the Elderly (LTCFs) from the Metropolitan Region of Belo Horizonte, Minas Gerais, Brazil in terms of administrative and care aspects. Method: an exploratory, quantitative study was conducted in the MRBH, with primary and secondary sources used to map the LTCFs. A structured questionnaire was used for characterization, and data was collected between November 2014 and December 2015 through telephone contact and site visits to the LTCFs. A descriptive statistical analysis of the data was subsequently performed. Results: the 156 participating institutions included private and mixed institutions, with predominantly female residents with dependency levels I and II, and elevated levels of occupation. Philanthropic LTCFs directly receive the retirement pensions of the elderly persons, although most also receive a government grant. The results in terms of activities offered were similar for the philanthropic and private facilities, while the staff of the private facilities had more health professionals and the philanthropic facilities had more social workers and psychologists. Conclusions: there was significant participation among the LTCFs, despite the limiting factors of the study such as the data collection instrument and strategy. It is important to prioritize the elderly when creating policies to improve care for institutionalized individuals, as well as facilitating interlocution between LTCFs to minimize the abandonment of state participation.

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INTRODUCTION

Brazil is undergoing a period of demographic transition and population aging due to a reduction in the birth rate and a decrease in the mortality rate[1]. In a decade, the proportion of elderly persons rose from 9.7% in 2004 to 13.7% in 2014[2], and projections indicate this group will represent 18.6% of the population in 2030 and 33.7% in 2060[3]. Data from the National Household Samples Survey showed that the population of elderly people in Brazil reached more than 27.8 million in 2014[4]. Therefore, the country faces a situation of complex and costly diseases, typical of long-lived countries characterized by chronic illnesses[5].

Due to social changes and issues, coupled with the increase in the number of elderly people, the demand for facilities that provide care for this population has been growing steadily[1]. This phenomenon depends on cultural factors, the degree of family support and the availability of alternative services. While Brazilian legislation recommends that care should be provided by the family, many families do not have the financial conditions or time to care for their elderly relatives, and Long-Term Care Facilities for the Elderly (LTCFs) are an alternative to preserve the lives of these individuals[6]. Long-term care for the elderly, however, is considered a major gap in public policies, whether in the health sector or in social policies[7]. LTCFs should be one of the links in the network of care for the elderly and the result of public policy, but instead there is a certain disregard for this issue[8].

In 2008, the Institute of Applied Economic Research[1] carried out a national survey of the population of elderly people living in LTCFs and identified 683 facilities in the state of Minas Gerais (MG), distributed in 476 of the 853 municipal regions, which house around 1% of the elderly population of Minas Gerais[9]. The lack of studies that outline the profile of LTCFs in Brazil reinforces the need to broaden such research due to the growing increase in such facilities, linked to the lack of political support and also the interest in society in issues related to aging, either due to the scale of the market or future projections regarding the living process. In the Metropolitan Region of Belo Horizonte (MRBH), there is a shortage of reliable sources for the recovery of LTCF data, emphasizing the importance of studies in this area. Thus, the present study aims to characterize the administrative and care aspects of LTCFs in the MRBH.

METHOD

A descriptive-exploratory study with a quantitative approach was performed, based on the 34 municipalities of the Metropolitan Region of Belo Horizonte (MRBH) in Minas Gerais. This is the third largest urban agglomeration in Brazil, with approximately 5.4 million inhabitants. In this study, 22 of the total number of municipal regions were included, being those with one or more LTCF: Belo Horizonte (BH), Betim, Brumadinho, Caeté, Contagem, Esmeraldas, Florestal, Ibirité, Igarapé, Itaguara, Jaboticatubas, Lagoa Santa, Mateus Leme, Matozinhos, Nova Lima, Pedro Leopoldo, Ribeirão das Neves, Sabará, Santa Luzia, São Joaquim de Bicas, São José da Lapa and Vespasiano.

The following primary sources were used to survey the LTCFs: the Federal Public Ministry, the State Health Department of Minas Gerais, the Municipal Health Department and the Municipal Public Ministry of Belo Horizonte, as this municipal region has the largest number of facilities. Secondary sources such as booklets, websites and social networks were also used. In this manner, 231 LTCFs were identified and, after the sources were cross-referenced, the existence of 170 LTCFs in the MRBH was confirmed. It should be emphasized that LTCFs without records or operating permits were not included in this study. The difference between the 231 LTCFs identified and the 170 facilities confirmed is therefore due to the existence of duplicate data or the closure of the activities of some facilities.

A structured questionnaire created by the authors was used for data collection. This allowed a profile of the researched facilities to be identified, such as type, number of residents, criteria for admission of residents, among others. Data collection involved initial telephone contact with an on-site visit carried out in facilities where telephone contact was not possible. Collection occurred between November 2014 and December 2015 and a database was created from the findings. Descriptive statistics were used to analyze the data and the results were presented, in terms of distribution frequency, in tables and graphs.

The study was approved by the Ethics Research Committee of PUC Minas under opinion number 817 (CAAE: 31471114.4.0000.5137), and the participating facilities signed forms agreeing to participate.

RESULTS

A total of 170 institutions were surveyed, 156 of which participated in the survey with the consent of their managers, who were mostly the administrator/owner or director of the institution (47.44%), or the technical manager, manager or coordinator (23.97%), In the absence of primary contacts, the administrative and/or health professionals of the facilities (28.59%) were interviewed. Table 1 shows the number of LTCFs mapped and the participants with type and total of institutionalized elderly residents by municipal region.

Table 1. Distribution of Long Term Care Facilities for Elderly Persons in the Metropolitan Region of Belo Horizonte, Minas Gerais, 2015

Municipal Regions	Number of LTCFs mapped	Number of participating LTCFs	Number of private participating LTCFs	Number of philanthropic participating LTCFs	Total number of residents in participating LTCFs
Belo Horizonte	118	106	79	27	2438
Betim	3	3	0	3	108
Brumadinho	1	1	0	1	63
Caeté	2	2	0	2	79
Contagem	15	15	11	4	337
Esmeraldas	1	1	0	1	26
Florestal	1	1	0	1	16
Ibirité	2	2	0	2	35
Igarapé	1	1	0	1	32
Itaguara	1	0	0	0	-
Jaboticatubas	1	1	0	1	22
Lagoa Santa	3	3	1	2	112
Mateus Leme	1	1	0	1	33
Matozinhos	1	1	0	1	24
Nova Lima	1	1	0	1	36
Pedro Leopoldo	1	0	0	0	-
Ribeirão das Neves	5	5	2	3	121
Sabará	2	2	0	2	43
Santa Luzia	7	7	3	4	170
São Joaquim de Bicas	1	1	0	1	12
São José da Lapa	1	1	0	1	12
Vespasiano	1	1		1	33
Total	170	156	96	60	3752

Of the 156 participating institutions, 62% were private (96) and 38% (60) were philanthropic. Private non-profit entities that provide social care services are considered philanthropic, certified by the National Council of Social Assistance (CNAS)[10]. The philanthropic facilities were located in all the municipal regions mapped, with the emphasis on 12 municipal regions with smaller populations and only one philanthropic institution, as shown in Table 1. The highest concentration of LTCFs was in the state capital, Belo Horizonte, with 118 facilities mapped, most of which were private (106 participants, 79 private and 27 philanthropic).

The survey revealed an average occupancy rate of 88%, regardless of the nature of the institution. Regarding the capacity of institutions, philanthropic facilities operated at 95% of capacity, and private facilities at 82%. Of the participating facilities, 67 (42.9%) stated that they had at least one criterion for non-admission of the elderly; 39 (25%) two criteria; 32 (20.5%) three or more criteria and only 18 (11.6%) said they had no criteria. Among the criteria most frequently described by facilities for non-admission of the elderly were degree of dependency (18.9%) and the presence of psychiatric disorders (13.8%). Being bedridden, tracheostomized, having dementia or an infectious-contagious disease are other examples that may prevent the admission of the elderly to the LTCFs surveyed. A total of 77% of the LTCFs were mixed; 20% were exclusively female and 3% male. Women corresponded to 67% of the institutionalized public. It should be noted that this information corresponds to 88.4% of the gender data of the residents of the participating institutions; 11.6% of LTCFs were not included as the interviewee was unable to provide the information.

Information relating to the degree of dependency of the institutionalized elderly person was not provided by 41.8% (1.568) of the sample. This is because at the time of the interview the respondents were not in possession of this information. Of the 2,184 who provided answers, 874 elderly persons had grade II dependency, 677 had grade I and 633 had grade III. (Figure 1).
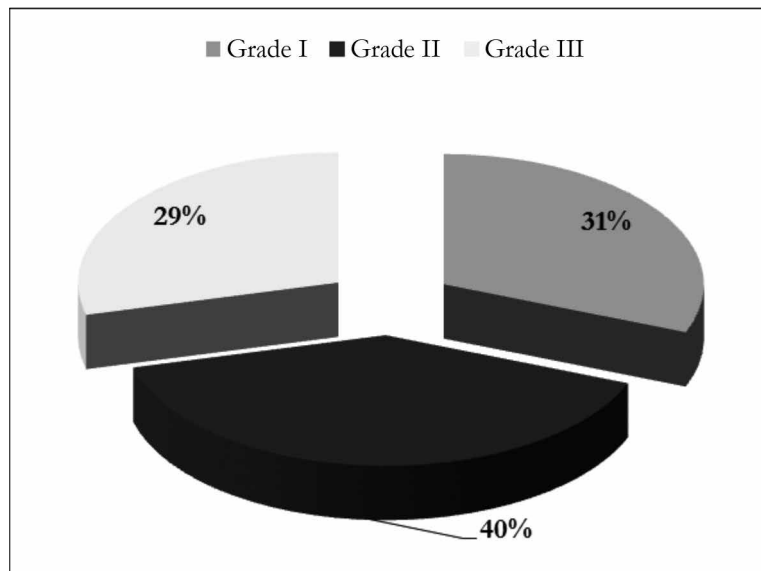
Figure 1. Proportion of institutionalized elderly persons according to degree of dependency. Metropolitan Region of Belo Horizonte, Minas Gerais, 2014 to 2015.

The majority of private LTCFs (90.6%), declared that they did not use the pensions of the elderly persons to fund the institution; whereas the majority of philanthropic facilities (93.3%), used the benefits of the elderly person to cover costs. Of these, 79% used up to 70%, and 20% used more than 70% of the monthly income of the elderly person. Only 63% of the philanthropic LTCFs that participated in the survey said that they received government grants, 92.1% of which were municipal grants. The survey found that 28.1% of private LTCFs charged between three and four minimum monthly salaries (based on a minimum monthly salary of R$ 724.00 in 2014 and R$ 78800 in 2015), and 31.3% charged over four minimum salaries. In terms of the partnerships and donations received by the LTCFs, the philanthropic facilities had more partnerships (81.7%) and received more donations (95.0%) than the private facilities. Of the private LTCFs 22.9% had some kind of partnership, whether with teaching institutions or several types of voluntary groups, and 17.7% received donations. A total of 16% of the LTCFs had partnerships with Higher Education Institutions, irrespective of the type of facility.

Figure 2 shows the key professionals that comprise the staff of each LTCF, followed by the type of facility. In general, it can be seen that the private LTCFs have greater numbers of health professionals, while there were more social workers and psychologists in the philanthropic facilities, due to the requirements of the contracts entered into with certain city or town councils.
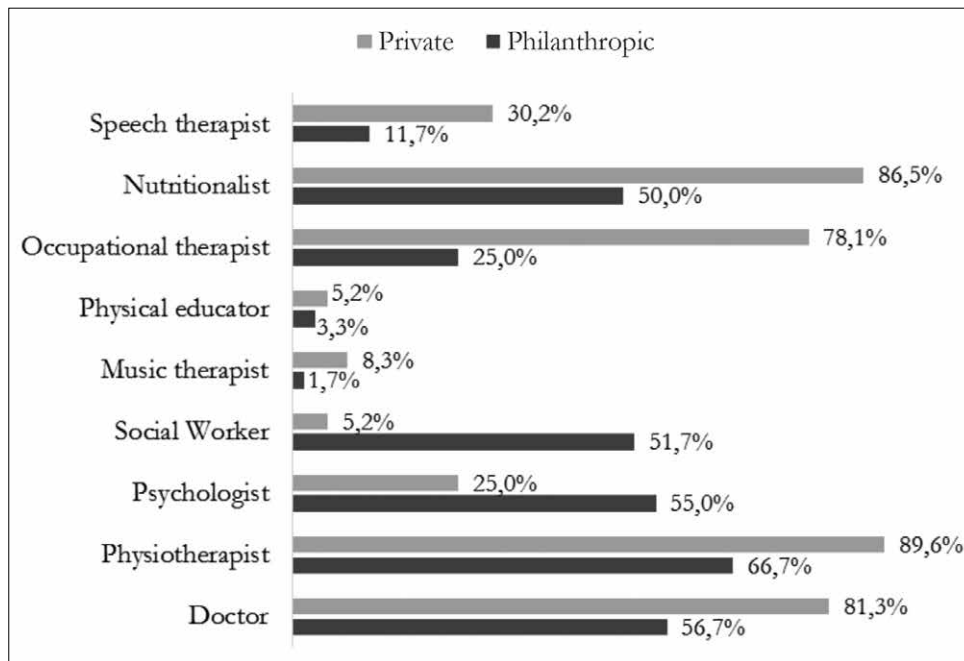
Figure 2. Composition of staff according to nature of Long Term Care Facility for the Elderly. Metropolitan Region of Belo Horizonte, Minas Gerais, 2014 to 2015.

Private and philanthropic LTCFs offered similar activities, with particular emphasis on ecumenical services, socializing parties and cooking workshops. The day-center modality is offered by 67 facilities (43%) although less than 8% of philanthropic facilities offered this service.

Regarding the care of residents with more complex health needs, if beyond the capacity of the LTCF team, regardless of the nature of the facility, 26.4% said that individuals were cared for exclusively by the private healthcare service. A total of 73% were cared for through a mixed structure, that is,

both public and private health services, and 0.6% were unable to provide this information. In private facilities, 25% of residents were cared for by the public service, 31.25% by the private service and 43.75% received care through a mixed structure. For residents of philanthropic facilities this proportion was different, with 43.3% receiving care from the public service, 18.3% via private healthcare and 36.7% through a mixed structure.

DISCUSSION

The data of the present study revealed the existence of 170 LTCFs in the MRBH, contrasting with a survey published in 2011[11] which identified 105 facilities, notably in BH, which had 42 private and 26 philanthropic facilities, giving a total of 68 LTCFs. These data demonstrate the accelerated growth of LTCFs, especially in the private sector and most notably in the capital of Minas Gerais, which corresponded to 74.5% of the total. A study of LTCFs in the state of Rio de Janeiro between 2010 and 2013 showed that 76.2% of the facilities were private, 21.3% were philanthropic and only 2.5% were public[12]. These data agree with national studies and reinforce the change in the profile of institutions, with a tendency towards the growth of the number of private facilities in large urban centers[1].

This expansion reveals the niche in the market in relation to aging, which corroborates the emerging need of families to provide care for elderly persons in the context of changes in family dynamics. However, in view of the socioeconomic conditions in Brazil, the need for vacancies in philanthropic LTCFs is important to meet the demands of social and health inequalities and inequities that can impact the institutionalization of the elderly. It should be noted that in the present study, no public LTCFs were identified, revealing irresponsibility and omission on the part of the government when dealing with an express need for social protection mechanisms, as the State should share responsibility for the care of the elderly with families and society[13].

Despite the increase in LTCFs, attention should be paid to the occupation rate and the rigid admission criteria in some facilities. With regard to

the occupation rate, philanthropic LTCFs operate at close to maximum capacity and even have a waiting list. This difference is probably due to the historical and social structures that surround its origin, the socioeconomic conditions of the substantial majority of the Brazilian elderly, and the scarcity of public policies of care for this population which means no other form of care is available. Despite the significant increase of private facilities in recent years from a market perspective, similar surveys showed occupancy rates of 91.6% and 91.5%[1,12], suggesting that the difficulty of access may limit decisions regarding institutionalization. This hypothesis is reinforced by strict criteria for admission to most LTCFs[14], although current legislation recommends only age as a criterion, regardless of family support, for residing in LTCFs[15]. There still seems to be a preference for independent older people, as they are less costly and require less care, with most philanthropic facilities not admitting elderly people with dementia, who are bedridden or who have organic diseases[14]. The degree of dependency and the presence of dementia and some illnesses, such as infectious diseases, were the conditions that most influenced non-admission to the LTCF[11].

A previous study conducted by Camargos et al. on the demand for LTCF vacancies in the MRBH, showed that there is a waiting list for admission in around 60% of facilities[11]. This list allows institutions to reinforce the choice of "desired elderly persons", or in other words, more independent individuals, to the detriment of those in worse conditions of health, placing the social duty to support such elderly persons exclusively on their families. The difficulty of institutionalizing the most impaired elderly persons shows the need for discussion about frailty and public policies aimed at this population group, and points to the inability of the State to meet this demand[16].

Gender

IBGE data from 2013[17] show that women represent 55.7% of the elderly population of Brazil. However, it can be affirmed that the proportion of institutionalized women is even greater, as they are more likely to be widowed and disadvantaged

socioeconomically [18,19]. Women are also in the majority on waiting lists for institutionalization, reflecting cultural aspects and family arrangements[20]. According to national data, 57.3% of institutionalized people in Brazil are women[1]. This scenario reflects a worldwide trend, based on a study by Schneider et al. in the city of New York, USA, where the population living in LTCFs (Seniors Centers) in 2009 was predominantly female (71%)[21]. This is explained by lower mortality rates among women, corroborated by the fact that the majority of the elderly population is female, a percentage that increases gradually with age[15], characterizing the phenomenon described as "the feminization of old age"[22].

Level of dependency

In this study a prevalence of elderly people with grade II dependency was observed. It is believed that the type and frequency of activities offered may influence the functionality of the elderly. A study conducted in Porto Alegre with 55 elderly persons showed that the most frequent activities among the residents were watching TV (60%), talking with friends (54.5%) and reading (47.3%), meaning they remained physically inactive most of the time. Only 15 (27.3%) individuals performed some physical activity[23]. It is important to emphasize the importance of encouraging the institutionalized elderly to participate in different activities, especially those that promote mobility and balance, which are basic assumptions for functional independence[24].

A survey in the city of Taubaté identified that 37% of the institutionalized elderly were considered independent for Activities of Daily Living (ADL). These results highlight the need to encourage the elderly in the institutional environment with individualized plans that provide self-care and independence, indicating the close relationship between the degree of dependency and the actions offered in the LTCFs[25]. It was observed that, in practice, the great challenge for the promotion of health seems to be the difficulty of the facilities to adapt the actions they offer to the heterogeneity of residents, with respect to degree of dependency and cognitive capacity.

Cost and established partners

While it is advocated that the contribution of the elderly to the cost of care in a philanthropic entity should be optional and should not exceed 70% of monthly income[13], a fifth of the philanthropic-based LTCFs claimed to take a higher percentage.

A study carried out between 2006 and 2007 in LTCFs in the state of Paraná revealed that the facilities depended on the amounts paid by residents and/or their relatives, which represented 64% of their total income[26]. In a national survey conducted between 2007 and 2009, only 6.6% of Brazilian institutions were public or mixed[1]; showing that care for the elderly is still the responsibility of the elderly persons themselves and their families. It is necessary to develop forms of long-term care by the State, beyond simple co-financing through an agreement signed by the municipal region with philanthropic facilities. This paradox is described by Giacomin (2012)[8], when revealing that the Brazilian State transfers its responsibility in the care of the institutionalized elderly to philanthropic LTCFs, since the number of public facilities is insignificant. This outsourcing of state care to philanthropic LTCFs violates the provisions of the National Social Assistance Policy (PNAS), considering the universal policy of allowing the collection of a substantial portion of the benefits of the elderly persons.

The fact that most of the revenue that comes from government grants in the case of philanthropic LTCFs is derived from municipal resources can be explained by the organization of PNAS through the Unified System of Social Care (SUAS), which advocates the decentralization of the level of complexity. Thus, the federal government transfers resources to municipal funds through agreements signed with municipal regions.

Despite the growing increase in private LTCFs, the prohibitive costs charged makes such facilities an option for few elderly persons, considering the incomes received by the majority of retirees [27].

It was expected that philanthropic LTCFs would form more partnerships and receive more donations, as was shown in the study, since it is known that

they receive little help from public authorities, and require community and resident resources for their upkeep. Corroborating with the findings of this study, there were almost two volunteers (1.80) per elderly person in the philanthropic LTCFs, and the government contributed 12% of the expenses through signed contracts[27]. The history of asylums or shelters in Brazil is still marked by the participation of the church (Saint Vincent de Paul Society) and by the philanthropy that guarantees institutions tax exemptions and an increased chance of receiving donations and voluntary staff and/or staff granted by the State[1].

A study conducted between 2006 and 2009 showed that philanthropic facilities in the northeast of Brazil established a wider range of partnerships than public and private facilities[28]. Although public funding is largely insignificant, the State contributes in other ways through partnerships, such as the provision of medicines and medical services. Some State action is also present in the private sector, including partnerships with the Unified Health System (SUS), as well as with religious associations and universities, with the latter taking the form of supervised internships[1].

The presence of students in LTCFs is significant given the importance of these future elderly care workers, preparing them and making them aware of gerontological issues, contributing to the improvement of the care provided and, above all, to the renewal of the practice through studies and research[29]. The partnership with Higher Education Institutions occurs in more than 10% of public and philanthropic LTCFs, according to a study of all the regions of Brazil[30]. An international study conducted in Portland in the USA found that the strengthening of organizational ties with the community and teaching brings benefits for both sides through the sharing of resources[31].

Staff and activities offered

Despite not being health institutions, the majority of services offered in LTCFs relate to healthcare, with 66.1% providing medical services and 56%

physiotherapy services [1]. It is important to discuss this trend, particularly in private facilities, which is moving towards the transformation of LTCFs into "mini hospitals" and raises a necessary question about the overload of activities and the lack of connection of these professionals with the elderly. This may be a strategy adopted by these facilities to "sell" their product, since relatives and those responsible for the elderly persons tend to assume that their family members will be better cared for in such facilities. On the other hand, philanthropic LTCFs have more psychologists and social workers than private facilities, demonstrating their historical role as social assistance institutions. The largest expenses for most LTCFs were human resources (54%), followed by food (17%) and building maintenance (11%).[26].

It should be emphasized that LTCFs can be seen not only as social care entities, but as a hybrid service in the provision of care that includes Activities of Daily Living (ADL), health care and a social and emotional life[31,32]. However, RDC 283/2005[15] does not establish the number of graduate-level professionals who should make up the staff of a LTCF; but determines that for every 40 elderly people, there must be one graduate-level professional, with a workload of 12 hours per week, to carry out leisure activities, and that there should be a technical manager (TM), also with degree level training, with minimum working hours of 20 hours per week.

In relation to the activities offered, contrary to what might be expected, it was observed that philanthropic LTCFs offer several activities, despite their difficulties in terms of specific physical structures like libraries and academies, which are more frequent in private LTCFs.

Despite being present in less than half of the LTCFs surveyed, the day-center modality is an alternative that allows the maintenance of family ties and generates lower costs. This represents a space for elderly people who do not have full-time care at home[28]. However, what is observed is that this service is almost exclusively offered by private LTCFs, and is not an option for lower income and, therefore, more vulnerable, families. In addition, one should consider the particularities of the day-center, which are different in nature from LTCFs.

Complex health needs

The creation and implementation of actions and services with inter and intra-sectorial linkage between all segments of society envisaged by the National Policy on the Elderly (1994) [33], faces operationalization and implementation challenges, especially considering the relationship between LTCFs and the Health System[31,34]. The (Unified Health System or National Health Service) SUS is the main place of care for institutionalized elderly persons (61.9%), through basic health units and SAMU[11,23]. In philanthropic LTCFs, most elderly persons do not have a health plan [35]. It is believed that the 73% who use both public and private services in this study, use private services in a complementary manner, obtaining medicines and vaccines through Primary Health Care, as these are not provided by private health services. Home healthcare services for elderly persons with supplementary health insurance was also identified.

Difficulties and limitations of the present study

The great difficulties found when carrying out the survey of LTCFs in the MRBH must be noted. It was necessary to perform a search of several sources, as none presented complete and updated data. This reveals, in part, the lack of knowledge/inability of the organs responsible for the public management of these services, especially in the context of the accelerated demographic and epidemiological transition experienced. On the other hand, one cannot disregard the lability of the economic market, as many private facilities open and/or close their doors with impressive speed.

One limitation inherent to the study is the data collection strategy used, as on-site visits were not carried out for all the facilities surveyed. There was also some variation in the respondents, as direct contact with the managers or technical managers was not always possible, and in some situations the questionnaire was carried out with another professional from the institution, thus not guaranteeing the accuracy of the data provided. In addition, for information such as degree of dependency, some interviewees responded and others did not, meaning these data may be subject to memory bias.

CONCLUSIONS

It can be concluded that the LTCFs in the MRBH are mixed in nature, with a predominance of female residents and private facilities and institutions that operate at elevated levels of occupation. Among the institutionalized elderly, most have degree of dependency I or II. The philanthropic facilities directly use the retirement pensions of the elderly for funding, although most also receive a government grant. With regard to the activities offered, it was observed that there was a diversity of actions, with ecumenical services, socialization parties and cooking workshops predominating.

There is an urgent need to prioritize the elderly in policy-making and the mobilization of councils regarding the quality of services and the establishing of intersectoral guidelines that can improve care for institutionalized elderly persons. In addition, very little is done by the government to meet the specific demands of care for the institutionalized elderly. Such problems could often be minimized by greater interlocution between facilities, in order to find solutions to the problems faced and to share and expand successful experiences, highlighting the importance of the mobilization of social capital where there is little State action.

Finally, we suggest urgent further studies in this context, which will allow a better understanding of the approach to health promotion and quality of life among the institutionalized elderly.

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What is the impact of the European Consensus on the diagnosis and prevalence of sarcopenia among institutionalized elderly persons?

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Abstract

Objective: To verify the impact of the European Consensus on the diagnosis and prevalence of sarcopenia among institutionalized elderly persons in Natal, Rio Grande do Norte, Brazil. *Method:* 219 elderly persons (≥60 years) of both genders were recruited for the study. Two criteria were initially used to calculate the prevalence of sarcopenia: criterion A, based on the European Consensus, considering only elderly persons with good physical and cognitive conditions and criterion B, considering all elderly individuals, regardless of their physical and/or cognitive condition. The association between sarcopenia and gender, age and body mass index (BMI) in the two groups was investigated using the chi-square test and the Student's t-test, with a significance level of 5%. *Result:* the diagnosis of sarcopenia according to Criterion A revealed a prevalence of 32% (95% CI: 22.54-43.21), whereas Criterion B identified a prevalence of 63.2% (95% CI: 56; 45-69,13). Despite the difference in the prevalence of sarcopenia using the two criteria employed ($p<0.001$), no differences were observed in terms of the association with gender ($p=0.149, p=0.212$), BMI ($p<0.001, p<0.001$), and age ($p=0.904, p=353$). *Conclusion:* including only elderly people with good physical and cognitive abilities to calculate sarcopenia, based on the European Consensus, underestimates the prevalence of this condition among institutionalized elderly. As elderly persons with physical or cognitive limitations are extremely typical in the population of care facilities and increased diagnostic calculation for sarcopenia did not interfere with the distribution of associated factors, it is recommended that these individuals are considered in the basis of calculation for future studies of the diagnosis and prevalence of sarcopenia.

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INTRODUCTION

The researcher Irwin Rosenberg (1989)[1] was a pioneer in identifying the relationship between the reduction in muscle mass and advancing age, using the term "sarcopenia" (from the Greek "sarx" or meat + "penia" or loss) to describe this phenomenon. The association between the reduction of muscle mass and generalized weakness and the functional decline of the elderly has increased research interest in sarcopenia, culminating in a range of studies on the theme[2]. Despite the simplistic definition that describes sarcopenia as the loss of muscle mass, the adoption of this term in clinical practice has generated several biases for the measurement of the disease, as muscle mass does not represent all the physical alterations and functional complications observed in elderly persons with sarcopenia[3,4].

The loss of independence and physical capacity associated with sarcopenia has also been related to an increase in the number of falls, frailty, disability and death in this population[5-7]. As a result, the definition of sarcopenia has taken as its main outcome the generalized decline of skeletal muscle mass and strength that comes with advancing age[8], and the subsequent reduction in quality of life, increased physical disability and the risk of death[6,9]. Sarcopenia is therefore currently classified as a disease under code M62.84, based on the harm caused to the health of the elderly person[10].

In an attempt to standardize diagnostic criteria for sarcopenia, the European Working Group on Sarcopenia in Older People, Cruz-Jentoft et. al.[5], recommended the use of indicators of low muscle mass and low muscle function (strength or performance). The gait speed test was used to measure muscle and functional performance, body composition (anthropometric measures) to evaluate body mass index, and hand-grip strength (HGS) to measure the strength of the elderly person.

Despite being widely reproduced in scientific literature as a simple, objective and valid standard for the diagnosis of sarcopenia, the application of the European Consensus (2010) is limited for the study of elderly persons who do not have the physical capacity to perform the gait speed test. In this manner, it excludes wheelchair users and bedridden elderly persons, as well as those that do not have the cognitive capacity required to perform the test, which represents a large section of institutionalized elderly persons[11].

Considering the methodological limitations for the diagnosis of sarcopenia in the context of the reality of the institutionalized elderly, a model that allows the evaluation of elderly persons with poor conditions of physical and cognitive health must be considered. Therefore, the aim of the present study was to analyze the impact of the European Consensus (2010) on the diagnosis and prevalence of sarcopenia, considering not only ambulatory elderly persons, but also those with physical and cognitive limitations.

METHOD

The present cross-sectional study was carried out between November 2013 and February 2014 in all (n=9) private or non-profit Long Term Care Facilities (LTCFs) in the city of Natal, Rio Grande do Norte, Brazil. In total, 219 elderly persons (≥ 60 years) of both genders resident in the institutions were evaluated.

The criteria for inclusion in the study were that all the elderly persons were resident in the LTCFs evaluated and were aged 60 or over (confirmed by an official document). Additionally, the participants were asked to avoid strenuous physical activities, as well as the consumption of alcohol and caffeinated drinks, in the 24 hours prior to the tests.

Excluded from the initial sample were elderly persons who were fed via an enteral tube, those with physiological disorders that impeded the performance of the tests, and those that did not participate in all the stages of the study or that did not take part in all the proposed evaluations. As such, of the initial sample of 314 elderly persons that met the inclusion criteria, 95 were excluded from participation in the study, giving a final sample of 219 subjects.

With the help of a member of staff from each institution, the Mini Mental State Exam (MMSE)[12] was applied, and the weights and heights of the

elderly individuals, either actual or estimated by knee height, were measured to calculate Body Mass Index (BMI). To evaluate sarcopenia, we adopted the criteria established by the European Consensus on the Definition and Diagnosis of Sarcopenia (2010), with the aim of stratifying the prevalence of sarcopenia among institutionalized elderly persons. The criteria used were based on the determination of reduced levels of muscle mass (calf perimeter), associated with a reduction in strength (hand-grip strength) and functionality (gait speed), for the diagnosis of sarcopenia among elderly persons (n=75) with sufficient physical and cognitive conditions (MMSE>12) for the carrying out of the tests (Criteria A).

Elderly persons with a gait speed greater than 8m/s, analyzed by timing the individuals walking a distance of two meters, performed the handgrip strength test (HGST), which involves the application of maximum grip using a Jamar® dynamometer. It was performed with the elderly persons comfortably seated, positioned with the shoulder lightly adducted, the elbow flexed to 90°, the forearm in a neutral position and the wrist extended between 0° and 30°. Individuals with HGST scores below 30kg for men and 20kg for women and those with reduced gait speed (≤8m/s) underwent calf perimeter measurement. Those with perimeter values below 31cm were considered sarcopenic. Values higher than those established for HGST and/or calf perimeter meant the elderly individuals were classified as non-sarcopenic. For bedridden individuals, wheelchair users or those who did not have sufficient physical or cognitive capabilities (MMSE≤12) to perform the gait speed test (n=144), only muscle mass was evaluated (calf perimeter). This strategy was adopted as for this group of elderly persons, the result of gait speed would be ≤0.8m/s for physical and/or cognitive comprehension disability and the realization of the test (Criterion B). Additionally, we were able to adopt a criterion that included a larger portion of elderly persons resident in the LTCF.

Initially, the descriptive data were analyzed by mean and standard deviation of BMI, age and prevalence of sarcopenia for comparison of the elderly persons diagnosed according to Criterion A and Criterion B. For comparison of the mean continuous variables among the groups the Student's t-test was used. The chi-squared test was used for analysis of the qualitative variables, with a data distribution value of $p<0.05$ considered statistically significant.

The project was approved by the Ethics Research Committee of the Universidade Federal do Rio Grande do Norte (Federal University of Rio Grande do Norte) (CEP/UFRN) under approval N° 308/2012 and was carried out in accordance with the principles of medical research involving humans of the World Medical Association Declaration of Helsinki. Following explanation of the methodological procedures and objectives of the study, all the participants signed a Free and Informed Consent Form prior to the collection of data.

RESULTS

As can be seen in Figure 1, of the 75 elderly persons who formed part of criterion A, only 18 were able to participate in the HGST, of whom 12 exhibited low strength and underwent calf measurement together with the 57 elderly persons who exhibited low gait speed. In total, 24 elderly persons were considered sarcopenic using criterion A. When criterion B was applied a further 114 subjects with reduced calf perimeters were added to this total, giving an overall value of 138 sarcopenic elderly persons.

Criterion A – Exclusive for ambulatory elderly persons with good cognitive conditions.

```
                        75 Elderly persons

                         Gait Speed Test

          >0.8 m/s                              ≤0.8 m/s
          (n=18)                                (n=57)

     Handgrip Strength Test    ──────►   Calf Perimeter Measurement (n = 69)
          (n=18)

  3 male≥30Kg    4 male  ≥30Kg       <31 cm            ≥31cm
  3 fem. ≥20Kg   8   fem.  ≥20Kg     3 fem.            4 male. + 5 fem.
                                     $=21              $=21

        6                          24 Sarcopenic        45
   Non-sarcopenic                                   Non-sarcopenic
```
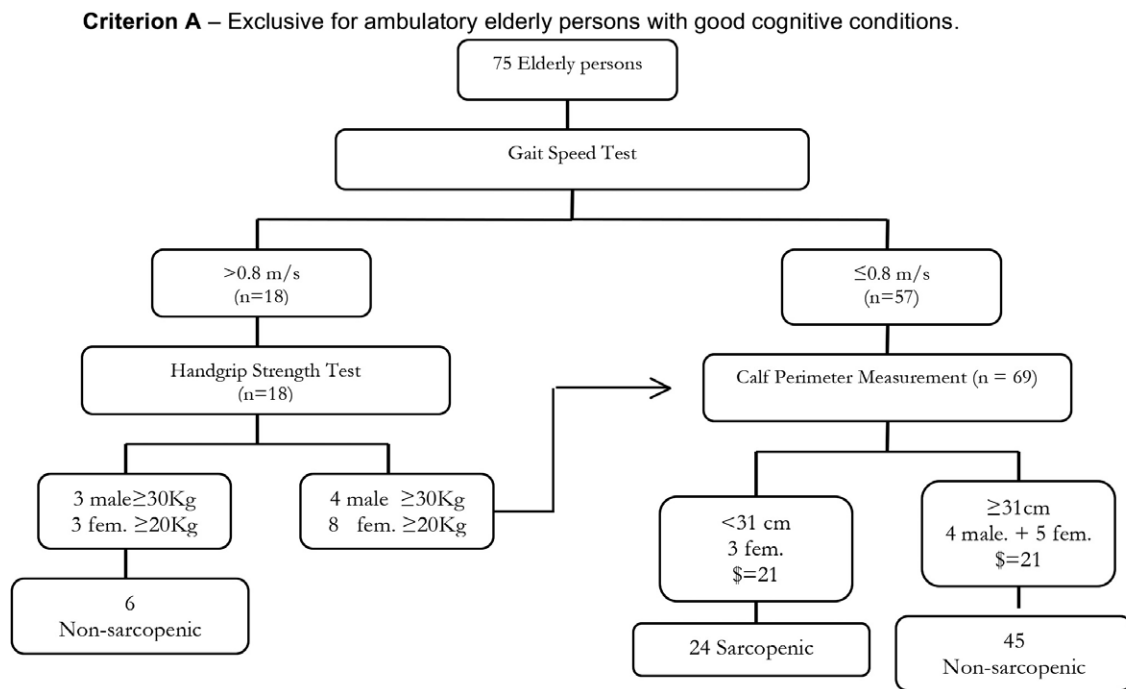
Fem=female.

Criterion B – Includes other non-ambulatory elderly persons and/or those with poor cognitive condition.

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     Could elderly persons walk and/or have good cognitive ability?
                              (n=219)

          Yes (n=75)                              No (n=144)

        Gait Speed Test (n=75)

     >0.8 m/s                                  ≤0.8 m/s
     (n=18)                                    (n=57)

  Handgrip Strength Test (n=18)   ──────►   Calf Perimeter Measurement (n=213)

  3 male ≥30Kg   4 male≥30Kg        <31 cm             ≥31 cm
  3 fem. ≥20Kg   8 fem.≥ 20Kg       3 fem.             4 male + 5 fem.
                                    $ = 21 male        $ = 36 male
                                    # = 114 fem.       # = 30 fem.

        6                         138 Sarcopenic         75
   Non-sarcopenic                                   Non-sarcopenic
```
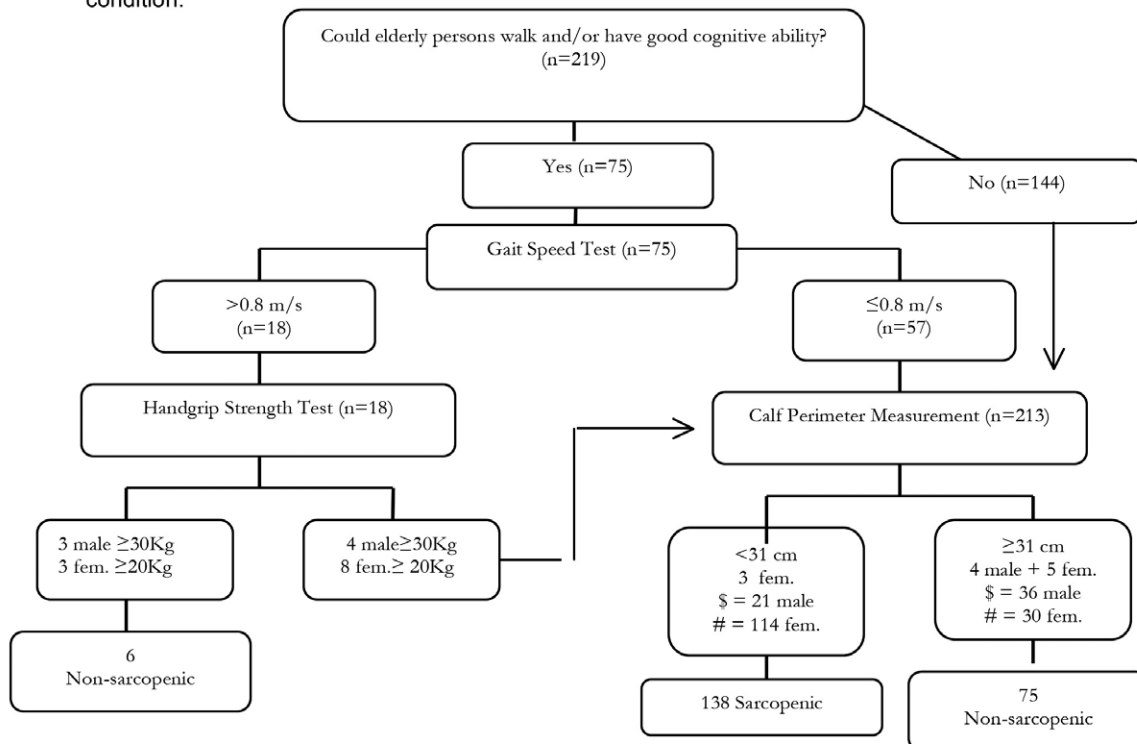
Fem=female.

Figure 1. Flowchart adapted from European Consensus (2010) for the definition and diagnosis of Sarcopenia among institutionalized elderly persons in the city of Natal, using the criteria of functionality (gait speed), strength (handgrip strength) and muscle mass (calf perimeter). Natal, Rio Grande do Norte, 2014.

When the elderly persons in the sample with sufficient physical and cognitive capabilities to perform the gait speed test (Criterion A) were compared with the other elderly persons who were evaluated for the diagnosis of sarcopenia (Criterion B), Criterion A identified a prevalence of sarcopenia of 32% (CI95%: 22.54-43.21), while Criterion B revealed a prevalence of 63.2% (CI95%: 56.45-69.13), showing that inserting elderly persons with poor physical/cognitive conditions in the diagnosis of sarcopenia practically doubles the prevalence of the disease. In addition, the Criterion B elderly had a higher mean BMI and a lower mean age than the Criterion A elderly, while no difference was observed in the distribution of gender among the criteria used, as described in Table 1.

Although the elderly persons with low physical and cognitive capacity directly influenced overall prevalence among the institutionalized elderly, as observed in Table 1, the associations with factors such as gender, BMI and age presented the same behavior, irrespective of the parameters of diagnostic analysis of sarcopenia performed in Criterion A and Criterion B (table 2). While BMI was significantly statistically different, with a higher percentage of underweight sarcopenic elderly, gender and age did not differ.

Table 1. Distribution of gender, prevalence of sarcopenia, age and BMI of institutionalized elderly persons from the city of Natal, Rio Grande do Norte (2014) and differences between diagnostic criteria A and B.

Variables	Criterion A (n=75) n (%)	Criterion B (n=219) n (%)	P value
Male	17 (22.7%)	49 (22.4%)	0.334
Female	58 (77.3%)	170 (77.6%)	
Variables	Criterion A (n=75) Mean (±sd)	Criterion B (n=219) Mean (±sd)	P value
Age (years)	80.24 (±8.74)	84.12 (±8.84)	<0.001
BMI (kg/m²)	25.89 (±5.58)	20.45 (±4.64)	<0.001

*Chi-squared test

Table 2. Factors associated with sarcopenia among institutionalized elderly persons in the city of Natal in relation to Criterion A and Criterion B. Natal, Rio Grande do Norte, 2014.

Variables	Criterion A n (%) Sarcopenia	Non-Sarcopenia	p value	Criterion B n (%) Sarcopenia	Non-Sarcopenia	p value
Male	3 (17.6%)	14 (82.4%)	0.149	28 (57.1%)	21 (42.9%)	0.212
Female	21 (36.2%)	37 (63.8%)		110 (64.7%)	60 (35.3%)	
BMI (kg/m²) Underweight	15 (88.2%)	2 (11.8%)	<0.001	105 (92.9%)	8 (7.1%)	<0.001
BMI (kg/m²) Normal weight	6 (23.1%)	20 (76.9%)		28 (48.3%)	30 (51.7%)	
BMI (kg/m²) Overweight	3 (9.4%)	29 (90.6%)		5 (10.4%)	43 (89.6%)	
Age ≥80 years	14 (32.6%)	29 (67.4%)	0.904	90 (64.3%)	50 (35.7%)	0.353
Age <80 years	10 (31.2%)	22 (68.8%)		48 (60.8%)	31 (39.2%)	

*Chi-squared test; Criterion A: European Consensus (2010); Criterion B: Adapted European Consensus; BMI: Body Mass Index; SARC: Sarcopenia

DISCUSSION

The present study revealed that Criterion B elderly persons had a higher mean age and a lower mean BMI than Criterion A elderly. These results were expected, as it has been observed that advancing age is accompanied by a higher incidence of multi-morbidities and functional disability, leading to bedridden and wheelchair bound elderly persons[13]. Additionally, such elderly persons suffer a progressive loss of body mass with age, especially in comparison with ambulatory elderly persons[6,14]. It is therefore impossible for elderly persons in such a context to undergo the gait speed test, the criterion used by the European Consensus to diagnose sarcopenia. However, when non-ambulatory elderly persons are included, the prevalence of sarcopenia is 31.2% higher than when only ambulatory elderly persons are included, corroborating the arguments above and leading to a more accurate prevalence of sarcopenia in LTCFs.

When comparing the two calculations for the diagnosis of sarcopenia used in the present study, it was found that the prevalence among elderly persons who could not walk or who had a poor cognitive condition directly interfered with the overall prevalence among the population of elderly residents of LTCFs. While the calculation used in Criterion A identified 32% of the elderly persons as sarcopenic, the calculation used in Criterion B practically doubled (63.2%) the prevalence of sarcopenic elderly, showing that an approach aimed at the care of sarcopenic elderly persons should be a priority, as the condition affects the majority of LTCF residents.

The bedridden and wheelchair-bound elderly exhibit greater risk factors for a variety of diseases[15] and naturally present higher frailty indicator scores with the loss of strength and functionality[16], resulting in a higher prevalence of sarcopenia. This corroborates the findings of the present study, which identified a higher prevalence of sarcopenia when the wheelchair-bound and bedridden elderly of Criterion B were included. This group would also be considered sarcopenic according to the criteria of SARC-F[17], which is used for the clinical and diagnostic analysis of sarcopenia. Among the established criteria, difficulties in carrying weight, need for assistance when walking between rooms, difficulty in transferring from the chair to bed,

limitations when climbing stairs and the incidence of falls of the elderly are all evaluated. More than two positive answers to these questions are sufficient for the diagnosis of sarcopenia. It can therefore be seen that tasks which are difficult or impossible for the bedridden and wheelchair bound elderly to perform are representative for the categorization of sarcopenia.

Despite the disparity between criteria A and B for the prevalence of sarcopenia, factors associated with BMI, gender and age were distributed in the same manner. While the BMI presented was significantly statistically different among sarcopenic and non-sarcopenic elderly, gender and age revealed no difference. It can therefore be seen that the inclusion of elderly persons with poor physical and cognitive conditions, as well as offering a diagnosis of sarcopenia that best represents the institutionalized elderly population, reveals the same distribution of associated factors as elderly persons with good physical and cognitive conditions, and such criteria are therefore representative from the point of view of both diagnosis and associated factors. In terms of BMI, it was found that most of the elderly were underweight, regardless of the criterion, demonstrating that the loss of mass (muscular or adipose) is a factor directly related to sarcopenia[2].

In the present study, only calf perimeter was used to measure sarcopenia in the non-ambulatory elderly, as these individuals were unable to achieve a gait speed of >0.8 m/s, based on the European Consensus criteria for the diagnosis of Sarcopenia (2010). For the conceptual development of the use of this criterion, the calf perimeter for those who are bedridden/wheelchair-bound can be considered a good predictor of sarcopenia, as this group of elderly people is already weakened, with no muscle strength and/or skeletal muscle, which is why they are unable to walk[18,19]. Although the European Consensus (2010) establishes calf perimeter values below 31cm for the diagnosis of sarcopenia, less conservative studies have reported that values below 34 cm for men and 33 cm for women indicate low muscle mass and are considered suitable values to predict sarcopenia, with a sensitivity of 88% and 76% and a specificity of 91% and 73% for men and women respectively[18].

In spite of this relationship between muscle weakness and sarcopenia, one of the limitations

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of the present study was that it considered only anthropometric evaluation for the diagnosis of sarcopenia in bedridden or wheelchair-bound patients or those with low cognitive ability. The analysis of muscular strength and functionality in the elderly should be considered when fully considering the criteria for the definition of sarcopenia, which in addition to loss of mass is also characterized by the generalized loss of strength and functional capacity that occurs with advancing age[8]. Future studies could analyze whether the use of hand-grip strength in Criterion B would result in a significant change in the prevalence of sarcopenia. In the analyzed data, HGS showed a moderate (r = 0.310) and significant (p = 0.007) correlation with gait speed, meaning it is possible to relate strength and functionality among institutionalized elderly persons with reduced physical and cognitive capacity.

Careful analysis of the method of diagnosing sarcopenia is extremely important not only for the clarification of the conceptual aspects of this condition, which has recently been classified as a disease[6], but also to reliably define the prevalence of sarcopenia in the target population studied. The diagnostic analysis of sarcopenia does not consider elderly persons with physical and cognitive restrictions and therefore misrepresents the actual prevalence of the condition, as demonstrated in the present study, reiterating the need for dialogue about the diagnostic methods of sarcopenia and to seek strategies that include elderly persons with physical and cognitive restrictions in the basis of its diagnostic calculation. This information becomes imperative when considering the reality of long-term care facilities in Brazil, due to the high prevalence of health-related factors in this population, with high rates of bedridden individuals, wheelchair users and elderly persons with reduced cognitive capacity[11].

Strategic government action plans have used prevalence to identify the impact of a disease on a population and the damage it causes to health, mainly to guide strategies to combat illness. When this prevalence reaches representative indicators for a population, new strategies must be used so that health care can be provided effectively. Thus, the change in how the prevalence of a health condition is registered directly impacts the public health strategies designed to combat it[20]. The diagnosis of sarcopenia used by the European Consensus (2010) can therefore have a major impact on the analysis of the prevalence of this disease among institutionalized elderly persons, underestimating diagnostic cases and consequently delaying an epidemiological approach to this health condition. Based on the results found, the use of the criteria adopted in the present study to diagnose sarcopenia in the institutionalized population in Brazil is therefore recommended, as these consider the non-ambulatory elderly and cognitively deficient individuals.

Despite being recommended by the European Consensus (2010), the diagnostic criteria of sarcopenia have some limitations for the analysis of physical performance and muscle mass. Calf perimeter, although recommended, is not selective for muscle mass as it evaluates all such mass, and is not considered a gold standard of body composition assessment. There are also some limitations with respect to physical performance analysis, since the Consensus itself uses a cutoff point for gait speed, but does not establish the precise form of assessment. There may therefore be some variations in the acceleration and deceleration of the method used which can change the final value of gait speed. In addition, there is no reference standard for gait speed and calf perimeter between men and women, as there is with strength.

CONCLUSION

The diagnostic calculation of sarcopenia considering only the criteria of muscle mass for elderly persons with physical and/or cognitive limitations, in addition to covering a larger population of the elderly, represents the real condition of residents in long-term institutions. Despite the high prevalence, the associated factors of gender, age and BMI are similarly distributed between the two criteria suggested for the diagnosis of sarcopenia. We therefore recommend that this adaptation of the European Consensus criteria for the diagnostic calculation of sarcopenia among non-ambulatory individuals and those with cognitive deficits is used in future studies that seek to evaluate the prevalence of sarcopenia among institutionalized elderly persons.

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Ageism in the organizational context – the perception of Brazilian workers

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Abstract

Objective: elaborate a scale for ageism in an organizational context (Escala de Ageismo no Contexto Organizacional or EACO), seeking evidence of its structural validity and investigating possible differences in prejudices against elderly workers. This article also highlighted differences between gender, age and levels of schooling. *Method:* the project was divided into two studies: the first focused on the construction of the EACO, testing the understanding of the initial instrument among 82 workers. A new version was sent to and analyzed by ten judges, resulting in a 28-item scale with six dimensions. The second study presented evidence of the validity of the EACO, using a more robust national sample. The modified instrument was electronically issued to 2,400 workers of varying ages from different regions of Brazil, with 600 participants responding. *Results:* Exploratory factorial analysis (EFA) resulted in an EACO with 14 items, with satisfactory eigenvalues, factorial loads and communality, grouped into two dimensions: D1 - negative attitudes, composed of cognitive and health aspects (α=0.83) and D2 - positive attitudes, composed of affective aspects (α=0.77). Younger workers had more negative attitudes towards aging than older workers, who in turn had more positive attitudes than younger individuals. *Conclusion:* The EACO tested ageism in organizations and demonstrated evidence of validity. It is also recommended, however, that the scale is used in its longer version in future research, with national and transnational groups and participants of different educational levels.

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INTRODUCTION

Population aging is a reality both in Brazil and around the world[1,2]. With increased life expectancy, the percentage of older workers in the job market has also increased. In Brazil, it is estimated that, approximately 57% of the working-age population will be over 45 by 2040[3], which according to Tafner, Botelho and Erbisti[4] represents a significant demographic leap. The same has occurred in Portugal and other European countries that have seen the aging process affect the economically active population [5]. Rapid population aging is a challenge, both for the payment of pensions and the provision of the necessary health and social services for this population. It is therefore predicted that people will work longer due to a shortage of skilled labor and the sustainability of the economy, which demands the continued presence of more experienced workers in the workforce[5,6].

Ageism is linked to diversity and inclusion, which have recently become social and political concerns, as described by Torres et al.[7]. Accepting differences leads to the development of attitudes and actions that encourage inclusion and the punishment of discriminatory behavior. In practice, the media and the scientific community have focused on racism and sexism, and of the three isms (racism, sexism and ageism), ageism has been little discussed, especially with regard to the cognitive ability of older workers and their permanence and inclusion in the labor market[8,9].

The term ageism or age prejudice was conceived by Butler[10] as a process of systematically stereotyping and discriminating against people through age, affecting decisions on hiring, medical care and social policy. Goldani[9] differentiates ageism from age discrimination, considering the former to be a system of attitudes ascribed by individuals and society to others on the grounds of age, while the latter excludes people simply by using age as a decisive factor.

Organizational ageism can be defined by a set of negative or positive attitudes towards aging, valuing or devaluing the elderly work force, favoring or disfavoring their inclusion/exclusion and permanence in the labor market[11]. Discrimination against older workers can range from non-hiring to dismissal,

especially when an organization needs to reduce its workforce.

Koppes et al.[12] observed that age discrimination is one of the forces driving ageism. For these authors, discrimination in the Netherlands was perceived as substantial, with 14% of workers reporting being discriminated against, a proportion that rose to 20% among those aged 55-64.

In Spain, Alcover[13] stated that it is more difficult for the elderly to deal with the uncertainties and insecurities experienced at work. It is important that organizations reconcile rights and opportunities for workers of all ages and provide a favorable working environment to remain competitive.

European studies by Van Dalen et al.[14,15] and in Brazil by França et al.[16] presented similar results in relation to the perception of managers: loyalty, reliability and managerial skills stood out among older workers, while the skills to deal with new technologies, health and physical vigor, and the will to learn were notable among younger workers. In the Brazilian study, despite the awareness of managers of the challenge of population aging, few measures were taken to retain or recruit older workers or improve their productivity.

Following this line of thinking, Iweins et al.[17] stated that organizations need to promote health, safety and quality of environment for older people to allow them to continue working, and to encourage the development of intergenerational teams, which are an important way of breaking down prejudices and mutually benefiting younger and older workers[18]. Such teams will be able to discuss national and local problems and encourage the proposing of alternatives for collective well-being and the reduction of prejudices[19,20].

Negative stereotypes can lead to the exclusion of older workers and must be tackled. One of the ways to reduce these stereotypes is to increase studies and research on the perception of managers and workers regarding aging in organizations, guaranteeing reflection in all sectors of society[14-16], especially in times of crisis, when the cooperation of workers of all ages is welcome. As Camarano et al.[21] stressed, the labor market needs to prepare to absorb older workers

by creating more job opportunities in an attempt to reduce the prejudice suffered by this group.

Despite this, it is difficult to identify ageism, and the lack of studies and instruments to measure it reduce the chances of producing knowledge and advancing this theme[16,22,23]. The construction of a scale of organizational ageism can serve as a barometer for potential interventions to reduce ageism, stimulating equal opportunities and labor participation for all age groups.

In this context, the aim of the present study was to create a scale of ageism to be applied to workers of various ages across Brazil, seeking evidence of the validity of its structure. In addition, the perception of Brazilian workers regarding prejudice against older workers was sought, evaluating if there are differences between the gender, age and level of schooling of the participants. The present Project includes two studies: the first is based on the construction of the Scale of Ageism in an Organizational Context (Escala de Ageismo no Contexto Organizacional, or EACO), drawing on previous studies on the subject and the suggestions of ten evaluators. The second study used a robust sample and sought evidence of validity of the EACO.

STUDY 1 METHOD

Construction of the Scale of Ageism in an Organizational Context (EACO)

The sample consisted of 82 workers from 62 public and private companies located in Rio de Janeiro and Minas Gerais, Brazil, who, when invited, agreed to participate in the research. The main inclusion criterion was the age of the participants, who were divided into two groups: the first with workers aged 18 to 35 years and the second with workers aged 50 years or older. The mean age of the younger group (N=47) was 29 years (±3.9) and that of the older group (N=35) was 55.7 years (±4.4).

Based on a review of national and international literature on ageism[10,11,14,15] and in the practical experience of 30 years of consulting on the theme of aging in organizations of the first author, an initial instrument with 46 items was elaborated. The items of the instrument were arranged on a Likert scale ranging from 1 *Totally disagree* and 5 *Totally agree*.

The study was submitted to the Research Ethics Committee of the Universidade Salgado de Oliveira (UNIVERSO) and approved on 8-11-2012, N° 78-2012. All participants signed a Free and Informed Consent Form, and the participants were assured of the secrecy and anonymity of the data and informed that they would receive no inducement or payments and could withdraw from the survey at any time.

The first version of the 46-item scale was evaluated by 82 participants. The researchers selected items that were understood by most participants, resulting in a 39-item version. This second version was sent for evaluation by ten evaluators, who analyzed the conceptual, semantic and operational validity of the items and the groupings in seven categories, in order to create a scale to be tested later in a larger sample.

In terms of clarity, evaluators should consider the intelligibility of each item and its ability to represent a single idea in a simple, direct and unambiguous way. With regard to relevance, the scoring should reflect the importance of each item in relation to perceptions about aging in organizations.

RESULTS OF STUDY 1

The preliminary instrument with 46 items was tested in a sample of 82 workers from both age groups. Two items which were not answered by more than 30% of the sample and five other items which presented restricted variability, with 90% of the answers concentrated between options 1 and 2 (totally disagree and disagree), were withdrawn. The items fitted into seven categories whose contents were addressed in literature, such as: 1) Organizational guidelines/policies; 2) Health and safety at work; 3) Cognitive aspects; 4) Leadership/Acceptance of orders; 5) Emotional balance; 6) Productivity and 7) Representativeness/employability.

In the second stage of this study, the 39-item scale was analyzed by ten expert evaluators - teachers and researchers who worked in the area of aging and/or worked with psychometric analysis in eight Brazilian universities (UFF, UFSC, UERJ, UFPA, UFV, UNIVERSO, UFRR and UNB). The judges evaluated the conceptual, semantic, and operational validity of the items and clusters presented, compressing the answers into the seven categories

described above. They scored the items by degrees (from 0 to 3) in terms of the clarity and relevance of the items, as well as their pertinence and adequacy in the categories, with a minimum agreement of at least 80% of the experts.

According to the criteria defined above, 11 items were withdrawn, and based on the theoretical explanation of the dimensions, the seventh dimension was withdrawn - Representativeness/employability. Thus, the EACO was composed of six theoretical categories: 1) Organizational guidelines/policies; 2) Health and safety at work; 3) Cognitive aspects; 4) Leadership/Acceptance of orders; 5) Emotional balance; 6) Productivity; as described in Chart 1. The scale now composed of 28 items was tested in a larger study, as can be observed in study 2 described below.

Chart 1. Proposed categories for the Scale of Ageism in the Organizational Context (EACO). Niterói, Rio de Janeiro, 2014.

Categories	Definition
D1 – Organizational Norms/Policies Items: 13, 19, 22, 25 and 28	Norms are parameters or guidelines for decision making, which include the definition of levels of delegation, range of values and/or threshold quantities and the extent of actions to achieve the challenges and objectives[30].
D2 – Health and Safety at Work Items: 2, 3 and 26	The WHO[31] defines health as the situation of perfect physical, mental and social well-being. Therefore, in the workplace, the health of workers is related to physical, mental and social well-being, including the prevention and control of accidents and diseases by reducing conditions of risk.
D3 - Cognitive Aspects Items: 1, 4, 7, 16, 17, 21, and 27	Cognitive aspects include learning, memorizing, and concentrating on task completion, information processing, and problem solving [32].
D4 - Leadership/Acceptance of Orders Items 6, 12 and 14	Leadership is the process of influence between leader and follower, hierarchical relationship, oriented mainly towards meeting mutual goals and expectations [33].
D5 - Emotional intelligence Items 8, 9, 10, 15 and 18, 23	Emotional intelligence consists of five basic, interdependent skills: self-awareness, self-motivation, self-control, empathy, and sociability. The first three relate to examinations of reactions of the self and what the individual does with their own feelings, while the others look outward toward the feelings of others and social interactions[34].
D6 – Productivity in organizations Items 5, 11, 20 and 24	Productivity is the efficiency indicator that guides the organization towards actions that strengthen the company's financial health and increase its competitiveness[35].

Chart created by authors

STUDY 2 METHOD

Evidence of validity of Scale of Ageism in an Organizational Context (EACO)

In a continuation of the first study, study 2 used a convenience sample with 2,400 workers over 18 years old from all regions of Brazil. The database was created using emails from friends and collaborators and the snowball technique, where each participant was encouraged to invite friends from their online social network to participate.

A total of 600 workers from public (56%) and private (44%) and large (38%) and medium-sized enterprises (62%) participated in this study. These entities were from the energy, transportation, education, banking, information technology and industrial sectors, and the armed forces. The majority of the sample was female (66%), aged between 18

and 75 years (M=42.36, ±13.11), and did not hold a management position (62%). The majority had a postgraduate degree (61%) and just over half (53%) were married or lived with a partner. The Southeast region was the most representative (50%), followed by the Northeast (23%), North (11%), Central-West (9.0%) and South (7%).

The EACO ready to be tested in this second study was composed of 28 items, as can be seen in Chart 2.

Chart 2. Scale of Ageism in Brazilian Organizations (EACO). Niterói, Rio de Janeiro, 2014.

This instrument addresses aging and work. Read each sentence and choose between 1 2 3 4 5 as the most suitable value, 1 = "totally disagree" and 5 = "totally agree". Younger workers = up to 35 years Older workers = 60 years or older

1	Older workers take more time to perform tasks in the work environment
2	Older workers tend to get sick more easily.
3	Older workers tend to miss work more
4	Younger workers tend to have greater ability to concentrate
5	Younger workers can tolerate a longer working day
6	Older workers have difficulty taking orders from younger workers
7	Older workers tend to forget new tasks
8	Younger workers generally do not have the patience to deal with older workers
9	Older workers are more resistant to change
10	Older workers are more persistent than younger workers
11	Younger workers are more productive than older workers
12	In general, older workers have more relationship difficulties than younger workers
13	People must retire at age 70
14	Older workers should not hold managerial positions.
15	Older workers are more committed to work than younger workers.
16	In general, older workers are more knowledgeable about work
17	Younger workers are more able to learn new technologies
18	Older workers are better able to cope with work pressures
19	Training older workers is a wasted investment
20	Aging affects worker productivity
21	Older workers are less creative than younger workers
22	Organizations should hire older workers
23	Older workers are more able to solve problems than younger ones.
24	The departure of older workers can increase the productivity of organizations
25	Retirees should not continue working
26	Older workers tend to suffer more work-related accidents than younger workers.
27	Younger workers understand work routines better than older workers
28	Older workers should have reduced working hours

Chart created by authors

The factorial analyzes were performed using Principal Axis Factors (PAF), and the matrix of the factorial loads was rotated by the orthogonal Equamax method. The internal consistency of the scores was assessed using Cronbach's Alpha. The relationships between the scale scores and the external variables gender, age groups, schooling and public versus private companies were evaluated by means of the t-test. In addition, Pearson correlations were tested between the ageism, gender, age and schooling scores. Finally, multiple linear regressions were performed to verify the influence of age, gender and level of education on positive and negative attitudes towards aging in the organizational context.

RESULTS OF STUDY 2

From the original scale of 28 items, items 14 and 19 were withdrawn as they presented restricted variability, that is, more than 90% of the responses were concentrated among options 1 and 2 (totally disagree and disagree). Because it was an exploratory study, the criterion was the gradual exclusion of items: commonality below 0.20, then 0.25 and finally 0.28. In this way, the removal of most of the items was avoided in the first analysis. A new analysis verified the necessity of the withdrawal of five items (8, 13, 17, 25 and 28) as they presented commonality below 0.20. The following analysis demonstrated that a further five items (6, 9, 12, 21 and 24) needed to be withdrawn as they had commonalities below 0.25. Finally, items 5 and 22 were also withdrawn with commonalities below 0.28. In order to preserve the largest number of items, and as they are on the borderline of the recommended value (0.30), it was decided to keep items 4 and 20.

After the items were excluded, parallel analysis was performed to evaluate the number of factors to be extracted. To achieve this, the variance explained by the empirical dimensions was compared with the variance explained by the dimensions generated from random databases, by means of the 95th percentile. It was difficult to sustain a third factor, as the random data presented a greater explained variance than the empirical factors (empirical factors: 34.6%, 21.0% and 7.5%, in order of factors; Random factors: 16.9%; 15.1% and 13.6%, in order of factors). Therefore,

two factors were extracted. The divergence between the explained variance values presented in Table 1 is justified as these data were analyzed before rotation. Furthermore, in the *Scree Plot* the curve of the eigenvalues stabilizes from the third factor. In addition, the third dimension presents an eigenvalue below 1, which does not justify its extraction.

In exploratory factorial analysis, the first extraction of factors was performed by analyzing its main components in order to verify the initial number of factors in the matrix. Next, the parameter estimation method was used, i.e. Principle Axis Factoring (PAF) with Equamax rotation. The final scale presented 14 items divided into two dimensions: i) D1 - negative attitudes, defined mainly by cognitive and health aspects, which revealed excellent internal consistency ($\alpha=0.83$), factorial loads between 0.53 and 0.64, M=2.23 (±0.69) and ii) D2 - positive attitudes, a dimension defined mainly by affective aspects, adequate internal consistency ($\alpha=0.77$) and factorial loads of 0.57 to 0.71; M=3.32 (±0.82). These factors explained a total of 37% of variance.

To analyze the differences or similarities of perceptions regarding older workers by age, the sample was divided into two groups. The younger workers, aged up to 35 years, formed the first group (N=212; M=28; ±6.34) and older workers, aged over 50, formed the second group (N=193; M=57; ±5.76). This division followed the example of studies by Van Dalen et al.[15] and França et al.[16], when the perceptions of groups of young and old people of aging in organizations were analyzed.

The results revealed that there are significant differences between the age groups in terms of positive and negative attitudes towards organizational aging (t=-5.96, $p<0.001$). As for negative attitudes (t= 3.22, $p<0.001$), the group of younger workers (M=2.30; ±0.57) had a higher mean value and were more negative in relation to aging than the older group (M=2.07, ±0.70). On the other hand, the older group (M=3.55; ±0.80) had more positive attitudes than the younger ones (M=3.06, ±0.86) t=3.22; $p<0.01$.

Pearson correlation analysis was performed to analyze the correlation between the factors. The results of the analyzes showed that the correlation

between the factors was low (0.09), indicating that the scale is orthogonal and its factors do not correlate with each other. Correlations were identified between the EACO dimensions - negative (D1) and positive (D2) attitudes and three independent variables: age, gender and schooling, as can be seen in Table 2.

Table 1. Scale of Ageism in Organizational Context (EACO). Niterói, Rio de Janeiro, 2014.

Items	M (sd)	CF1	CF2	h²
2. Older workers tend to get sick more easily.	2.64 (±1.14)	0.64		0.41
1. Older workers take more time to perform tasks on the desktop	2.38 (±1.11)	0.64		0.41
11. Younger workers are more productive than older workers	2.43 (±1.03)	0.63		0.40
7. Older workers tend to forget new tasks	2.17 (±1.05)	0.62		0.39
3. Older workers tend to be out of work	1.73 (±0.96)	0.58		0.34
27. Younger workers understand work routines better than older ones	2.01 (±1.02)	0.58		0.34
26. Older workers tend to suffer more accidents at work than younger workers	2.03 (±1.03)	0.56		0.31
20. Aging affects worker productivity	2.39 (±1.10)	0.53		0.29
4. Younger workers tend to have greater ability to concentrate	2.30 (±1.09)	0.53		0.29
15. Older workers are more committed to work than younger workers.	3.14 (±1.25)		0.71	0.50
23. Older workers have more ability to solve problems than younger ones	3.27 (±1.07)		0.65	0.42
10. Older workers are more persistent than younger workers	3.37 (±1.15)		0.63	0.41
18. Older workers are better able to cope with work pressures	3.36 (±1.11)		0.61	0.37
16. In general, older workers are more knowledgeable about work	3.47 (±1.12)		0.57	0.32
Percentage of Explained Variance (total=37%)		22.57	14.60	
Eigenvalues		3.87	2.56	

Table created by the authors

Table 2. Regressions and correlations between the variables gender, age and schooling and positive and negative attitudes towards aging in the organizational context. Niterói, Rio de Janeiro, 2014.

Dependent Variable / Output	Predictor Variables / Input			B	t	p
	Gender			0.11	2.72	0.007**
Positive attitudes	Age			0.13	3.16	0.002**
	Schooling			-0.03	-0.82	0.41
	Gender			-0.40	0.99	0.32
Negative attitudes	Age			-0.29	-7.28	0.000***
	Schooling			-0.17	-4.28	0.000***
Correlations	1	2	3	4	5	
D1-Negative attitudes	1					
D2- Positive attitudes	0.09*	1				
Age	-0.14**	0.26**	1			
Schooling	-0.07	-0.12*	-0.18**	1		
Gender	-0.11**	-0.06	-0.02	0.08*	1	

Regression analyzes for positive and negative attitudes were conducted independently (as each regression analysis seeks to evaluate a single Output variable as a function of a set of predictor variables); N=578; Positive attitudes - RΔ = 0.028; F=6.46; **$p<0.01$; Negative attitudes - RΔ=0.096; F=21.52; ***$p<0.001$; Correlations = (*$p<0.1$; **$p<0.5$). Table created by the authors.

In the interpretation of the correlations, the Miles and Shevlin[24] criteria were used to classify the magnitude of correlation coefficients according to the following ranges: 0.10 to 0.29 (low); 0.30 to 0.49 (moderate) and >0.50 (high). In this study, the IVs and DVs had low correlations, or in other words between 0.08 and 0.26.

The negative attitudes dimension of aging in the organizational context had a negative, low and significant correlation with age and gender, but not with schooling. Thus, younger male participants have more negative attitudes towards aging in the organizational context. However, the dimension of positive attitudes towards aging demonstrated a low significant positive correlation with age and a negative correlation with schooling, but not with gender. In other words, older and less educated participants have more positive attitudes towards aging in the organizational context.

The first regression, with the positive attitudes dimension as a dependent variable, resulted in a significant model, but which explained only 3% of the positive attitudes ($R^2=0.03$, F=6.46, $p<0.01$). This model revealed that the age ($\beta=0.13$, t=3.2, $p<0.01$) and gender ($\beta=0.11$, t=3.16, $p<0.01$) variables were statistically significant (Table 2). Thus, women and older workers demonstrated more positive attitudes towards aging in the organizational environment.

The second regression, with the negative dimension as the dependent variable, resulted in a significant model, but explained only 10% of the positive attitudes ($R^2=0.10$, F=21.52, $p<0.001$). This model showed that age ($\beta=-0.29$, t= -7.28, $p<0.001$) and schooling ($\beta=-0.17$, t= -4.28, $p<0.001$) were the variables which reached statistical significance, as can be observed in Table 2. In other words, younger and less educated workers demonstrated more negative attitudes toward aging in the organizational environment.

DISCUSSION

The aging process is an emerging theme in the world of work. In Brazil, this process requires several measures to be taken by organizations, as the population of older workers will soon represent the majority of the workforce. However, there is a paucity of research and actions on this topic, especially studies on prejudiced attitudes against older workers, including instruments that can identify ageism in organizations, and what can be done to reduce it.

The present study elaborated and validated a pioneering instrument in Brazil to measure ageism in the organizational context and was validated with 600 workers from all regions of the country. Its results offer important practical implications, one of which is the need for organizations to devise actions and strategies that contribute to lessening the uncertainty and perception of insecurity that surrounds age, especially when facing the difficult decision to reduce the workforce[13]. The non-adoption of these actions and strategies may result in an attitude of total alienation arising from existing prejudices regarding older workers. A paradigm shift with respect to stereotypes about older workers, meanwhile, may influence managers in relation to the retirement of their employees[21,25].

A recent longitudinal study by Van Dalen and Henkens[26] based on data from 2010 and 2013 demonstrated that the evaluation of older workers by managers tended to improve over time, especially regarding factors which were already evaluated positively, such as loyalty, reliability and interpersonal and managerial skills, as well as resistance to stress, creativity and even flexibility and willingness to learn (factors commonly attributed to younger workers). Only physical vigor and skills for new technologies were assessed more negatively. In general, as managers age they tend to be more positive about older workers. The researchers argue that, in addition to the age of managers, regular contact with other managers and older workers tend to improve their assessments.

Managers are the main mobilizers of the labor market, and so it is important to encourage regular contact between such individuals and these workers, as well as perform research into changes in perceptions regarding the aging of workers[26]. In this sense, the importance of investigating the perceptions of younger workers, who witness others leaving the organization, is increased. Valuing and respecting older people can foster the loyalty and sense of belonging of young people to organizations.

Intergenerational exchanges should be stimulated from childhood in order to reduce negative

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attitudes towards aging[27]. As for the reduction of organizational prejudices, international literature recommends certain actions, as well as stimulating intergenerational production[17]: promoting seniority as a significant component in all exercises of diversity; developing a guide on ageism to be used as an educational tool, which goes beyond mere knowledge of the law; conducting training sessions that value intergenerationality, communication and team building. In Brazilian literature, recommendations include greater investment in training, updating the skills of older workers, the approximation of workers using intergenerational teams[7,17] and encouraging programs aimed at retaining the skilled labor of these workers through the reduction and/or flexibility of working hours, special leave and workload. Some examples of the formation of intergenerational teams[17,18] and the presentation of a diagnosis of diversity and organizational inclusion[28] have also been highlighted, in which the organization can identify, in addition to ageism, other prejudices that impede the valuation of diversity and an organizational culture of inclusion[8].

It is noteworthy that ageism is among the "isms" that is least addressed by academia and society as a whole[11,28]. It is, therefore, a silent prejudice that affects people in various contexts, including in the labor market. This idea is reinforced by a recent study with students from the University of the Third Age (U3A). The results showed that the participants did not consider ageism an inherent problem in the aging process[29], unlike the findings of research conducted in other countries[13,17]. It is therefore increasingly necessary to study this theme in order to promote broader discussions that offer practical solutions and work opportunities for all[5,7,25].

Among the limitations of this study are: a) the research did not obtain representation from the states of Acre, Amapá and Piauí and had little representation in the southern region of the country; b) the sample obtained a higher concentration of workers with higher educational levels, medium and large companies, and many respondents from the southeast region. These limitations indicate the need to replicate the short scale of 14 items which emerged from the factor analysis in other organizational contexts.

Studies on ageism in Brazil are incipient, and other investigations using the original EACO proposal with 28 items, which was pre-tested and resulted from the analysis of the evaluators as described in Study 1, are required. Items that have been observed by other authors can also be added. Future studies may also identify predictors for ageism and outline types of organizational intervention that can reduce it.

In addition to the importance of providing a scale to measure the level of ageism among workers in organizations, it is believed that this article will encourage further research which will, in turn, bring about increasingly necessary discussions on this subject. The current Brazilian demographic profile affects organizations and requires urgent modifications in the management of human resources to deal with this new context more effectively.−

CONCLUSION

This study resulted in the creation of an instrument (EACO) that could allow Human Resource teams to combat ageism and formulate guidelines and policies to extend the working lives of older people. The continuation of this study is recommended, with the replication of EACO in Brazilian and transnational studies, seeking the representativeness of older workers in relation to educational level and regional location, and at the same time, verifying the existence of differences and/or similarities in different organizational contexts. Measuring prejudiced attitudes can help build a more inclusive work environment to enable older workers to continue to participate in the job market if they wish.

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Factors associated with the care of elderly persons with Primary Health Care sensitive conditions

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Abstract

Objective: to analyze factors associated with the care of the elderly for Primary Health Care sensitive conditions in an Emergency Care Unit. *Method:* a cross-sectional study was carried out in a municipal district located in the northwest of the state of Paraná, Brazil, between May and November of 2015. A semi-structured instrument was used, consisting of three distinct blocks that addressed sociodemographic profile, characterization of care and the reasons that led the elderly to seek care in the unit. The data were submitted to descriptive analysis and logistic regression for the treatment of variables. *Results:* A total of 191 elderly persons, who were female (56%), had less than eight years of schooling (85.3%) and were retirees (78.5%) were interviewed. The results showed that people with chronic morbidities were 1.42 times more likely (CI: 1.08 - 5.42) to seek the Emergency Care Unit prior to the Basic Health Unit and were 1.65 times more likely (IC: 1.01 - 6.82) to be referred by the unit for care. The lack of a doctor in Basic Health Units was also a factor responsible for the 1.36 times greater chance (CI: 1.03 - 5.38) of the elderly being referred to the Emergency Care Unit for primary care sensitive conditions. *Conclusion:* the lack of human resources in the first level of care of the health service, together with the need for treatment of morbidities, were factors associated with the elderly seeking treatment for primary care sensitive conditions, with diseases of the osteomuscular and connective tissue systems the main reasons for seeking such care (47.6%).

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INTRODUCTION

The increase in life expectancy and the aging of the population have occurred in an accelerated manner in developing countries. In Brazil this phenomenon has been associated with an increase in the incidence and prevalence of chronic noncommunicable diseases, with 79% of Brazilians over 60 years of age reporting chronic health conditions[1-3]. The average burden of illness in years of life lost, adjusted for disability, is made up of infectious diseases (14.8%), external causes (10.2%) and chronic diseases (66.2%), constituting a triple disease burden[4].

To meet the impact of the health needs of the elderly, the Ministry of Health created the National Health Policy for the Elderly in 2006. This is aimed at the promotion, prevention and recovery of health, based on the guidelines of the Sistema Único de Saúde (the Unified Health System) (SUS), seeking to develop individual and collective resolutive actions offered under Primary Health Care (PHC). Such actions should be carried out by the Family Health Strategy (FHS) in Basic Health Unit (BHU) coverage areas, supported by and linked to secondary and tertiary care for medium and high complexity referrals[5,6].

The Brazilian health system has adopted PHC as the preferred entry point for users into health services. However, this care point includes challenges that must be overcome, such as the insufficient provision of health services due to a lack of human and technological resources[7]. This fact subsequently affects demand in other health care facilities, such as Emergency Care Units (ECUs).

The ECUs offer an intermediate level of care, mediating referrals from the BHUs/FHS and hospitals to resolve acute or exacerbated clinical cases. A study carried out in southern Brazil revealed that most of the treatment provided by this high complexity service is not an ideal fit for urgent and emergency cases, creating confusion in the organizational structure, with emotional harm to patients and professionals, compromising the quality of care provided[8]. Treatment of PHC-sensitive conditions in ECUs is an evaluative indicator of the first level of health care, as efficient actions in the promotion and prevention of comorbidities result in a reduction in hospital admissions[9].

Hospitalizations for Conditions Sensitive to Primary Care (HCSPCs) is a list developed by the Ministry of Health, published under Ordinance 221/2008, which indicates hospitalizations that would be avoidable if basic care services were effective and/or accessible[9]. HCSPCs can include, in certain conditions, non-controlled complications of a chronic illness or other conditions related to actions and services of prevention[10].

Understanding the sensitive causes of the care provided in the ECUs allows the identification of the effects of PHC strategies, guiding the planning of interventions in such location, contributing greatly to the reduction of avoidable care, especially among the elderly population[11]. In view of the above, the objective of this study was to analyze the factors associated with the care of the elderly in ECUs for conditions sensitive to primary health care.

METHOD

A cross-sectional study was carried out between May and November 2015 in a municipal region located in the northwestern part of the state of Paraná, Brazil. The municipal region in question has an estimated population of 403,063 inhabitants, with 35 BHUs and 74 FHS teams, providing population coverage of 68.01%[12]. It has two functioning ECUs. The study was carried out in one of these units, which covers around 200,000 people and is registered with 11 BHUs in the municipal region[13].

To calculate the sample, the number of elderly persons receiving care in the ECU in the four months prior to the beginning of data collection was surveyed, resulting in an average of 300 elderly individuals treated per month. A proportional stratified sample was performed, considering an estimate of error of 5% and a 95% confidence interval, plus 10% for possible losses. The final sample was 191 people. The selection technique was non-probabilistic based on traffic, or in other words, the elderly persons who attended the ECU were invited to participate in the study. Inclusion depended on the verification of adequate cognitive ability through the application of the Mini Mental State Exam (MMSE), with cognitive decline considered a score equal to or less than 24 points[14].

In addition to assessing the cognitive status, the following inclusion criteria were adopted: people of both genders, aged 60 or over, who were not classified within the emergency criteria (green and blue color) of the risk classification of the Manchester Screening Protocol, which consists of classifying the patient according to their clinical condition, rather than order of arrival[15].

After the classification of risk, the medical consultation and the confirmation that the treatment provided was primary care sensitive, the elderly were approached to verify if the diagnosis received was classified by the Tenth Revision of the International Classification of Diseases (ICD-10) and was included on the Brazilian HCSPC List, which has 19 diagnostic groups[9].

Next, a semi-structured instrument was applied, divided into three distinct blocks. A pilot test was first carried out, which was submitted to modifications for qualification and adaptation to the context in which it was applied.

The first block of the instrument obtained information regarding the patient's identification and socio-demographic situation (gender; age; schooling; economic situation; referral BHU) and clinical data (existing morbidities; recurring visits to ECU; health plan). The second block dealt with the characterization of the care provided in the unit (risk classification; if referred by BHU and, if so, which professional carried out the referral; interviewee's perception about the need for referral, when referred; the health need described by the patient; and the diagnosis given, which would indicate the inclusion of the subject in the study, according to the ICD-10 and HCSPC).

The third block dealt with the reasons that led to seeking ECU care (frequency of seeking care in the BHU; if care was sought for a health complaint in the BHU before the ECU; reasons for not seeking care in the BHU; if care was sought in the BHU, what led to the non-resolution of the health complaint; how the individual evaluated the service in the BHU and in case of an unsatisfactory evaluation, what was the reason; opinions on what should be improved in the BHU; classification of the severity of the current health problem; if treatment was provided for the existing morbidity in the BHU; knowledge about the role of the BHU and ECU in providing care; expectation of care at the ECU).

The following dependent variables were adopted: *Referred by BHU*, through a BHU referral form confirming that care was sought in the BHU and for some reason the individual was referred; and *Sought Care in BHU before ECU*, where the participant was questioned about seeking care at the BHU before going to the ECU. The two dependent variables were evaluated from the responses of the interviewees and the absence of referral by the BHU for the majority of those who said they had sought the unit to treat their health problem.

The independent variables were divided into two blocks. The first evaluated the reasons why the individual did not seek treatment at the BHU: evaluation of the service performed by the BHU; presence of chronic morbidity, such as those requiring follow-up care; geographic location, with a walking distance of twenty to thirty minutes considered as a parameter, taking into account factors related to public transportation, such as cost and waiting time[16]; lack of doctors; lack of confidence in BHU care; BHU service hours.

The second group evaluated the reasons that led to seeking care at the ECU: better technological and treatment resources of the ECU, such as the presence of available doctors for treatment and equipment for imaging tests; better service; the fact that appointments are not needed at the ECU; where individuals considered their clinical situation as an ECU case, after which they were questioned about their perception of their current state of health; fast service; possibility of examinations without the need to schedule a date and time, unlike the BHU; same day delivery of test results, again unlike the BHU, where the wait was approximately 10 days..

All questionnaires were checked by the researchers for correction of possible typing errors and failures regarding the requirements considered for inclusion of the subject in the study.

A descriptive analysis of the sociodemographic data was performed in percentage and absolute numbers. The association between independent

and dependent variables was verified using univariate logistic regression analysis using the Forward method, considering and inserted in ascending order those that remained in the model as they presented a value of p <0.20 and multivariate. The magnitude of the associations was estimated by Odds Ratio (OR), adopting the 95% interval as a measure of precision, considering the statistical significance of those with a value of p<0.05.

The study was developed in accordance with the ethical precepts recommended by Resolution 466/2012 of the National Health Council[17] and its design was approved by the Standing Committee on Ethics in Research with Human Beings (Approval no. 137/2014). All the participants signed two copies of a Free and Informed Consent Term (FICF).

RESULTS

A total of 191 elderly people were interviewed, the majority of whom were aged between 60 and 70 years (49.7%), female (56%) and lived with a partner (59.1%). A large part of the sample had <8 years of schooling (85.3%) and were retirees and/or pensioners (78.5%). In terms of their clinical situation, the majority reported a chronic morbidity undergoing treatment (91.1%) and did not have a supplementary healthcare insurance plan (70.7%).

Regarding ICD-10 and HCSPC classification, most visits were due to diseases of the musculoskeletal system and connective tissue (47.6%), respiratory system illnesses (30.3%) and diseases of the digestive tract (10.9%), shown in Table 2.

Table 1. Sociodemographic characteristics of elderly persons receiving care at ECU. Paraná, 2015.

Variables	n	%
Age (years)		
60 to 70	95	49.7
71 to 80	50	26.2
>81	46	24.1
Gender		
Female	107	56.0
Male	84	44.0
Marital Status		
With Partner	113	59.1
Without Partner	78	40.9
Schooling (years)		
<8	163	85.3
>8	28	14.7
Economic situation		
Retired	150	78.5
Employed	30	15.7
Unemployed	11	5.8
Health Plan		
Yes	56	29.3
No	135	70.7

Table 2. Characterization of care requirements of elderly persons classified with complaints sensitive to primary care who sought treatment at the ECU. Paraná, 2015.

Main complaint*	CID-10**	N	%
Osteomuscular and connective tissue diseases	M00-M99	91	47.6
Diseases of the respiratory tract	J00-J99	58	30.3
Diseases of the circulatory system	I00-I99	13	6.8
Diseases of the genitourinary system	N00-N99	06	3.1
Diseases of the digestive system	K00-K93	21	10.9
Diseases of the nervous system	G00-G99	17	8.9
Symptoms, signs, and abnormal findings from clinical and laboratory tests, not classified elsewhere	R00-R99	08	4.1

*Some elderly persons had more than one complaint; **ICD: International Classification of Diseases

In univariate analysis, association with the variable sought BHU before the ECU found that elderly persons with chronic morbidity were 1.67 times more likely not to seek the BHU before the ECU. It was also found that the lack of doctors (p=0.038) and lack of confidence in care (p=0.025), reduced the chance of seeking the BHU for a consultation. The improved resources available (p=0.038) and the fact that it is not necessary to schedule an appointment in the ECU (p=0.002) also reduced the chance of seeking the BHU for consultation (Table 3).

The variable relating to elderly persons who were proven to have been referred by the BHU found that those with a chronic morbidity were 2.75 times more likely to be referred for care in the ECU, and that the lack of a physician resulted in a 2.81 greater chance of being referred for care in this unit (Table 3).

The results of multivariate analysis found that those with chronic morbidities were 1.42 times more likely to seek the ECU before the BHU and 1.65 times more likely to be referred to the ECU by the BHU. The lack of a doctor resulted in a 1.36 times greater chance of the elderly being referred to the ECU to meet their health needs (Table 4).

Table 3. Univariate analysis of factors associated with seeking care in the ECU. Paraná, Brazil, 2015.

Variables	Sought BHU before ECU		Univariate Analysis			Referred by BHU		Univariate Analysis		
	Yes	No	OR	CI95%	p	Yes	No	OR	CI95%	p
Perception of care at BHU										
Negative	27	114	1	0.52-2.95	0.621	22	119	1	0.82-10.13	0.084*
Positive	8	42	1.24			3	47	1.89		
Presence of Morbidities										
No	21	100	1	1.26-5.67	0.009*	8	106	1	1.52–9.21	0.002*
Yes	14	56	2.67			17	60	2.75		
Geographic Location of BHU										
Close	29	110	1	0.19-1.27	0.138*	19	120	1	0.31-2.19	0.698
Far	6	46	0.49			6	46	0.82		
Lack of Doctors at BHU										
No	27	91	1	0.17-0.97	0.038*	8	108	1	1.71-9.69	0.004*
Yes	8	65	0.41			17	58	2.81		
Lack of confidence in care at BHU										
No	34	128	1	0.01-1.02	0.025*	24	138	1	0.02-1.58	0.095*
Yes	1	28	0.13			1	28	0.2		
Better care at ECU										
No	30	116	1	0.17-1.33	0.153*	21	125	1	0.18-1.79	0.339
Yes	5	40	0.48			4	41	0.58		
Better Resources at ECU										
No	30	101	1	0.14 – 0.97	0.038*	22	108	1	0.07-0.88	0.022*
Yes	5	55	0.38			3	58	0.25		
Long wait for care at BHU										
No	28	117	1	0.30-1.85	0.532	17	128	1	0.63-3.95	0.312
Yes	7	39	0.75			8	38	1.58		

Continuation of Table 3

Variables	Sought BHU before ECU		Univariate Analysis			Referred by BHU		Univariate Analysis		
	Yes	No	OR	CI95%	p	Yes	No	OR	CI95%	p
Considered ECU case										
No	30	92	1			21	101	1		
Yes	5	64	0.24	0.08–0.65	0.003*	4	65	0.29	0.09-0.90	0.025*
Faster service at ECU										
No	12	34	1			8	128	1		
Yes	23	122	0.53	0.24–1.18	0.118*	17	38	0.63	0.25-1.57	0.321
Possibility of undergoing exams at ECU										
No	22	96	1			16	102	1		
Yes	13	60	0.94	0.44-2.01	0.885	9	64	0.89	0.37-2.14	0.806
No need to schedule an appointment at ECU										
No	26	71	1			20	77	1		
Yes	9	85	0.28	0.12–0.65	0.002*	5	89	0.21	0.07-0.60	0.002*

* Variables with p-value <0.20 were included in multivariate analysis; OR: *Odds Ratio*; CI: Confidence interval; BHU: Basic Health Unit; ECU: Emergency Care Unit.

Table 4. Multivariate analysis of factors associated with elderly persons seeking care at the ECU. Paraná, Brazil, 2015.

Variables	Sought care at BHU before ECU		Multivariate Analysis		
	Yes	No	OR	CI95%	*p*
Presence of Morbidities					
No	14	100	1	1.08 - 5.42	0.032
Yes	21	56	1.42		
Lack of Doctors at BHU					
No	27	91	1	0.15 - 0.96	0.041
Yes	8	65	0.38		
Considered ECU Case					
No	30	92	1	0.07 - 0.59	0.003
Yes	5	64	0.20		
No need to schedule an appointment at ECU					
No	26	71	1	0.12 - 0.72	0.007
Yes	9	85	0.31		
	Referred by BHU		Multivariate Analysis		
Variables	Yes	No	OR	CI95%	*p*
Presence of Morbidities					
No	8	106	1	1.01 - 6.82	0.043
Yes	17	60	1.65		
Lack of Doctors at BHU					
No	8	108	1	1.03 - 5.38	0.032
Yes	17	58	1.36		

OR: *Odds Ratio*; CI: Confidence Interval; BHU: Basic Health Unit; ECU: Emergency Care Unit.

DISCUSSION

The FHS has been expanding in recent years. Data show that in 1998, the country had 2,195 teams registered with the Ministry of Health, covering 4.4% of the Brazilian population. At the beginning of 2016 this number had grown to 48,410 teams, with a population coverage of approximately 64%. In the state of Paraná, the numbers show an even more significant increase, with the number of teams increasing from 115 in 1998 to 2,868 in 2016, covering 68% of the population of the state[18].

In the municipal region where the study was carried out, the data also showed an increase in the number of registered teams, with 75 currently in operation, providing population coverage of 68.01%[15,18]. Despite this progress, there are still complex challenges in PHC to be overcome, such as using the information that is collected and provided

by the FHS teams themselves. This disarticulation in the PHC micro-policy reflects on the health care provided, which, in many situations, is non-resolutive, causing the population to seek other levels of care to meet their health needs[7].

The use of the HCSPC indicator allows the identification of the treatment provided and makes it possible to classify such treatment according to the diagnosis received. It relates the characteristics of the care provided to the attributes of PHC in preventing, diagnosing and treating diseases, as well as the monitoring and control of the health of people with chronic diseases. These actions, when effective, reduce the frequency of PHC-sensitive consultations at other levels of complexity[19].

The study was aimed at the elderly population, as hospitalization expenses are higher in this age group due to their physiological, economic and social

vulnerability [20]. The number of elderly women was slightly higher than the number of men, which is in line with studies on the profile of the population treated by health services[19,21]. The majority did not have more than eight years of schooling which puts them in a situation of social vulnerability. A study has demonstrated that low educational levels lead to lower rates of adherence to the treatment of chronic diseases, strongly influenced by the difficulties of access to health services[20].

Elderly people who live with partners behave differently than those who live alone. This is due to the support between the couple, strengthening them against the aging process, which is often combined with chronic diseases. The leading role of women in the family group, resulting in greater control of the seeking of health care for their partners, is also relevant. This fact indicates the need to consider the differences of genres and family compositions to ensure a quality of health care that is more coherent with the unique needs of the users[22].

It is important to emphasize the fundamental importance of modifying the approach of health professionals who treat the elderly population in PHC through continuous education and professional valorization, with a strengthening of the connection with and understanding of health needs. The present study showed that the elderly who sought the BHU before the ECU and who were undergoing treatment of a chronic morbidity were twice as likely to be referred to the ECU by a health professional. The same result was observed for the variable that investigated if the elderly were referred by a BHU professional due to the lack of doctors in the BHU.

PHC is considered to be the first contact with the health service and should be understood as the preferred entry point for the use of health actions and services. The health care provided at this level should consider the characteristics of the population, the behavior of the individual, and the technological resources available[23,24].

Disconnected actions result in gaps in care for health service users, especially the elderly. The results of the present study were similar to the results of a study carried out with BHU users, health professionals and managers to evaluate the integrality of actions, which also revealed user dissatisfaction

with the non-resolution of acute complaints, which can therefore be considered another reason for seeking care in UPA[23,24].

The result indicated by the variable that investigates whether the elderly sought treatment at the BHU before the ECU reveals that elderly persons with chronic morbidities are more likely to seek the ECU first. Other studies have identified that many users seek the ECU because of the lack of medical professionals at the UBS[23,24]. Other factors include the guarantee of care by doctors and the availability of complementary exams, without the necessity of prior appointments, offered by the UPA[25].

The fact that the ECU offers uninterrupted medical care represents a major challenge for public health, as the behavior of the population and the health professionals themselves is still influenced by the biomedical model of hegemony, with the concept of prevention little debated and/or understood by society. This situation reflects a need for health professionals to learn the importance of the articulation between levels of health services and actions, according to the guidelines of the Health Care Networks that indicate PHC as a model of care[26,27].

The pyramid structure of the health system, adopted since the beginning of the 20th century, with the flow of users at various levels of technological complexity, has not provided satisfactory results for the needs of the population. This model of care is not consistent with the health needs of the population, especially considering population aging and the prevalence of chronic diseases. The care coverage provided does not integrate with care actions, which have proven to be insufficient for the reality of Brazil.[28] The inadequacy of ECU demand has been described both by national[28,29] and international researchers[30,31]. This result suggests that many units of medium complexity address situations that should be accommodated, solved and accompanied by basic care[28,32].

The current structure of the SUS suggests it is more prepared to deal with acute than chronic conditions. This phenomenon has also been experienced in other parts of the world. A study carried out in Australia revealed that conditions sensitive to primary care were more prevalent in the

over-60 population, and that the majority of visits dealt with complications of chronic and degenerative diseases[30]. The results of this study indicated diseases of the musculoskeletal system and connective tissue and those of the respiratory and circulatory system as the main reasons for seeking care in ECU.

Also corroborating the results of the present study, a literature review study pointed out that doctor availability and the continuity of primary care can reduce hospitalization for acute problems arising from chronic morbidities, such as arterial hypertension and diabetes Mellitus[31]. This finding reinforces the need for longitudinal care for those with chronic morbidities, in order to avoid possible complications, thus avoiding re-hospitalizations

One limitation of the present study was the size of the sample and the fact that it was performed in only one of the two UPAs located in the municipal region, which makes it impossible to generalize the results, which are therefore limited only to the population in question. In addition, another limitation was that the research was carried out within the unit, which may result in constraint and consequently allow the environment to influence the participants' responses. It is reiterated that the study indicates factors that led to treatment and not hospitalizations due to

conditions sensitive to primary care, which may assist the understanding of professionals regarding the demand for services more suited to another level of care.

CONCLUSION

The results of this study allow us to conclude that elderly persons with chronic diseases are more likely to seek BHUs and to be referred by primary care professionals. It was also found that the lack of doctors in the BHU is a factor that leads to an increase in the demand for treatment for primary care sensitive conditions.

There are therefore barriers between the health needs of the elderly and the provision of services, which shows that the reorganization of primary health care will not be sufficient to solve the health problems of the population, and that other means of organizing the flow of treatment are required. There is an urgent need for administrative policies that implement strategies to minimize ECU care for conditions sensitive to primary care, especially for the elderly population, which has specific characteristics and needs continuous and comprehensive care, both of which are found in primary care.

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Factors associated with the use of dental care by elderly residents of the state of São Paulo, Brazil

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Abstract

Objective: To investigate factors associated with the use of dental care services. *Methods:* A cross-sectional study with a representative sample of elderly individuals aged 65 years or older residing in the state of São Paulo in 2015 was performed. Hierarchical multivariate logistic regression analysis was used based on the theoretical model of access determination proposed by Andersen (1995) to predict dental care visits. *Results:* The prevalence of public service use by the elderly was 1.981 (37.8%), while 3.253 (62.2%) used the private service/ health plan/ other type of service. Hierarchical multiple analysis ($p \leq 0.05$) identified that less schooling or never having studied, non-white, lower income and motivated by pain/extraction were associated with the use of public dental services. The study showed a reduced use of public dental care among elderly persons who required some type of upper dentures (except complete dentures), need for some type of lower dentures (including complete dentures) and demonstrated a positive self-perception of oral health condition. *Conclusions:* A higher prevalence of the use of private dental care/ health plan/other type of service was identified. Less schooling or never having studied, non-white skin color, lower income and seeking the dentist with pain or to extract teeth were factors associated with the use of public dental services by the elderly.

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INTRODUCTION

Brazil is undergoing a demographic and epidemiological transition due to the accelerated growth of the elderly population, with repercussions for the organization of health services, including dentistry[1]. The main oral illnesses, caries and periodontal disease have a cumulative nature and can compromise quality of oral health and result in significant tooth losses and complex and costly rehabilitation needs[1-4]. In this context, offering universal access is one of the main challenges faced by the Sistema Único de Saúde (the Unified Health System) (SUS) if it is to serve as a model of public health care policy for the elderly population[1,2,5].

The most recent epidemiological survey of the oral health condition of the Brazilian population identified an index of caries (measured by the DMFT scale for the number of decayed, missing and filled teeth) of 27.53 for the 65-74 age group[3]. The missing component accounted for 92% of this index[3]. Periodontal conditions in the 65-74 age group showed that 90.5% had excluded sextants and of the few sextants that could be examined in this age group, 4.2% had calculus and 3.3% had periodontal pockets, while 2.5% were shallow pockets[3]. In terms of the use and need of dentures, only 23.5% of the elderly did not use any type of upper denture and the percentage of users of complete dentures was 63.1%. A total of 7.6% of individuals used partial removable dentures, while the proportion of individuals who did not require dentures was 7.3%. These results indicate that the Brazilian elderly have high rates of edentulism, caries, periodontal disease and the need for dentures[1,3].

Despite these poor oral health conditions and the low prevalence of the use of dental services, 46.6% of the elderly required dental treatment[3,4]. Overall, 14.7% have never visited the dentist at any time in their lives and 42.3% of those who have used the dentist last did so more than three years prior to the survey[3]. Recent studies have indicated that access to dental services is modulated by contextual factors relating to both the oral health services and the individual[2,5-9]. The regular use of dental services contributes to the maintenance of oral health by means of less complex and preventive treatment, the early detection of diseases in distinct stages of life and improving the quality of life of the elderly[2].

In Brazil the elderly can use the public dental service, acquire a private dental plan or pay directly for treatment. This structure provides greater access to elderly persons who can pay for a dental service or plan, which increases iniquities in the use of oral health services[1,5,6]. Unlike with medical services, the majority of Brazilian elderly people do not use the public dental service when seeking treatment[5]. In countries such as Brazil, which has a universal coverage system, the healthcare network is expected to offer better access to dental care for older populations. The present study is relevant as few studies have investigated the determinants relating to the use of the public dental service by the elderly[4,5].

The aim of the present study was therefore to investigate factors associated with the use of public dental care services by elderly persons, based on the epidemiological survey of the Conditions of Oral Health of the Population of the State of São Paulo (SB-SP) carried out in 2015.

METHOD

An epidemiological cross-sectional population-based study representing the state of São Paulo, Brazil, was performed[10]. To achieve this, 178 municipal regions plus the state capital (Primary Sampling Units - PSU) were drawn[9]. In the second stage 390 Census Sectors (Secondary Sampling Units - SSU) were drawn, with two sectors for each of the 177 municipal regions and 36 sectors for the city of São Paulo[10]. The sample plan was elaborated by clusters in two stages of draws based on the Probability Proportional to Size (PPS) of the population[10].

Individuals aged 65 and over were interviewed. This age group is recommended by the World Health Organization (WHO) for oral epidemiological studies and has become more important with changes in life expectancy[10]. Data from this group are necessary both for the effective planning of treatment for the elderly and for monitoring the general effects of dental services provided to a population[10].

The sampling plan design was elaborated by clusters in two stages of draws, considering the sample weight and the effect of the draws in the respective stages[9]. The state of São Paulo was stratified into six macro-regions described as domains[10]. In each domain 33 PSU were selected, with the exception of Macro I (the Metropolitan Region of the Capital), where 12 municipalities were drawn, in addition to the capital itself[10]. The draws were carried out based on the PPS of the population of each of the municipalities. In the second drawing stage, two SSU were drawn from each municipality, also respecting the probability proportional to the number of inhabitants in the sectors, while in the city of São Paulo, 36 SSU (corresponding to 18 collection points) were drawn. All the households in the selected sectors were analyzed for individuals belonging to the respective age group index[10].

The sample was defined based on frequency estimation, the variability of the problem being investigated and the acceptable margin of error. Dental caries were used as the reference standard for the calculation of the sample, as this measure was used in the last two national surveys and is still the most common oral health problem[10]. However, the present study also used periodontal condition and usage and need for dentures data as a basis of calculation, taking as parameters the results of the Southeastern Region obtained by an earlier national study[10]. The sample size was calculated for each of the health problems and for the respective age group with the results of mean dental caries, periodontal condition and dentures (use and need), standard deviation and prevalence, acceptable margin of error (ε), design effect (deff) and non-response rate (NNR) of the diseases for the age index, with this value considered as a population parameter for the calculation of the sample[10]. The formula for calculating the sample size for each of the diseases was adjusted for the size of the elderly population living in the state of São Paulo, according to the Population Projection System data for the municipalities of the state of São Paulo of the SEADE Foundation[10]. From the data of the population size index of the state, it was possible to apply the formula and, thus, to define a sample size that would allow statistical inference[10]. In this equation the deff and the NNR were added, thus adjusting the sample size formula to minimize the

effect of the two-stage cluster draw[10]. The number of elderly persons examined was 5,951 individuals[10].

The households visited were those of the census tracts drawn from each municipal region through the exhaustive technique with the minimum sample size for each PSU[10]. As it was not possible to perform a simple draw of the households based on the municipality as a whole, drawing stages per level were added to maintain the probabilistic basis of the study[10]. In this way, the census sector was the field of work of the team and guided the spatial distribution of the populations, and the sectors were drawn with probability proportional to the number of inhabitants in each of the municipal regions[10]. A questionnaire was applied to the individuals examined, which contained questions related to socioeconomic characterization, the use of dental services and self-reported oral morbidity or the self-perception of oral health[10].

The calibration of the dental and support teams was carried out to simulate the conditions that the examiners would encounter, discuss the operationalization of the stages of the study and the attributions of the participants, and ensure an acceptable degree of uniformity in the procedures[10]. The consensus technique was used, calculating the Kappa coefficient in the final round, weighted for each examiner, age group and injury studied, with a value of 0.65 as the minimum acceptable limit[10]. The consensus revealed no concerns in comparisons with a standard examiner[10].

The dependent variable of the present study was the type of dental service last used: public or private/health plan/other. Individuals who never visited the dentist, were unable to provide information or did not respond were excluded from the analysis.

The selection of the independent variables was based on the theoretical model of the determination of the use of health services revisited by Andersen and employed in studies on the use of dental services[4,5,11,12]. According to the model, the use of health services is a result of the interaction of individual and contextual characteristics, the health system and the history of use of such services[4,5,11,12]. The author assumes that the determinants are divided

into three groups: predisposing (related to the individual and sociodemographic factors), facilitating (income, characteristics of the health service) and need (perception of the health condition and health needs presented) factors[4,5,11,12]. The predisposing variables used were: gender, schooling, ethnicity/race and history of toothache. The facilitating variables were: family income, when a dentist was last consulted, reason for last visit and satisfaction with the treatment. The need variables were the presence of dental calculus, need for endodontic treatment, need for upper and lower dentures and satisfaction with oral/dental condition.

Data analysis involved the calculation of prevalence and bivariate analysis through the chi-square test to associate the independent variables with the outcome[4,5,12,13]. The variables with significance lower than 0.20 in the bivariate analysis were then accepted for the construction of the multiple logistic regression model and Odds Ratio (OR) with 95% confidence interval. The model was constructed to predict the probability of the elderly using the public dental service[4,5,12,13]. Gender, family income or schooling were considered as confounding variables[12,13]. Three alternative logistical models were therefore constructed: in the first, the gender variable was excluded; in the second, schooling was included, but not family income; in the third, family income was included, but not schooling[12]. We chose to show the model that excluded the gender variable, as it exhibited greater strength of association with the use of public dental services[12]. Furthermore, the association with the gender variable remained statistically significant in the crude model. However, the OR measures produced by this technique may overestimate associations, and the possibility that the results obtained are overestimated cannot be ruled out [4,12,13]. In this sense, hierarchical logistic regressions were performed to estimate the multiple models, inserting each of the three blocks of variables according to the distal and proximal factors of the theoretical model used[5]. The final model presents the adjusted values of the variables that remained associated at the level of $p \leq 0.05$, with 95% confidence

intervals in each of the steps of the hierarchical analysis[5].

The research project was approved by the Ethics Research Committee under number 111/2015 and complied with Resolution 466, dated 12 December 2012, of the National Health Council relating to research involving human beings. A Free and Informed Consent Form (FICF) was applied and signed by each individual examined in the study.

RESULTS

Of the sample of 5,951 elderly persons, 5,234 (87.9%) took part in the study, as 717 (12.1%) were excluded because they had never visited the dentist, could not provide the information or did not answer the question about where their last dental appointment took place.

Table 1 presents the description and bivariate analysis of the type of dental service used and the independent variables. Among the elderly interviewed, 1,981 (37.8%) used the public service on their most recent visit to the dentist while 3,253 (62.2%) used the private service/health plan/other type of service. Regarding the predisposing factors, female (3,270, 62.5%), less educated (3,563, 69.5%), white (3,660, 69.9%) subjects without a history of toothache (3,959, 76,1%) were found to be most prevalent. For the facilitating factors, elderly persons with lower family incomes (51.5%), who last used the dental service three or more years previously (45.5%) and were motivated by treatment (42.7%) prevailed in the sample, while satisfaction with treatment was not associated with the use of dental services in the bivariate analysis. Regarding the factors of need, the presence of dental calculus was identified in 1,265 (58.5%) elderly persons, with 62 (1.2%) requiring endodontic treatment and 2,042 (40.2%) exhibiting dissatisfaction or indifference with their oral/dental condition. A total of 1,913 (36.6%) of the elderly persons identified the need for complete upper dentures and 1,752 (33.6%) required complete lower dentures.

Table 1. Prevalence and bivariate analysis of the predisposing, facilitating and need factors associated with the use of dental services by elderly people in the state of São Paulo, 2015.

Variables	Participants n=1,981	%=37.8	Private/Plan/Other n=3,253	%=62.2	Total (%)	*p*-value*
Predisposing						
Gender						0.003
Male	794	40.4	1,170	59.6	1,964 (37.5)	
Female	1,187	36.3	2,083	63.7	3,270 (62.5)	
Schooling (years)						<0.001
Never studied	469	45.4	564	54.6	1,033 (20.2)	
1 to 9	1,379	38.7	2,184	61.3	3,563 (69.5)	
10 to 25	88	16.6	441	83.4	529 (10.3)	
Race/Ethnicity						<0.001
White	1,283	35.1	2,377	64.9	3,660 (69.9)	
Non-white	698	44.3	876	55.7	1,574 (30.1)	
Toothache						<0.001
Yes	558	44.8	687	55.2	1,245 (23.9)	
No	1,414	35.7	2,545	64.3	3,959 (76.1)	
Facilitating						
Family income (*reais*)						<0.001
Less than 1,500.00	1,125	45.7	1,337	54.3	2,462 (51.5)	
From 1,501.00 to 2,500.00	546	35.8	979	64.2	1,525 (31.9)	
More than 2,501.00	147	18.5	649	81.5	796 (16.6)	
Time (years)						<0.001
Less than 1	663	41.9	916	58.1	1,579 (32.9)	
Between 1 and 2	410	39.6	626	60.4	1,036 (21.6)	
3 or more	727	33.3	1,457	66.7	2,184 (45.5)	
Motive						<0.001
Check-up	368	41.6	517	58.4	885 (17.5)	
Treatment	623	28.8	1,537	71.2	2,160 (42.7)	
Pain/extraction/other	863	42.8	1,152	57.2	2,015 (39.8)	
Satisfaction with treatment						0.235
Satisfied	1,665	37.1	2,819	62.9	4,484 (88.6)	
Dissatisfied/indifferent	198	34.5	376	65.5	574 (11.4)	
Need						
Dental calculus						<0.001
Yes	520	41.1	745	58.9	1,265 (58.5)	
No	291	32.5	605	67.5	896 (41.5)	
Endodontics						0.001
Yes	37	59.7	25	40.3	62 (1.2)	
No	1,944	37.6	3.228	62.4	5,172 (98.8)	

Continuation of Table 1

Variables	Participants		Private/Plan/Other		Total (%)	p-value*
	n=1,981	%=37.8	n=3,253	%=62.2		
Upper dentures						<0.001
Complete dentures	808	42.2	1.105	57.8	1,913 (36.6)	
Some	300	47.3	334	52.7	634 (12.1)	
No	873	32.5	1.812	67.5	2,685 (51.3)	
Lower dentures						<0.001
Complete dentures	744	42.5	1.008	57.5	1,752 (33.6)	
Some	587	43.4	766	56.6	1,353 (25.8)	
No	650	30.6	1.475	69.4	2,125 (40.6)	
Oral/dental satisfaction						<0.001
Satisfied	1,059	34.8	1,982	65.2	3,041 (59.8)	
Indifferent/dissatisfied	849	41.5	1,196	58.5	2,045 (40.2)	

*p-value: probability of significance by Pearson Chi-Squared Test.

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In the bivariate analysis, the associated predisposing, facilitating and need factors ($p \leq 0.20$) for the use of dental services were identified. This analysis supported the hierarchical logistic model (Table 1).

The hierarchical multiple analysis ($p \leq 0.05$) is presented in table 2. It was observed that being less educated or never having studied, non-white, lower income and motivated by pain/extraction were associated with the use of public dental services. In addition, elderly persons were 1.4 (95% CI: 1.05; 1.87) times more likely to wait three or more years to visit the public dental service in comparison with those who used the private service. In addition, there was a lower use of the public dental service among elderly persons who needed some type of upper dentures (except complete dentures), need for some type of lower dentures (including complete dentures) and those with a positive self-perception of their oral health condition.

Table 3 shows the crude and adjusted models for the significant variables ($p \leq 0.05$) of the hierarchical model and their respective R^2 values, with the adjusted model explaining by 14% the fact that elderly people living in the state of São Paulo use the public dental service.

Table 2. Hierarchical multiple logistic regression analysis of factors associated with the use of public dental services by elderly people in the state of São Paulo, 2015.

Variables	Block 1			Block 2			Block 3		
	OR	CI (95%)	p-value*	OR	CI (95%)	p-value*	OR	CI (95%)	p-value*
Predisposing									
Schooling (years)									
Never studied	0.26	(0.20 - 0.33)	<0.001	0.27	(0.20 - 0.37)	<0.001	0.22	(0.14 - 0.35)	<0.001
1 to 9	0.79	(0.68 - 0.91)	0.001	0.72	(0.61 - 0.85)	<0.001	0.66	(0.48 - 0.89)	0.007
10 to 25	1			1			1		
Race/Ethnicity									
White	0.72	(0.63 - 0.81)	<0.001	0.78	(0.67 - 0.89)	<0.001	0.71	(0.57 - 0.88)	0.002
Non-white	1			1			1		
Toothache									
Yes	1			1			-	-	-
No	0.71	(0.62 - 0.81)	<0.001	0.92	(0.78 - 1.07)	0.276	-	-	-
Facilitating									
Family income (reais)									
Less than 1,500.00				0.77	(0.67 - 0.89)	<0.001	0.73	(0.58 - 0.92)	<0.001
From 1,501.00 to 2,500.00				0.32	(0.26 - 0.40)	<0.001	0.33	(0.24 - 0.45)	0.008
More than 2,501.00				1			1		
Last visit									
Less than one year				1			1		
Between one and 2 years				1.70	(1.45 - 1.99)	<0.001	1.83	(1.41 - 2.38)	<0.001
3 years or more				1.51	(1.28 - 1.80)	<0.001	1.40	(1.05 - 1.87)	0.020
Motive									
Check-up				1			1		
Treatment				1.08	(0.89 - 1.31)	0.424	0.95	(0.71 - 1.26)	0.713
Pain/extraction/other				0.57	(0.49 - 0.66)	<0.001	0.58	(0.46 - 0.74)	<0.001
Need									
Dental calculus									
Yes							1		
No							0.83	(0.67 - 1.03)	0.085
Endodontics									
Yes							1		
No							0.92	(0.43 - 1.95)	0.827
Upper dentures									
No							1		
Some type							0.74	(0.55 - 0.99)	0.043
Complete dentures							1.17	(0.87 - 1.57)	0.299
Lower dentures									
No							1		
Some type							0.41	(0.26 - 0.66)	<0.001
Complete dentures							0.62	(0.41 - 0.95)	0.028
Oral/dental satisfaction									
Satisfied							0.77	(0.62 - 0.95)	0.015
Indifferent/unsatisfied							1		
R²		0.05			0.12			0.21	

*p-value: probability of significance by Pearson chi-squared test.

Table 3. Crude and adjusted model of hierarchical multiple logistic regression analysis of factors associated with the use of public dental services by elderly people in the state of São Paulo, 2015.

Variables	Crude*			Adjusted**		
	OR	CI (95%)	p-value	OR	CI (95%)	p-value
Predisposing						
Schooling (years)						
Never studied	0.22	(0.14 - 0.35)	<0.001	0.27	(0.20 - 0.36)	<0.001
1 to 9	0.64	(0.47 - 0.87)	0.004	0.71	(0.60 - 0.84)	<0.001
10 to 25	1			1		
Race/Ethnicity						
White	0.71	(0.57 - 0.89)	0.003	0.82	(0.71- 0.95)	0.007
Non-white	1			1		
Toothache						
Yes	1			-	-	-
No	0.74	(0.59 - 0.94)	0.015	-	-	-
Facilitators						
Family income (reais)						
Less than 1,500	0.74	(0.59 - 0.94)	0.010	0.77	(0.66 - 0.89)	<0.001
From 1,501 to 2,500.00	0.34	(0.24 - 0.46)	<0.001	0.33	(0.26 - 0.41)	<0.001
More than 2,501.00	1			1		
Last visit						
Less than one year	1			1		
Between one and 2 years	1.76	(1.35 - 2.29)	<0.001	1.85	(1.56 - 2.18)	<0.001
3 years or more	1.42	(1.07 - 1.89)	0.017	1.56	(1.31 - 1.86)	<0.001
Motive						
Check-up	1			1		
Treatment	0.98	(0.73 - 1.31)	0.893	1.19	(0.98 - 1.44)	0.084
Pain/extraction/other	0.60	(0.47 - 0.77)	<0.001	0.59	(0.50 - 0.68)	<0.001
Need						
Dental calculus						
Yes	1			-	-	-
No	0.83	(0.66 - 1.03)	0.083	-	-	-
Endodontics						
Yes	1			-	-	-
No	0.95	(0.45 - 2.01)	0.887	-	-	-
Upper dentures						
No	1			1		
Some type	0.75	(0.55 - 1.01)	0.056	0.96	(0.78 - 1.18)	0.686
Complete dentures	1.15	(0.86 - 1.56)	0.345	1.36	(1.06 - 1.75)	0.018
Lower dentures						
No	1			1		
Some type	0.41	(0.26 - 0.66)	<0.001	0.65	(0.52 - 0.82)	<0.001
Complete dentures	0.62	(0.40 - 0.95)	0.028	0.87	(0.70 - 1.07)	0.179
Oral/dental satisfaction						
Satisfaction	0.79	(0.64 - 0.98)	0.035	0.80	(0.69 - 0.92)	0.001
Indifferent/dissatisfied	1			1		
R²		0.22			0.14	

*p-value: probability of significance of crude model by Wald Test; **p-value: probability of significance of adjusted model without gender variable by Wald Test.

DISCUSSION

Brazilian elderly persons must carry the burden of inheriting a disease-centered care model with invasive curative dentistry practices and limitations in access to public dental services[1,14]. A study suggests that the use of dental services in adults and the elderly is related to the corresponding habits in childhood[15].

Analysis of the use of public health services allows an indirect evaluation of the equity of a health system[12]. A study in Montes Claros, Minas Gerais, found a lower prevalence of public service use among the elderly[3,5]. A study conducted in European countries with a universal coverage system found a variation of 50% to 82% in the use of public dental services, except in Poland, where the prevalence of such use was 23%[15]. Systematic review studies have identified the scarcity of public services as one of the main barriers to access to health services by the elderly[1,16]. The present study found that 37.8% of the elderly used the public dental service.

Acceptable standards of health service use are influenced by socioeconomic and demographic determinants[16,17]. In this sense, poorer elderly persons may suffer greater difficulties in obtaining health care, which reinforces social inequities in the use of dental services among this age group[16-18]. Previous studies have shown that elderly women with higher incomes and levels of schooling used dental services more[4,17,18]. A higher income can facilitate paying for dental services, the purchasing of dental products and adherence to health insurance, while greater schooling can be translated into a higher level of information about the importance of regular visits to the dentist[1,18]. A study found that Brazilians spent an average of R$42.19 *reais* on dental care services and R$10.27 *reais* on oral hygiene products[19]. In addition, spending on health and insurance plans increases with age, favoring the access of richer elderly persons to this type of coverage[19]. In the USA, elderly persons over the age of 65 are covered by public health insurance (Medicare), which covers individual expenditure on medical costs[6]. In Brazil, the elderly can either use the public service, pay directly, or pay for private health insurance. This structure allows greater access to health services for elderly persons who can pay for the service, which reinforces the iniquities in oral health and explains the findings.

Studies in countries such as Japan and the USA have identified difficulties in public transportation, place of residence, low mobility, an inability to drive, and lack of family transport support as barriers to accessing dental care[20,21]. Another study pointed out that the association between socioeconomic factors and the use of health services may vary according to the countries (the health system adopted) and the type of service used[16]. However, a study in Ponta Grossa in Parana did not identify an association between lower family income and delays in consulting the dentist among the elderly[4]. The removal of economic barriers would not necessarily make the prevalence of health service utilization in different contextual levels more equal[4].

Race is a limiting factor in the use of dental services by the elderly[22]. A study conducted among the Brazilian elderly showed that the chance of black elderly persons not having used the dental service at least once in their lives is 0.62 OR times less than among white elderly persons[22]. The findings of the present study indicated that there is less chance of a white elderly person using public oral health services. In this sense, social determinants may explain poor access to oral health services by non-white elderly persons[22]. Differences in access to oral health services among whites and non-whites can in part be attributed to the effects of discrimination[22].

Studies that used data from the National Household Sampling Survey (PNAD) of 1998, 2003 and 2008 identified a reduction in the percentage of elderly people who had never been to the dentist, despite this group having the lowest prevalence of regular dental service use (less than one year)[7-9]. A previous study with elderly people in São Paulo showed high rates of use of health services, with 83.3% reporting having had at least one visit in the 12 months prior to the interview[12]. However, only 32.9% of the elderly interviewed reported having visited the dentist in the previous year and the findings of this and other studies[4,5,18] indicate that elderly persons wait longer before visiting the dental service. This fact can be explained by the fact that dental appointments tend to decrease with aging due to the high prevalence of dental loss and edentulism[4]. In addition, the ability of the elderly to access and use health services may be related, in addition to income and schooling, to the possession of private

health insurance and difficulties in accessing public dental services[1,4,12].

Elderly people reported greater chances of seeking outpatient and inpatient health services[12,16]. In terms of oral condition, the presence of toothache was the reason why 23.9% of the elderly visited the dentist, a finding similar to a previous study[4]. The main reasons cited for non-use of the services, if specified, were related to the issues of disease severity, self-medication, quality of service, distance and cost of services[12,21]. The elderly with lower income cited reasons such as the non-serious nature of the health problem, distance and the quality of health services[23]. The study also identified a lower prevalence (17.5%) of the use of preventive dental services. Studies in Montes Claros, Minas Gerais, with elderly people aged 65 to 74 years, identified greater demand for dental treatment than for check-ups or prevention[5]. The high prevalence of seeking dental care for treatment, pain or extraction shows the reflexes of oral diseases and of curative/invasive practices experienced in this age group[1,5]. On the other hand, the increase in the dentate and edentulous elderly population may represent an increase in health demands and the need for dental treatment. Changing this profile requires strategies and attitudes of co-responsibility, as the curative approach is limited by offering uneconomical actions of prevention and health promotion, with repercussions for the health system and the population[1].

For Andersen (1995), individuals and families should perceive health problems and seek care[11]. Perceived needs (need for upper and lower dentures) are individual factors that identify barriers to access and the use of dental services[4,11]. In the present study, the need for dentures (both complete and some type of dentures) was associated with access to public dental services. These findings may indicate the existence of suppressed demands by specialized dental services. When undergoing one or more tooth extraction the elderly will need future prosthetic rehabilitation treatment, which is costly both for the elderly and for the public service. In Brazil, the Centro de Especialidades Odontológicas (the Center of Dental Specialties) and the Laboratórios Regionais de Prótese Dentária (the Regional Dental Prosthesis Laboratories) are responsible for the supply and manufacture of dentures in the public

service[5]. Paradoxically, the increase in the number of people with teeth, difficulty accessing this type of rehabilitation and the high costs of the private service were related to the lack of recent use of dental services[4,5,18]. In this sense, studies on access to public dental services are important tools for reorienting the care model for non-priority population groups through oral health policy and planning.

Regarding satisfaction with mouth/teeth, 40.2% of elderly individuals described self-rated dissatisfaction or indifference in relation to their oral health. The precarious oral health condition of the Brazilian elderly may account for the negative evaluation of dental services, and dental loss can be perceived as a natural process of aging[24,25]. Studies carried out in the cities of São Paulo and Florianópolis (Santa Catarina) showed that the elderly self-evaluated their oral health as good or very good[24,26]. The perception of oral health among the elderly can be affected by personal beliefs and values, as pain and disability are inevitable at this age[25,26], despite the high prevalence of need for upper and lower dentures identified in this study. Even if not associated with the use of the public service, the presence of calculus can be an important indicator for not visiting the dentist.

The cross-sectional study design did not allow causality to be established in relation to the determinants of access to the public dental service by the elderly. The greater use of dental services by women was not part of the bivariate and multiple analysis as their participation in the research may have been overestimated and could have compromised the external validity of the study. The use of the OR impacted on the variance of the estimates, suggesting parsimony in the interpretation of the results when using this technique. However, the study has a broad scope, a wealth of data from clinical exams and a methodological dedication that gives it internal validity. In addition, the NNR and the exclusion of the elderly who reported never having visited the dentist or said that they consulted other types of dental services may represent a different pattern of the use of dental services. Finally, some of the variables used depend to a certain extent on the respondent's memory and so information bias may have occurred. As an example, some individuals may have reported recent consultations with the dentist to avoid demonstrating negligence. Individuals

residing in rural areas or isolated communities may be confronted with the reduced supply of dental services due to residing in these types of areas, which can entail difficulties of movement, lack of public transport or precarious road conditions. It is therefore suggested that studies that identify patterns and barriers to the use of dental services by elderly people living in rural or remote areas are carried out.

CONCLUSION

There was a lower frequency of use of public dental services by the elderly in the present study.

The multiple model identified schooling, non-white skin color/ethnicity, family income, long periods without consulting the dentist, motivation of pain or extraction, the need for complete upper dentures, some type of lower denture and negative self-perception of oral/dental condition as factors associated with the use of public dental services by the elderly. Local health systems should therefore be organized to minimize the impacts of social and oral vulnerabilities that accompany advancing age. The expectation is that the results of the present study will support the expansion of non-specialized and specialized dental public services for the elderly population residing in the state of São Paulo.

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Investigation of the emotional and psychological factors of elderly persons frequenting ballroom dancing clubs

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Abstract

Objective: the present study investigated the psychological and emotional factors of elderly persons who practiced ballroom dancing. Method: the sample consisted of 93 elderly people who attended ballroom dancing clubs in the city of Maringá, in Paraná, Brazil. The Perceived Stress Scale, Self-Esteem Scale, Geriatric Anxiety Inventory, Life Satisfaction Scale and the SF-12 questionnaire were used. The data were analyzed using the Kolmogorov-Smirnov (data normality), Mann-Whitney U and Kruskal-Wallis tests (comparison of psychological variables according to sociodemographic and health variables), Spearman Correlation and Multivariate Linear Regression (relationship between variables). Results: there was a predominance of a good perception of health (69.9%); adequate values of life satisfaction (Md=27.00, Q1=25.00, Q3=30.00) and self-esteem (Md=31.00, Q1=30.00, Q3=32.00); as well as physical (Md=59.40, Q1=50.00, Q3=62.50); and mental health perception (Md=71.90, Q1=62.50, Q3=78.12). Low levels of anxiety (Md=6.00, Q1=3.00, Q3=12.00) and depression (Md=3.00, Q1=2.00, Q3=4.00), and a perception of moderate levels of stress (Md=20.00, Q1=13.50, Q3=24.50) were also found. Elderly people with a good perception of health were more satisfied with life and had higher self-esteem and lower levels of anxiety, stress and depression than those with poor/regular perception; anxiety (β= -0.32) and depression (β= -0.15) had a negative impact on life satisfaction, predicting its variability by 21%. Conclusion: the elderly had a healthy profile, and anxiety and depression were the main psychological and emotional factors that negatively influenced the satisfaction with life of these elderly people.

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INTRODUCTION

The psychosocial and emotional changes that occur during aging[1] include a decrease in self-esteem[2] and psychological and subjective well-being[3] and an increase in anxiety[4], which can lead to the development of depression and in the long term may influence decline in functional and cognitive capacity and subsequent impairment in the quality of life of this population[5].

For the elderly, self-esteem is related to the admiration, appreciation and importance that is attributed to them, as well as their positive relationship with society and their family and friends[6]. Anxiety, meanwhile, is a factor that may be related to other comorbidities in this population. Symptoms of anxiety can predict limitations in the activities of daily living of elderly persons[7,8]. Moreover, anxiety in the elderly is also related to major depressive disorders[9].

The subjective well-being of the individual throughout aging is an important indicator of quality of life. Experiences and adaptations that have and still occur in life, and which provide feelings of happiness, positive pleasure and affection, as well as the absence of negative affect, are essential for satisfaction with life, especially among the elderly[10]. An individual with low indicators of subjective well-being will also exhibit a concomitant increase in their perception of stress as a consequence of a series of factors that follow the decline in their subjective well-being. Such processes of stress can influence the emergence of diseases and difficulties in performing activities of daily living (ADLS)[11]. The careful observation of depressive symptoms is also of paramount importance, as such symptoms reflect both positive and negative emotions and feelings, and provide highly relevant information for the mental health care of the elderly[12].

As a consequence of the aging process and the physical, psychological and emotional changes it causes, the elderly population is highly sensitive to changes in quality of life[13]. Quality of life, in addition to encompassing basic aspects of the overall health of the individual, is also a reflection of their understanding and position in life within their cultural context, and includes their goals, expectations, patterns, and concerns about themselves[14]. It is therefore emphasized that quality of life is closely linked to life habits, such as physical exercise and socialization, potential promoters of physical and mental health [15].

When performing physical activity, the elderly can maintain an active level of physical, cognitive, social and psychological functioning[16]. Among the existing modalities of physical exercise, dancing is popular among this population, as it provides an environment of relaxation and fun, where the elderly can identify with individuals with similar cultural characteristics and interact socially with others, as well as expressing their emotions and relive feelings of the past. Dancing can therefore benefit the quality of life of these individuals, who set aside many problems, such as shyness, anxiety and depression, and therefore contributes to a better quality of life[17].

The objective of the present study was therefore to investigate the psychological factors of elderly people attending ballroom dancing clubs, aiming to clarify the relationship between these factors and their impact on life satisfaction.

METHOD

The study included 93 elderly persons of both genders who regularly performed activities in ballroom dancing clubs in the city of Maringá, Paraná, Brazil. The sample was selected in a non-probabilistic and intentional manner for convenience. The inclusion criterion where that the elderly should have participated in their respective groups for at least three months. Elderly people with perceptible auditory and cognitive deficits, in addition to those with neurological diseases that made them incapable of carrying out the questionnaires, were excluded.

To characterize the sociodemographic and health profile of the sample, a semi-structured questionnaire developed by the authors was applied, with questions relating to gender (male and female), chronological age (the values of which were grouped into ranges of 60 to 69, 70 to 79, and 80 years and over), monthly income in 2016 (grouped into bands of up to one minimum wage, one to two minimum wages, and over two minimum wages), schooling (data grouped into categories 0 years of study, one to four years of study, up to eight years of study and more than eight

years of study), occupational status (active or inactive), race (white, black, Asian-Brazilian), retirement (yes or no), smoking (never smoked, smoked or currently smoked); time frequented ballroom dancing club (up to 5 years, more than 5 years), weekly attendance at ballroom dancing clubs (twice a week, 3 times a week, 4 times or more) and history of falls in the last six months (yes or no).

To evaluate stress levels, the Perceived Stress Scale[18], which consists of 14 questions about the feelings and thoughts of the elderly persons over the previous month, was used. This instrument is answered on a five-point Likert scale (zero = never, one = almost never, two = sometimes, three = almost always, and four = always). Questions 4, 5, 6, 7, 9, 10, 13 are positive in relation to the individual, and are thus scored in an inverted manner. The other questions, with a negative character, have an immediate summation. The final score is a result of the sum of the scores of the 14 questions, ranging from 0 to 56 points, with a higher score indicating a greater perception of stress.

The Geriatric Anxiety Inventory, validated for the Brazilian context by Martiny et al.[19], was applied to evaluate the anxiety levels of the sample group. This instrument consists of 20 questions, answered yes or no, with each yes answer adding one point to the final score of the individual. Scores equal to or greater than ten identify the elderly person as suspected of suffering from generalized anxiety.

In order to identify depressive symptoms, the Geriatric Depression Scale[20], which consists of 15 dichotomous items, was used. Scores greater than five indicate depression.

To evaluate self-esteem, the Rosenberg Self-Esteem Scale, validated for Brazil by Hutz and Zanon[21], was used. This instrument consists of ten questions, answered on a four-point Likert scale ranging from 1 (totally disagree) to 4 (totally agree). The final result is obtained from the sum of the scores of the questions, ranging from 10 to 40 points. Higher values indicate greater self-esteem.

Subjective well-being was evaluated through the Satisfaction with Life Scale, validated for Brazil[22]. This scale is one-dimensional in nature and is composed of five questions answered on a scale of 07 points. The higher the value, the greater the satisfaction with life and vice versa.

Quality of life was assessed using the Short-Form Health questionnaire (SF12v2) in its validated Portuguese version[23]. This instrument assesses the individual's perception of their own physical and mental health through 12 questions answered on a Likert-type scale of five points (with the exception of question 02, which is answered via a three point scale). From the answers, the general scores of Total Quality of Life, Physical Health and Mental Health can be calculated, as well as the specific dimensions of functional capacity, limitation by physical aspects, pain, general health, vitality, social aspects and emotional aspects. For the present study, the general dimensions of results were used.

The survey was conducted from November 2016 to March 2017. Initially, contact was made with the managers of ballroom dancing clubs in the municipality of Maringá, Paraná. After the necessary clarifications, and the authorization of such managers, the collection of data began at the clubs at pre-scheduled times. The elderly persons were approached by the researcher responsible, who explained the objectives and nature of the research. The elderly who voluntarily agreed to participate in the study signed a Free and Informed Consent Form (FICF).

The interviews were individual and used only pencil and paper. They were performed by the researchers and lasted from 10 to 25 minutes per elderly person.

For the analysis of the categorical variables, the descriptive frequency and percentage statistics were used. For the numerical variables, the normality of the data was verified through the Kolmogorov-Smirnov test. As the data did not present normal distribution, Median (Md) and Quartiles (Q1;Q3) were used as descriptive measures. For the comparison of the psychological and emotional variables according to gender, monthly income and health perception, the Mann-Whitney U test was used. To compare the psychological and emotional variables according to the age group, the Kruskal-Wallis test followed by the Mann-Whitney U test was used to evaluate the pairs

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of groups. In order to verify the correlations between the study variables, the Spearman Correlation Coefficient (p <0.05) was applied.

A Multivariate Linear Regression model was then constructed using the variables which had a significant correlation with satisfaction with life as predictors. The existence of outliers was evaluated by the squared Mahalanobis distance (D^2) and the univariate normality of the variables was evaluated by the uni- and multivariate coefficients of asymmetry (ISkI<3) and kurtosis (IKuI <10). As the data did not present normal distribution, the Bollen-Stine Bootstrap technique was used to correct the value of the coefficients estimated by the Maximum Likelihood method implemented in the AMOS software package version 18.0. There were no DM^2 values indicating the existence of outliers, nor sufficiently strong correlations among variables to indicate problems with multicollinearity (Variance Inflation Factors <5.0). The regression coefficients were based on the following coefficients: low effect for coefficients <0.20, medium effect for coefficients up to 0.49 and strong effect for coefficients >0.50 (p<0.05). The present study was approved by the Ethics Research Committee of the Centro Universitário de Maringá, under approval number 2.091.893/2017, CAAE 67067517.6.0000.5539.

RESULTS

In the present study, the sample consisted of 93 elderly persons, with 19 men and 74 women (79.6%), a mean age of 70.4 (±7.1), aged between 60 and 69 years (53.8%), unmarried (single, widowed, divorced and separated (92.5%), white (66.7%), retired (83.7%), with a monthly income of one to two minimum wages (84.9%) and inactive (82.8%). The majority of the elderly had an incomplete primary education (52.7%) and 9.7% had no formal schooling (0 years of study). The majority (71.0%) had attended ballroom dancing groups for at least five years and at least twice a week (58.1%). The majority of the elderly were perceived to be in good health (69.9%), and had no history of falls in the last six months (86.0%).

Regarding psychological and emotional aspects, it was found that the majority of the elderly persons were not suspected of suffering from anxiety (64.5%) or depression (84.9%). Figure 1 shows that the elderly had moderate to high levels of Life Satisfaction (Md=27.0) and Self-Esteem (Md=31.0); low levels of Anxiety (Md=6.0), moderate levels of perceived stress (Md=20.0) and low signs of depression (Md=3.0). Moderate values were found for perception of physical (Md=59.4) and there were high perceptions of mental health perception (Md=71.9).
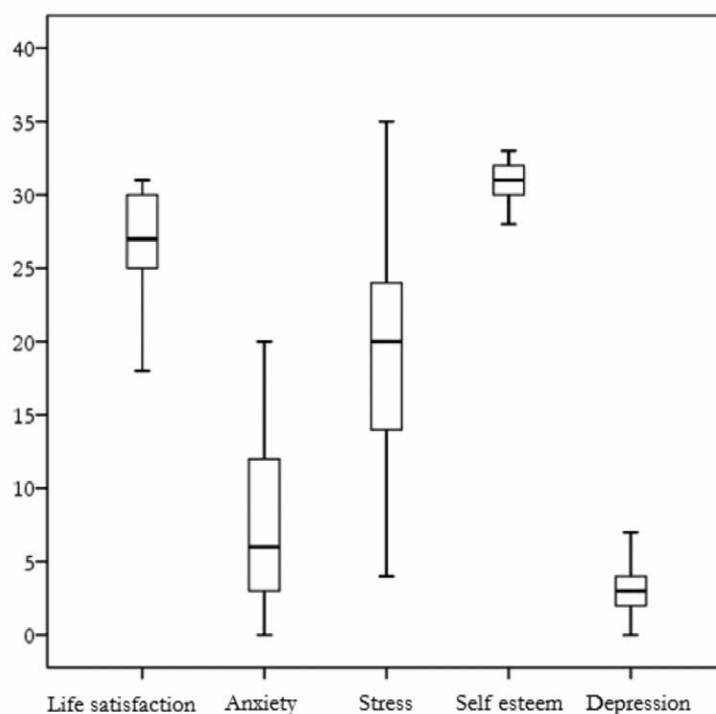

Figure 1. Psychological profile of elderly people attending ballroom dance clubs Maringá, Paraná, 2017.

When comparing the psychological variables of the elderly attending ballroom dancing clubs based on gender, age group and monthly income, no significant differences were found ($p>0.05$). In comparisons based on perception of health (Table 1), there was a significant difference ($p<0.05$) in all the variables except for quality of life. Higher life satisfaction, better self-esteem and lower levels of anxiety and stress characterized elderly persons with a good perception of health, while those with a poor/fair perception of health exhibited more anxiety and stress and profiles that were more indicative of depression, as well as lower self-esteem and satisfaction with life.

When correlating the psychological and emotional variables (Table 2), it was found that life satisfaction was negatively related to anxiety ($r=-0.41$), stress ($r=-0.30$) and being indicative of depression ($r=-0.30$), and positively related to self-esteem ($r=0.21$). In addition, it was observed that self-esteem was inversely related to negative psychological factors (anxiety, being indicative of depression and stress), whereas these correlated positively among each other.

A multivariate regression model was constructed to verify the impact of the psychological variables measured on the life satisfaction of the elderly people (Figure 2).

Table 1. Comparison of the psychological variables of elderly people attending ballroom dancing clubs based on self-perception of health. Maringá, Paraná, 2017.

Variables	Perception of health		P
	Good	Poor/Fair	
	Md (Q1;Q3)	Md (Q1;Q3)	
Life satisfaction	28.0 (26.0; 30.0)	26.0 (21.3; 28.0)	**0.009***
Anxiety	5.0 (2.5; 10.0)	11.0 (5.3; 15.0)	**0.002***
Stress	18.0 (12.0; 24.0)	24.0 (18.0; 26.0)	**0.013***
Self-esteem	31.0 (30.0; 32.0)	30.5 (29.3; 31.0)	**0.012***
Indicative of Depression	3.0 (1.0; 3.0)	4.0 (3.0; 4.8)	**0.001***
Quality of life			
Physical health	59.4 (50.0; 62.5)	57.8 (50.8; 62.5)	0.806
Mental Health	71.9 (62.5; 75.0)	71.9 (62.5; 78.1)	0.303
Overall QoL	62.5 (58.6; 67.9)	66.4 (59.3; 68.7)	0.349

*Significant difference: $p<0.05$ –Mann-Whitney U-test; QoL: quality of life; Md: median; Q1/Q3: quartiles.

Table 2. Correlation between the psychological and emotional variables of elderly people attending ballroom dancing clubs. Maringá, Paraná, 2017.

Variables	1	2	3	4	5	6	7	8
1. Life satisfaction		-0.41*	-0.30*	0.21*	-0.30*	0.06	0.07	0.07
2. Anxiety			0.59*	-0.37*	0.42*	-0.03	-0.20	-0.19
3. Stress				-0.39*	0.40*	-0.18	-0.15	-0.18
4. Self-esteem					-0.37*	0.06	-0.03	0.06
5. Indicative of Depression						-0.08	-0.02	-0.03
6. QoL in Physical Health							0.23*	0.73*
7. QoL in Mental Health								0.80*
8. Total QoL								

*Significant correlation (Spearman Correlation) $p<0.05$; QoL: quality of life.
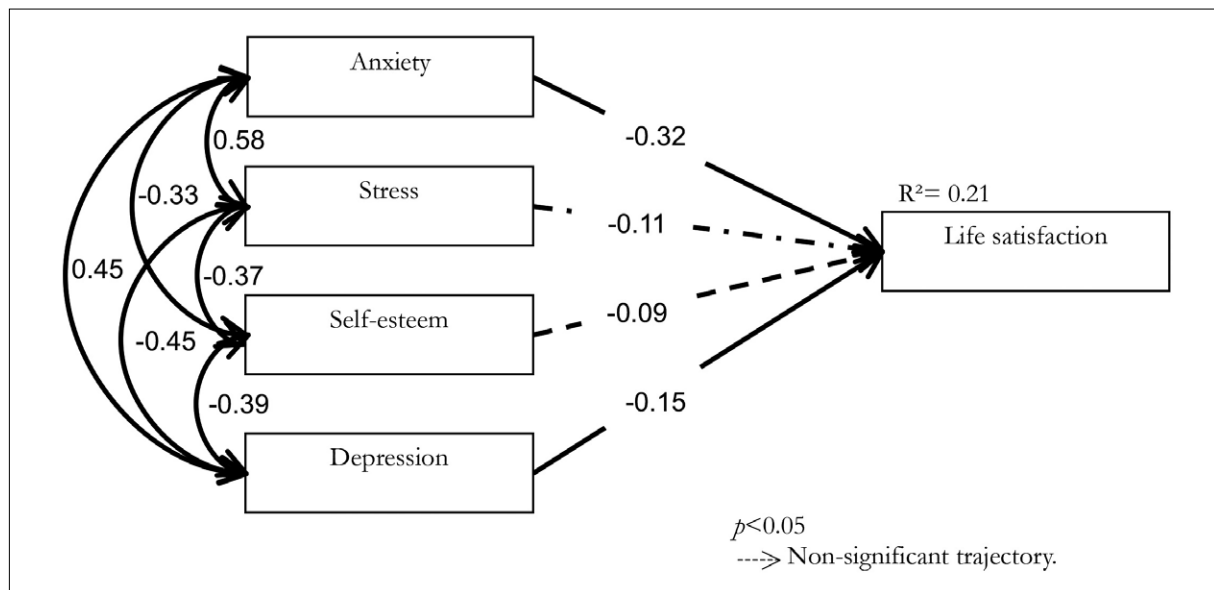
Figure 2. Impact of psychological and emotional variables on the life satisfaction of elderly ballroom dancing club members. Maringá, Paraná, 2017.

It is observed that anxiety, stress, self-esteem and depression predicted 21% of the variability of the life satisfaction of these elderly people (Figure 2). Regarding the individual trajectories of the model, it was verified that only anxiety (β=-0.32) and depression (β=-0.15) had a significant impact on life satisfaction. It is noteworthy that the increase of one standard deviation in the anxiety and depression units causes a reduction of 0.32 and 0.15 standard deviations, respectively, in the life satisfaction unit. Stress and self-esteem did not exhibit significant regression coefficients (p>0.05).

DISCUSSION

The present study sought to investigate the emotional and psychological factors of elderly people attending ballroom dancing clubs. It was observed that the majority of these elderly persons exhibited indicators of a profile of satisfactory quality of life, as they perceived themselves to have good general health, had good levels of self-esteem and life satisfaction and a good perception of physical and mental health, as well as low anxiety, stress and few indicators of depression. It can be inferred that the individuals evaluated in this sample of elderly persons who attended ballroom dancing clubs have a relatively high emotional and psychological profile, reinforcing the importance of physical activities for this population.

There was a predominance of desirable aspects of quality of life and health, which suggests a distancing from the problems typically faced by this population, such as social isolation, depression and accidents (falls). Such results may or may not be linked to the regular practice of ballroom dancing, which develops important physical abilities for the prevention falls and increases the autonomy of the elderly in activities of daily living, in addition to providing an environment rich in social interactions[25]. It was observed that most of the sample attended ballroom dancing clubs for more than five years, with the hypothesis that frequency in attending such groups may have been an influence factor for the profile found in the sample.

Sedentary behavior in the elderly population has been related to cognitive deficits, which may in turn impair the well-being and quality of life of such individuals, while physical exercise plays an important role in mitigating or even protecting against such deleterious effects of aging[26,27]. Evidence shows that sedentary elderly persons have a worse quality of life than active individuals[28].

There is a consensus about the benefits of performing physical activities and exercises among the elderly population. It has been found that physical exercises are potential promoters of the performance and well-being of the elderly, from sedentary individuals to elite athletes[15]. A systematic review[16,18]

evaluated controlled and randomized clinical trials investigating the self-esteem, symptoms of depression and the quality of life of the elderly aged over 65 and concluded that exercise programs for this group effectively improve such variables.

On the other hand, there is also evidence that physical exercise is not directly related to improvements in the psychological well-being of the elderly[29], although an analysis of literature suggests that such divergence may be related to the type of physical activity practiced. It is observed that, when dealing specifically with dancing, there is a consensus regarding the favorable results for the emotional and psychological health of the elderly. Studies conducted in Hong Kong[30], Greece[31] and Turkey[25] have shown the effectiveness of dance in reducing levels of stress and anxiety, improved the subjective perception of quality of life and well-being, and produced physical benefits favorable to the autonomy of the elderly.

Regarding the impact of psychological and emotional factors on life satisfaction as evaluated by the regression model, it was observed that, for this sample, anxiety levels and symptoms of depression appear to be intervening factors in the satisfaction of the elderly persons with their lives. Curiously, self-esteem and stress did not present significant trajectories, despite their significance in the correlation test. However, no studies were found that evaluated the direct relationships between these variables, making it impossible to discuss their effect further. What is known is that despite the individual contribution of each variable, literature seems to agree that the practice of physical activities will bring generalized benefits to the quality of life, life satisfaction and general well-being of the elderly.

The physical activity of ballroom dancing is a potential promoter of this profile, exposing its practitioners to a context rich in social interactions and positive experiences, as well as benefiting aspects of physical health that promote the quality of life of these individuals and being an attractive environment for practitioners that motivates them to remain engaged in this long-term activity.

Thus, professionals working with the elderly should seek to develop and/ or encourage more frequent attendance of facilities that offer ballroom dancing sessions and other physical exercises, as a form of promoting the physical and mental health of the elderly.

It is important to mention the size and geographical restrictions of the sample of the present study which do not allow the generalization of the results obtained for the wider Brazilian elderly population.

CONCLUSION

The elderly participants of the ballroom dancing clubs that participated in the present study presented a psychological and emotional profile that was favorable to their well-being, life satisfaction and quality of life. Anxiety and depression can be considered detrimental variables to the life satisfaction of the elderly person.

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Development of an application for mobile devices to evaluate the balance and risk of falls of the elderly

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Abstract

Objective: to develop an application for mobile devices to evaluate the balance and risk of falls of the elderly. *Method:* A cross-sectional study with a sample composed of 54 elderly individuals with an average age of 71 years submitted to three balance and risk of falls evaluation tests, was performed. The Timed Up and Go (TUG) and Performance Oriented Mobility Assessment (POMA) tests were employed. *Results:* The results were closely correlated, identifying three groups of volunteers: low, medium and high risk of falls. When these values were compared with the analyzes performed by the application, some of the variations in the results generated by the application were not related to the classic tests, as the software could discriminate between individuals with a high and low risk of falls. *Conclusion:* The developed application was able to verify the oscillations present in the maintenance of static balance of the elderly and could differentiate the results into two groups of high and low risk of falls.

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INTRODUCTION

Aging is defined as a natural and physiological process that progressively accompanies the life cycle. As well as psychosocial complications, physical losses also occur, resulting in slow reasoning, depression, functional disability, loss of strength, inactivity and physical degeneration. Active aging therefore contributes to the maintenance of functional capacity, the quality of life and the independence of the elderly[1-3].

An aging population is more likely to suffer co-morbidities and all types of disabilities. The functional changes inherent in the aging process, such as decreased mobility and muscle strength, can lead to imbalance and consequently increase the risk of falls in the elderly. As it is known that falls in the elderly are associated not only with the use of medications, but also with factors such as frailty and functional loss, it is important to identify the risk associated with these events. Such elements can be classified as intrinsic when they are related to the physiological alterations of aging and extrinsic when related to social and environmental circumstances[4-6].

It is important to develop preventive measures that describe the risk factors of this occurrence. The clinical approach should include a complete history of past falls and, additionally, an assessment of muscle strength and range of motion, as well as gait and balance tests. The application of the functional tests is intended to aid clinical evaluation by providing data on the patient's mobility capacity and revealing possible balance deficits. The main field tests are: the Timed Up and Go Test, the Berg balance scale, the functional reach test, the gait evaluation test and the Performance-oriented Mobility Assessment (POMA)[7,8].

In terms of applicability, although many functional tests have been validated, the combined application of two or more instruments is required for greater data precision. The use of more accurate tools has also been suggested for the evaluation of the balance of this population. Technological advances allow the introduction and updating of techniques and procedures used by health professionals, such as the use of mobile devices as support instruments. Smartphones have major potential as accessible, practical and portable devices that can help in areas ranging from data collection procedures to assisting in the diagnosis of diseases and providing treatment advice[9,10].

The use of smartphones in the area of health is growing as it provides professionals with more agility and flexibility in their work, from the time of data collection to the use of applications that assist with patient evaluation. The sensors embedded in these devices are increasingly being used in the evaluation of balance and gait. One of these sensors is the accelerometer, which has the potential to aid clinical procedures, offering quantitative data for assessment and balance and gait training[11-13].

Given this scenario, the present study aimed to develop an application for mobile devices that assesses the balance and risk of falling among the elderly, and to compare the results provided by the application with the findings of the Timed Up and Go (TUG) and Performance-oriented Mobility Assessment (POMA) tests.

METHOD

The present experimental study was developed through stages of application development and testing.

First stage – development of application

A specialist company was contracted to develop a smartphone application capable of capturing and quantifying the anteroposterior and lateral oscillations of the human body in an orthostatic position for use by health professionals. The production instructions requested a user recognition area with log-in and password; a patient registration area containing the fields name, telephone, date of birth, height and weight; a space to access and store patient information; a screen to perform a new analysis and the presentation of the results.

Second stage – testing of application

This stage of the study was carried out in a social center located in the Asa Sul region of Brasília, Distrito Federal, which serves about 300 elderly

people. This institution offers water aerobics, swimming, dancing, Pilates, RPG, sewing classes, computers and languages to a community containing both active and sedentary elders. Those interested in participating in this research were asked to attend sessions on scheduled dates in August and September 2015, in a room located in the social center itself, wearing gym clothes or clothes that allowed the mobility of the lower limbs.

The sample of this research was selected for convenience. Based on the inclusion criteria, active men and women who were able to understand the evaluator's instructions for performing the procedures were accepted. We excluded volunteers who presented physical and sensory limitations that made performing the functional, balance and gait tests difficult, as well as those who depended on aids to maintain balance, such as individuals with severe visual and auditory acuity, lower limb amputations, the use of prostheses or deterioration of the lower limbs, neurological diseases or who were unable to walk without assistance. The level of significance for the statistical analyzes was 95%.

The selection of the volunteers was performed through a questionnaire, applied by an evaluator properly trained for the task, containing the following information: name, id number, age, gender, practice of physical activity, clinical history, reports of falls in last three years and fear of falling on a scale between 0 and 10.

The following were used for data collection: a Moto X Play model smartphone, a pouch with an adjustable strap to attach the device to the volunteer and the materials needed to apply the TUG and POMA tests.

The POMA (Performance-oriented Mobility Assessment) test is used to assess the risk of falls in the elderly through tasks involving static and dynamic balance, gait and turning. Each activity has a certain score ranging from 0 to 28 points in total. The evaluated individual is classified into one of three categories: normal, adaptive and abnormal[14].

The TUG (Timed Up And Go) test assesses the mobility, balance, and risk of falls through sitting, standing, walking, turning, and sitting. The evaluated individual is classified based on the time taken to carry out the test and is classified into one of the three groups: independent (10 seconds or less), dependent for basic transfers (20 seconds or less) and highly dependent (more than 20 seconds)[15,16]. The questionnaires and evaluations were applied by the author of this study.

When able to participate in the research, volunteers underwent two phases of data collection: In the first, they were instructed to position themselves with their feet in parallel and to remain in this position for an analysis period of 20 seconds. The evaluator positioned the pouch with the adjustable belt in a centralized position relative to the center of mass anterior to the first or second sacral segment[11], as shown in Figure 1. After the fixation of the device, the application was triggered by the evaluator to begin data collection. The duration of the analysis was timed by the software itself, demonstrating the beginning and the end of the procedure. Once the data were collected, the pouch was removed from the volunteer. The second phase of the collection consisted of applying the POMA test and after one minute of rest, the TUG test.

This study was submitted to the Ethics Committee of the Universidade Católica de Brasília (the Catholic University of Brasilia) and was approved in accordance with CNS Resolution 466/2012 and complementary guidelines, under opinion number: 681.473.
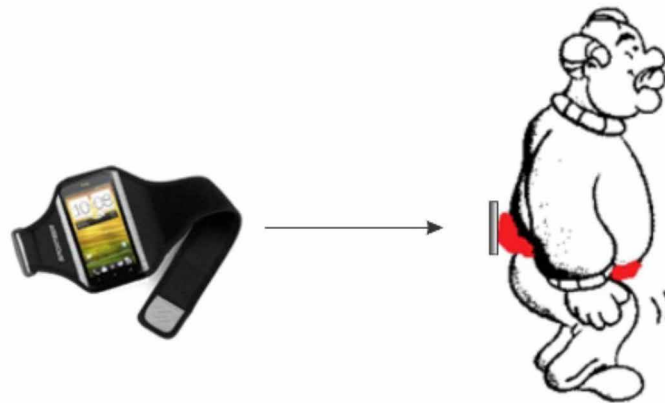
Figure 1. Fixation of device using pouch with adjustable belt. Brasília, Distrito Federal, 2016.

The evaluation data obtained with the application were stored and accessed by the Query language (SQL) database management system, visualized in the device itself, while the data referring to the POMA and TUG tests were recorded for later statistical analysis.

The difference between the means of the application results of the three risk groups was tested with variance analysis (ANOVA). A principal component analysis (PCA) test was performed using the TUG, POMA and application method results. The correlation of the three variables with the same factors indicates that the application is in accordance with the established methods.

RESULTS

The means of the application results were different for the three risk groups (F=17,142.40, $p<000.1$). However, only the mean of the low-risk elderly persons was different from the other two groups, and the means of the medium and high-risk elderly persons did not differ (Tukey test: medium-low=39.45, $p<0.0001$, high-low =41.23, $p<0.001$, high-medium=1.78, $p=0.98$). The methods of evaluation of the balance of the elderly correlated strongly with the first principal component (TUG: r = 0.88, $p<0.00001$; POMA: r = -0.92, $p<0.0001$; App: r=0.77, $p<0.0001$). However, the application values also correlated relatively strongly with the second component (r=-0.62, $p=0.00001$), which corroborates the results of ANOVA.

First stage: development of application

The application was developed using the Virtual Studio and Xamarim Studio tools in C# language with Framework.NET. The tool displays a screen for the identification and authentication of the user which is carried out by means of a register containing log in and password. After accessing the system, the evaluator has the option to access the database of previously collected results or perform a new analysis.

When choosing the *new analysis* option, the evaluator can determine the analysis time in seconds. The position of the accelerometer on the three perpendicular axes is used to form a sphere whose center is the initial position of the device fixed to the patient. Several different spheres are created for each patient during the analysis. Therefore, an increase in the standard deviation of the rays of these spheres represents an increase in the oscillation of the individual and a greater risk of falls. In this way the application effectively classifies these analyzes into low and high risks of falling.

To obtain the results, the ray of the sphere is initially applied with the formula:

$$R_2 = 2(x - x_0) + 2(y - y_0) + 2(z - z_0)$$

Where:

R = ray of sphere; $x0$, $y0$, $z0$ = coordinates of center of sphere with cartesian plane; and x, y, z = sample obtained in analysis.

Once the ray of all the samples were obtained, the mean and standard deviation were calculated, based on the formulas below:

$$R = 1 \, N \sum N \, i = 1 \, Ri \text{ (mean)}$$

$$\sigma = [\, 1 \, N \sum N \, i = 1 \, (Ri - R) \,] \, 1/2 \text{ (standard deviation)}$$

Where:

N = number of samples; P = mean ray of analysis; Ri = ray of sample; and σ = mean deviation.

It was found after the calculations that the results were around 10^{-2}. Therefore, the product was produced from the result by the constant 10^3, to make visualization by the user easier.

When the data was analyzed by distribution 35 was considered an effective value for classifying the groups, with results below this value representing a low risk of falling.

Second stage - testing of application

A total of 54 elderly persons took part in the present study, of whom six were men (11.11%) and 48 were women (88.88%). The mean age was equal to 71.3 (dp±7.41) years (Max. 91 and Min. 60 years). In relation to the history of falls, 25 participants (46.29%) said they had not suffered falls in the previous three years while eight volunteers (14.81%) reported four or more fall events. When asked about fear of falling, using a scale of 0 to 10, where 0 represents little fear and 10 is extremely fearful, 13 elderly people (24.07%) said they had no fear of falling while eight (14.81%) volunteers were very afraid of falling (score of 10 on the scale) as shown in Table 1:

The results of the TUG and POMA tests revealed a close correlation, allowing the volunteers to be classified into three groups of low, medium and high risks of fall. When these values were compared with the analyzes performed using the application, some of the results of the application did not relate to the classic tests, as the software did not differentiate between middle and high-risk elderly persons. These results are shown in Table 2 below, which describes the risk of falling results, and Figure 2 which denotes a boxplot chart showing the results of the application for the elderly, who were classified into three risk groups by the classic tests. The squares represent the means obtained by the application and the lines represent the mean plus +1 standard deviation or -1 standard deviation.

Tabela 1. Dados gerais da amostra referente ao presente estudo. Brasília, DF, 2016.

Variable	N (%)
Age (years)	
60 to 69	19 (35.18%)
70 to 79	28 (51.85%)
80 to 89	6 (11.11%)
90 or more	1 (1.85%)
Fall events	
No events	25 (46.29%)
1 event	13 (24.07%)
2 event	3 (5.55%)
3 events	5 (9.25%)
4 or more	8 (14.81%)
Fear of falling	
None (0)	13 (24.07%)
A little (1 to 4)	13 (24.07%)
Moderate (5 to 8)	16 (29.62%
A lot (9 to 10)	12 (22.22%

Continuation of Table 1

Variable	N (%)
Practice physical education	
Yes	45 (83.33%)
No	9 (16.66%)
Frequency (times per week)	
Once a week	3 (6.81%)
Twice a week	11 (25%)
3 times a week	5 (11.36%)
4 times a week	11 (25%)
5 times a week	14 (31.81%)
Types	
Pilates	5 (7.57%)
Water aerobics	22 (33.33%)
Walking	14 (21.21%)
Gym	11 (16.66%)
(Capoeira, swimming, dancing, yoga, stretching, functional training)	14 (21.21%)

Table 2. Result of risk of fall tests with TUG and POMA tests and Application. Brasília, Distrito Federal, 2016.

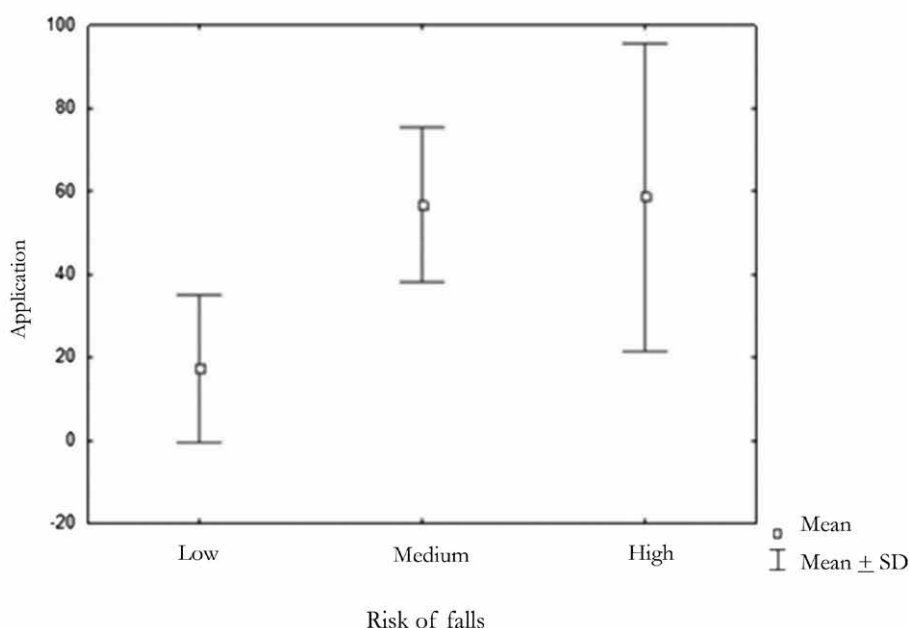| Risk of falls	TUG Test	Poma Test	Application
Low risk of falls	39 (72.22%)	39 (72.22%)	28 (65.11%)
Mean risk of falls	9 (16.66%)	9 (16.66%)	
High risk of falls	6 (11.11%)	6 (11.11%)	15 (34.88%)

Figure 2. Difference between mean oscillation identified with a smartphone application in elderly persons classified into three classes of risk by the POMA and TUG test. Brasília, Distrito Federal, 2016.

DISCUSSION

The functional changes inherent in the aging process, such as decreased mobility and muscle strength, can lead to imbalance and consequently increase the risk of falls in the elderly. Human balance in the orthostatic position is complex, with the body in constant oscillatory movement remaining in a situation of balance through reverse compensation and on the same plane as the constant imbalances that occur in this position[17,18].

With respect to the use of mobile devices as an instrument to aid the functional evaluation of the elderly, applications have been developed that support the execution and interpretation of tests of static balance, dynamic balance and gait. As in the present study, sensors similar to those found fixed to the ankle were attached to evaluate static balance by capturing oscillations in the maintenance of orthostatic posture. The volunteer was instructed to stand still during the test. After this step, a modified clinical test of sensory interaction of body balance was applied. The tool proved to be effective, with significant potential for assessing balance[19].

In relation to static equilibrium, a study compared the results of equilibrium tests from three instruments: a stabilometry platform, an equilibrium platform and an application developed for this purpose. The participants were instructed to hold the device against their chests while they adopted different evaluation postures. The results showed that the application was effective, suggesting that it is a valid and consistent method[20].

Like the previous study, an application was developed to aid in the assessment of unipedal balance. Volunteers were instructed to hold the device against their torsos while they stood on one leg (without the aid of the hands) on a stabilometry platform. The comparison between the two methods was also positive. Another study, meanwhile, compared the results obtained through five balance evaluation positions (parallel feet, heel to toe and single leg support) with data obtained by an application. The device measurements were also found to be reliable[21,22].

Another study had the aim of comparing balance evaluation by computerized photogrammetry and an accelerometer. This research revealed that the accelerometer in the smartphone effectively evaluated the static balance of the elderly, and that the use of this instrument could describe the progress of patients and assist in physiotherapy treatment plans[23].

One study aimed to develop an application that not only evaluated balance but allowed the possibility of balance training by verifying the results obtained by the device and through seven evaluation positions on the ground and on foam. The authors concluded that the application effectively assessed balance and allowed training for young adult volunteers[24].

In order to develop a smartphone application to detect, reduce and eliminate the subjectivity of clinical trials, a study was carried out involving 20 elderly people who underwent the Tinetti and Timed Get Up and Go tests using a smartphone attached to the waist for data collection. The authors concluded that the results were valid, helping the examiner to detect characteristics of frailty and thus improving accuracy in diagnosis[25,26].

As in the present study, the confidence of the data for the Timed Get Up and Go test collected through an iPhone 4 application was evaluated. Each participant performed the test three times wearing sensors positioned in the middle third of the sternum. It was concluded that the sensors incorporated into the iPhone 4 reliably identify kinematic standards in this test[27].

Similarly, 30 volunteers, of whom 14 presented signs of frailty, were tested in five different steps: transfer from sitting to standing; go, turn gait; go and return gait; and turn and sit. The data collected by the smartphone were subsequently analyzed. It was concluded that the sensors present in the iPhone 4 were able to verify and analyze the different sub-phases present in the Timed Up and Go test in frail and non-frail elderly[28].

With the purpose of analyzing the ability of a smartphone application to evaluate the sit and stand and single leg balance tests authors attached the mobile device to different segments, using the upper region of the torso in the first study[29] and the lumbar spine in the second[30]. Both obtained positive results compared to other forms of evaluation.

There was no agreement between the studies in terms of the functional tests applied to compare the results provided by the mobile devices. Similarly, there was no consensus as to whether or not a fixture attachment is required, or the best region for attachment.

CONCLUSION

Based on the results of this study it was concluded that the final version of the developed application was able to verify the oscillations present in the maintenance of the static balance of the elderly and to separate the results into high and low risk of fall groups. Despite the positive results, more tests should be performed to implement new functionalities and technical adjustments to improve this software.

Mobile devices have great potential as a support tool for health professionals. It is also important to highlight the key role of these professionals in gerontology technology, with the objective of developing and validating reliable tools. Further research is therefore necessary to prove the reliability and validation of the results.

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Latent Class Analysis: a new vision of the phenomenon of depression in elderly men in the Brazilian Northeast

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Abstract

Objective: to identify the prevalence of depression in elderly men and associated factors using Latent Class Analysis. *Method:* a cross-sectional, epidemiological study evaluating 162 Primary Care users resident in the community in Recife, Brazil, was carried out. The Yesavage Geriatric Depression Scale was used as a screening instrument. The study was based on descriptive analysis and Latent Class Analysis, which allows the indirect measurement of the phenomenon of Depression by measuring the latent phenomenon of depression through 15 directly observed questions/answers from the scale used followed by ordinal logistic regression. *Results:* Elderly men with up to four years of schooling had a 2.43 times greater chance of developing depression. Those with normal levels of cortisol were less likely to become depressed while elderly men with low levels of Vitamin D and testosterone and high levels of thyroid stimulating hormones (TSH) were more likely to be depressed. The prevalence of the highest level of depression in the study population was 29% and was associated with low levels of education and alterations in the clinical data investigated. *Conclusion:* The study concluded that Latent Class Analysis allowed an innovative perspective of the phenomenon of depression and its relationship with associated factors, allowing a better and broader approach to this phenomenon in clinical practice.

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INTRODUCTION

In the 1990s the World Health Organization (WHO) considered depression to be the fourth leading cause of social disability among diseases. It is expected that by 2012 it will become the second leading cause of disability in developed countries and the main cause of this condition in developing countries. It is estimated that the disorder will be the leading pathology of the global disease burden by 2030[1].

In Brazil, according to Ministry of Health data, the prevalence of depression is higher among women, ranging from 3% to 11% of the population, representing a significant public health problem[2]. It is worth noting that among the elderly, symptoms of depression may be related to socioeconomic, cultural and biological factors[3]. The high prevalence of depression among this group requires special attention due to its direct and indirect impact on the health of individuals. Improved diagnosis rates, the early identification of cases and a more effective approach to depressive disorders in Primary Care involves systematic screening[4]. This demonstrates the need for a wider investigation as such conditions have their own characteristics, and untreated depression in patients with preexisting diseases tends to have a longer or recurrent course[5]. The proportion of individuals with depression, as well as the severity of the condition, increases proportionally with advancing age, and is less frequent among men[6].

Although depression affects both genders, studies show that there is a lower prevalence of this disorder among men. There is controversy about this finding, however, as there is a difference between the number of men and women who seek health services[7]. One possible explanation may come from the cultural characteristics of gender relations, as women seek treatment for their health problems more frequently and express their feelings more often[4].

Depression is the most common psychiatric illness which leads to suicide, and the elderly are the age group which most often commit suicide. It is estimated that the majority (75%) of people who commit suicide consult with their doctors in the month and between one-third and one-half in the week prior to their deaths for reasons other than depression. The majority of first depressive episodes are undiagnosed and therefore untreated[2].

When accompanied by suicidal ideation, depression is a risk factor that justifies immediate and preventive measures. A greater number of ways to diagnose and assertively treat depression in the elderly is required[8]. Psychiatric disorders, and more specifically depression, are clearly the most important risk factors. Socio-environmental factors, such as lifestyle and social isolation, should also not be ignored[9].

Research specifically involving the topic of depression in the elderly male population remains rare. And as this population is not culturally accustomed to seeking outpatient care in Preventive Medicine, there is a need for greater knowledge.

This study aims to identify the prevalence of and factors associated (socioeconomic, demographic, morbidity and clinical-laboratory) with depression in elderly men treated in Primary Care.

METHOD

A cross-sectional epidemiological study was carried out in a Family Health Centre (FHC) in Sanitary District VIII, in Recife, Pernambuco, from June to September 2015.

The FHC features three teams and covers an area with 2,699 registered families and approximately 6,300 users.

The study population was formed by male elderly residents in the areas covered by the micro-areas of the three teams in the community of Jordão Alto. Elderly persons were considered those who at the time of data collection were aged 60 years or more, as stipulated by Brazilian Legislation. A total of 224 individuals were identified with these characteristics.

The study was carried out based on population census, without the use of a sample. Elderly men living in the community of Jordão Alto were included, without cognitive deficits or deficiencies that impeded their understanding and ability to respond to the questionnaire. Caregivers could be

present but could not participate in the interview responses. In the case of illiterate elderly persons, the reading of the FICF was performed by the interviewer and signed by fingerprint. Data collection was performed by means of a questionnaire and analysis of the patient's medical records (which included morbidity and clinical-laboratory data). The evaluation began with the Mini Mental State Exam (which was used as an exclusion criterion in case of moderate or severe cognitive impairment) and the Yesavage Geriatric Depression Scale with 15 questions.

The interviews were carried out at the Jordão Alto Health Center, in the Medical Treatment Room, or in the patient's home (in a private space) in the case of elderly people who could not visit the Health Center, with only the researcher and the interviewee (and their caregiver, when necessary) present, regardless of the chosen location. The users were selected during previously scheduled routine appointments and through invitation to attend the Health Center, delivered by Community Health Agents, during home visits.

Laboratory data was recorded from information taken from medical records. The Health Center laboratory collections are routinely performed when requested during consultations at the center itself. The results were analyzed according to laboratory reference values, in accordance with the guidelines of the Brazilian society of endocrinology and metabolism.

The reduced Yesavage Geriatric Depression Scale (GDS 15)[10] was used for screening of depressive symptomatology and the Mini Mental State Examination (MMSE) was applied as the exclusion criterion in case of cognitive impairment. The MMSE is one of the main and most frequently used instruments for cognitive evaluation, mainly among the elderly, and is recommended for the screening of cognitive deficit. It was decided to use the original cutoff point of 23[11]. It is known that the MMSE is influenced by several factors, notably schooling. Because of this, the use of varied cutoff points, appropriate to the different educational levels of the study population, is recommended[12]. To date, however, there is no consensus regarding cut-off points for cognitive decline in Brazil. Schooling has received special attention, being the subject of

analyzes carried out with different samples, aimed mainly at the suitability of these cut-off points[13]. A questionnaire elaborated by the authors was also applied, containing questions about social, economic, demographic factors, morbidities and clinical information.

The instrument selected for the screening of Depression in this study was the Yesavage Geriatric Depression Scale with 15 items (EDG 15) 10, which is widely used and validated as a diagnostic tool for depression in elderly patients. These items, taken together, exhibited good diagnostic accuracy, with adequate sensitivity, specificity and reliability[14].

Although the use of the Geriatric Depression Scale is recommended by the Brazilian Ministry of Health in Primary Care, its routine application only occurs in local contexts. The inclusion of such screening can provide early and more accurate diagnoses and interventions, as well as result in lower costs for the health system[4].

During the aging process, functional capacity can be impaired by incapacitating and psychosomatic diseases, which lead to physical inactivity, social isolation, affect quality of life and can be a risk factor for death[9]. The socioeconomic-demographic, morbidity and clinical questionnaire was elaborated with the objective of evaluating the association of these factors with the depressive symptomatology.

The socioeconomic variables, demographic variables, morbidities and those related to the hormonal profile of the subjects were considered as independent. The morbidities studied were considered those most frequently exhibited by users in Primary Care, such as Cardiovascular Diseases, Rheumatic Diseases, Diabetes Mellitus and Cancer.

The dependent variable was chosen to characterize the concept of depression in the participants. GDS 15[15] was used, which is a test for the detection of depressive symptoms in the elderly consisting of 15 questions (affirmative or negative), where the result is the sum of responses: 0 - when the answer is different from the example in parentheses and 1 - when the answer is the same as the example in brackets. The cutoff points and classification according to the sum of these points are: score of 0 - 4 points (absence of suspicion of depression); between 5 -11 points

(suspicion of depression); equal to or greater than 12 points (characterizes depression). The variable is therefore composed of 15 questions whose answers are categorical and dichotomous (Yes or No), ranging from zero to fifteen points[10,15].

However, considering: a) the limitations that cut-off points impose on the analysis and the impossibility of ensuring that people with the same score would have answered the same questions in a similar way; b) the complexity of the subject (Depression) and the difficulty of directly measuring and observing the same, and c) that the 15 questions of the instrument are strategies to indirectly measure something that is difficult to grasp in a single direct measure, Latent Class Analysis (LCA) was chosen as an evaluation technique. This is a latent phenomenon (not observed directly) but is indirectly measured by the 15 directly observed questions/answers of the scale used. Latent Class Analysis is a statistical method that identifies distinct groups (latent classes) based on the patterns of responses observed in categorical variables. This method investigates whether the relationship of covariance among a group of observable variables is explained by another latent variable (class)[16].

A descriptive analysis was performed, according to the nature of the presented variables. After the latent variable "depression" was created, it was used as a response variable (dependent). The strength of association between the independent variables and the response variable was expressed by the Odds Ratio (OR) with a confidence interval of 95%. For the calculation of the Odds Ratio, ordinal logistic regression, also called the proportional odds model, was used. Simple and multiple analyzes were performed. In the simple analysis, variables that obtained a p-value <0.25 were elective for multiple analysis. For the multiple regression the forward method was used and the other conclusions were considered at a significance level of 5%.

In terms of the blocks of analysis, the variables were classified according to Figure 1.
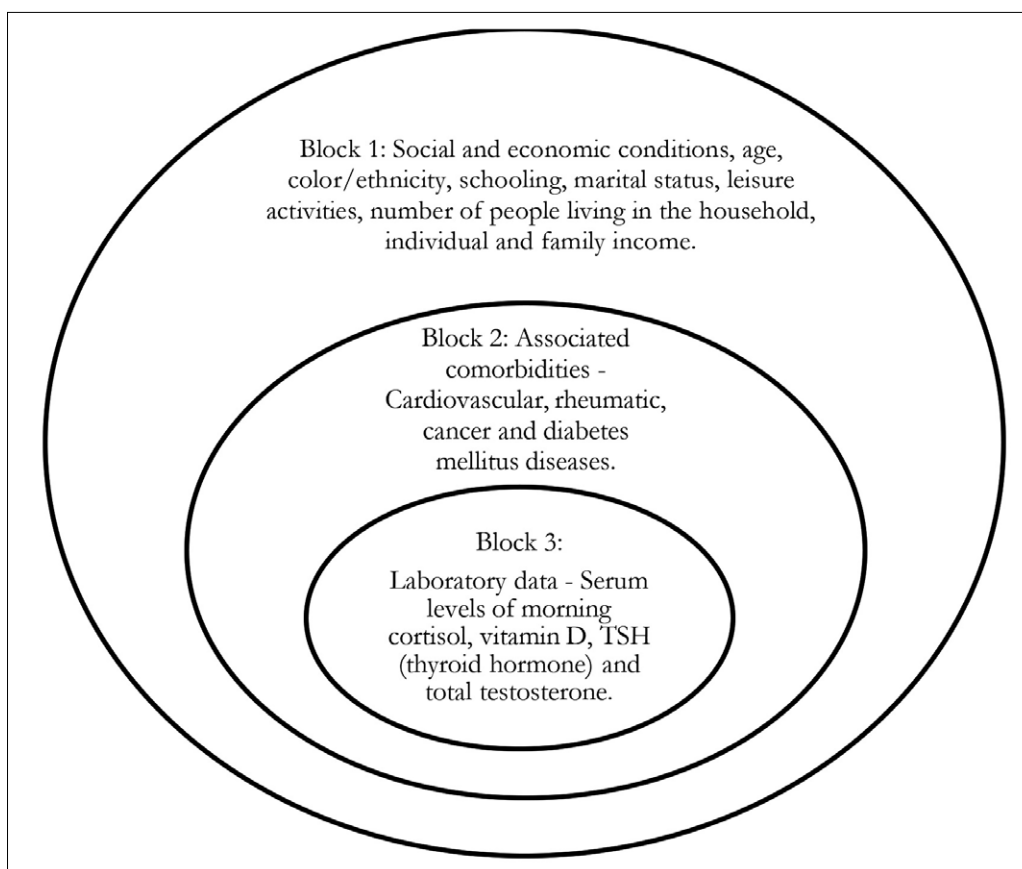
Figure 2. Absolute and relative frequency by class. Recife, Pernambuco, 2015.

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The Project was approved by the Research Ethics Committee of the Universidade Federal de Pernambuco (Federal University of Pernambuco), under approval number 1,076,173, according to resolution 466/12 on research with human beings. The interview was conducted following consent and the reading and signing of the FICF by the participants, and authorization of the letter of agreement from Recife City Council for access to users.

RESULTS

From a total of 224 elderly men registered with and receiving care at the Health Center, 36 users were rejected based on the exclusion criteria and 26 were not found at their address during the survey. A total of 162 elderly persons aged between 60 and 102 years were therefore interviewed. The median age was 69 years (interquartile Intervals from 64 to 78 years) and the Caucasian/white population totaled 26.5%. The median age position did not interfere with the extreme values.

It was found that approximately 83% of the respondents had a low level of schooling (1 to 4 years) and 15% had studied for five years or more. Regarding marital status, 68% were married, 6% were single and 26% were separated or widowed.

In an initial analysis of the results obtained in the Geriatric Depression Scale (GDS), the following profiles were observed: 37% of the elderly interviewed had a score between zero and four, with no suspicion of depression; 58.6% had scores between 5 and 11 (suspicion of depression) and 4.4% had scores between 12 and 15, and so were considered to have a diagnosis of depression, according to the established classification[12]. However, such cut-off points include, for example, individuals who scored 5 and those who scored 11 in the same category, with the former probably more likely to be included in the category with no suspicion of depression, and the latter, who scored 11, more predisposed to a diagnosis of depression.

Figure 2 therefore shows the absolute and relative frequency of each class as well as the names for each, according to the result obtained by LCA. Four distinct classes with greater parsimony were observed. Such distribution reveals a similar proportion (about 29%) at the extremes (Happy and Motivated, Depressed and Hopeless). In intermediate positions were 14.8% of discouraged but motivated elderly, and 26.5% who were considered as bored and helpless.

Table 1 shows the probabilities of belonging to each latent class according to the answer (Yes or No) given to each of the 15 questions in the GDS questionnaire.

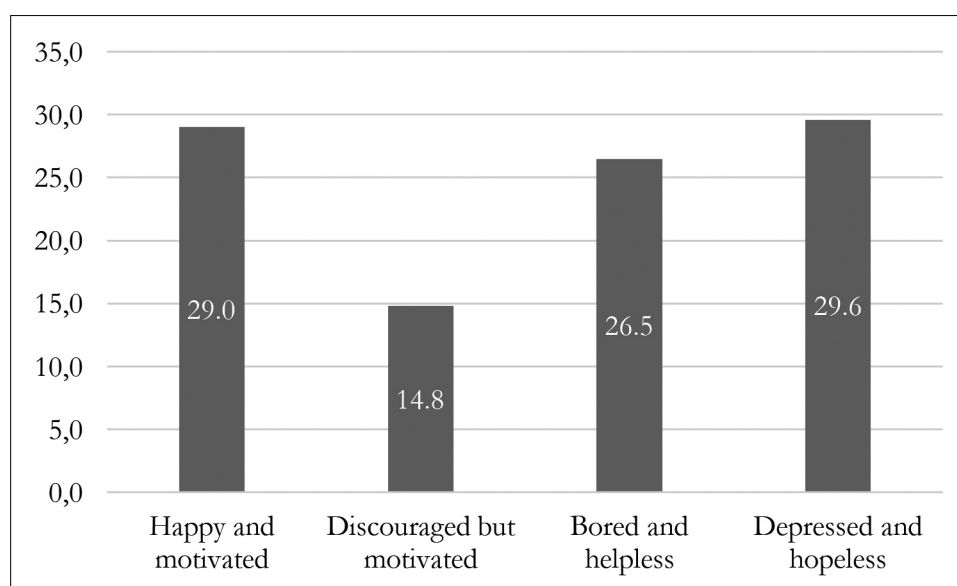**Figure 2.** Absolute and relative frequency by class. Recife, Pernambuco, 2015.

Created by authors

Table 1. Discrimination among four latent classes generated and response probability for the 15 questions of the GDS. Recife, Pernambuco, 2015.

Latent Classes	Happy and motivated	Discouraged but motivated	Bored and helpless	Depressed and hopeless
Are you basically satisfied with your life?	18.60	84.70	73.40	100.00
Have you dropped many of your activities and interests?	91.20	100.00	100.00	100.00
Do you feel that your life is empty?	0.00	20.30	54.00	100.00
Do you often get bored?	43.00	85.40	100.00	86.50
Are you in good spirits most of the time?	2.20	0.00	27.00	78.80
Are you afraid that something bad is going to happen to you?	9.80	84.50	84.70	97.80
Do you feel happy most of the time?	4.60	100.00	0.00	100.00
Do you often feel helpless?	38.50	33.20	100.00	72.80
Do you prefer to stay at home, rather than going out and doing new things?	82.50	92.40	100.00	100.00
Do you feel you have more problems with memory than most?	6.60	47.60	13.50	40.50
Do you think it is wonderful to be alive now?	0.00	0.00	9.00	28.50
Do you feel pretty worthless the way you are now?	0.00	0.00	11.20	30.60
Do you feel full of energy??	42.90	100.00	93.30	100.00
Do you feel that your situation is hopeless?	0.00	0.00	4.50	39.40
Do you think that most people are better off than you are?	86.80	100.00	100.00	89.10

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It can be seen in Table 1 that there are three questions whose responses were very similar for the four classes. Dropping most activities and interests, preferring to stay home instead of going out and doing new things, and thinking that many others are better off may be common perceptions in older people, from the most motivated to the most depressed. They do not therefore clearly and effectively discriminate a state of depression and could not be included in the sum of a score, even less so with the same weight as the other questions.

The chi-squared test (Table 2) revealed an association between the two forms of classification, while analysis of the standardized residuals showed that there was a higher than expected count (standardized residuals greater than 1.96 at a significance level of 5) between the extreme classifications of the presence and absence of depression, where the agreement was 100% The two intermediate latent classes coincided with the classification of *suspicion of depression* of the GDS scale, but with distinct profiles in these borderline areas of the extremes.

Table 2 shows that there is greater agreement between individuals who were classified as without depression by the GDS (as *Happy and Motivated*) and those with Depression (as *Depressed and Hopeless*). There is an intermediate zone that the GDS classifies as Suspicion of Depression, where when only the scores are considered, the subtlety of the class profile is lost. Regarding GDS specificity and sensitivity, Table 2 demonstrates the agreement between the LCA and the GDS. It was not the aim of this study to compare LCA to a gold standard for the screening or diagnosis of Depression, but to help an already validated instrument improve the definition of its categories.

Table 2. Association between two forms of Depression Classification Chi-squared test and Standardized Residuals Analysis. Recife, Pernambuco, 2015.

Latent Class Analysis		GDS Analysis*			Total
		Without depression	Suspicion of depression	Depressed	
Happy and motivated	n	22	25	0	47
	% Line	46.80	53.20	0.00	100.00
	% Column	100.00	21.60	0.00	29.00
	Standardized Residual	7.9	-3.3	-3.4	
Discouraged but motivated	n	0	24	0	24
	% Line	0.00	100.00	0.00	100.00
	% Column	0.00	20.70	0.00	14.80
	Standardized Residual	-2.1	3.3	-2.2	
Bored and helpless	n	0	43	0	43
	% Line	0.00	100.00	0.00	100.00
	% Column	0.00	37.10	0.00	26.50
	Standardized Residual	-3	4.8	-3.2	
Depressed and hopeless	n	0	24	24	48
	% Line	0.00	50.0	50.00	100.00
	% Column	0.00	20.70%	100.00	29.60
	Standardized Residual	-3.3	-4	8.2	
Total	n	22	116	24	162
	% Line	13.60	71.60	14.80	100.00
	% Column	100.00	100.00	100.00	100.00
	% do Total	13.60	71.60	14.80	100.00

*Chi-squared test ($p<0.05$); GDS – Geriatric Depression Scale

The results of the simple and multiple ordinal logistic regression models in each block are shown in Table 3. The p value and the 95% Confidence Interval (CI) were estimated by the Wald test. Multiple analysis reveals similar results, highlighting level of schooling and laboratory data as factors associated with Depression in the study population.

Table 3. Results for depression from the simple and multiple models of ordinal logistic regression. Recife, Pernambuco, 2015.

Independent variables of each block	Simples OR	CI 95% Inf	Sup	p-value	Multiple OR	CI 95% Inf	Sup	p-value
Block 1								
Age < median (69)	1.00							
Age ≥ median (69)	1.37	0.78	2.39	0.265				
Caucasians	1.00							
Non-Caucasians	1.49	0.78	2.83	0.225				
No schooling	1.97	0.87	4.43	0.100	1.90	0.76	4.70	0.166
Up to 4 years of schooling	1.74	0.79	3.82	0.167	2.43	1.01	5.89	0.048
5 years or more of schooling	1.00				1.00			
Individual income <median 790	1.20	0.67	2.14	0.529				
Renda individual ≥median 790	1.00							
Renda familiar <median-1580	1.08	0.62	1.88	0.788				
Renda familiar ≥median-1580	1.00							
Leisure activities	1.00							
No leisure activities	1.50	0.86	2.62	0.152				
N.people/room<median 2	1.45	0.77	2.73	0.239				
N.people/room≥median 2	1.00							
Single	1.00							
Married	2.21	0.64	7.58	0.206				
Separated or widowed	2.28	0.61	8.45	0.218				
Block 2								
Heart disease	1.23	0.65	2.32	0.522				
Without heart disease	1.00							
Rheumatologic diseases	0.97	0.53	1.77	0.920				
Without rheumatologic diseases	1.00							
Diabetes	0.86	0.47	1.57	0.625				
Without diabetes	1.00							
Cancer	0.82	0.21	3.16	0.775				
Without cancer	1.00							
Block 3								
Low Vitamin D level	14.14	6.18	32.32	<0.001	10.33	4.06	26.27	<0.001
Normal Vitamin D level	1.00				1.00			
Low TSH level *	1.00				1.00			
Normal TSH level	3.68	0.34	39.45	0.280	11.31	0.97	131.98	0.053
High TSH level	12.10	1.10	132.53	0.041	15.73	1.30	189.95	0.030
Low cortisol level	1.00				1.00			
Normal cortisol level	0.26	0.14	0.50	<0.001	0.34	0.17	0.69	0.003
High cortisol level	0.53	0.23	1.17	0.120	0.55	0.22	1.37	0.200
Low testosterone level	7.73	3.89	15.36	<0.001	3.24	1.41	7.42	0.005
Normal testosterone level	1.00				1.00			

*TSH = Thyroid stimulating hormone

Regarding level of schooling, it can be affirmed that the elderly with no schooling have a 90% chance (though not significant) of developing depressive symptoms, while those with up to 4 years of schooling have a 2.43 times greater chance of developing depression than those with 5 years or more of schooling. Analysis of the laboratory data revealed that low serum levels of vitamin D and testosterone were associated with depression in the elderly persons, and that high or normal levels of TSH also contributed to a predisposition to depression in these individuals. Normal levels of serum cortisol "protect" the individual, giving a 66% chance of not developing depressive symptoms.

DISCUSSION

It is important to fully understand the physiological, biochemical and social changes that elderly individuals suffer during the aging process to meet the specific needs of this age group. Depression in the elderly is considered a secondary illness in relation to chronic diseases, and may be related to the end of one's professional career, the onset of chronic diseases and abandonment by relatives[17].

The fact that men report fewer depressive symptoms contributes to the erroneous idea that depressive disorders affect the male gender less. In recent years, the number of men hospitalized for depression has increased, according to a study carried out in a medium-sized philanthropic psychiatric care hospital in Minas Gerais[18].

It was observed in the present study that both clinical data and schooling had significant and independent effects on depression. Older people with no education were 90% more likely to become depressed, while the chances of developing depression were 2.43 times greater in those with up to 4 years of schooling than those with 5 years or more of schooling. Another study carried out with the elderly population in the south of Brazil[19], showed that those with a lower educational level had a statistically higher mean ($p<0.05$) of depressive symptoms. In a cross-sectional study conducted by Brischiliari[20] to assess CNCD, it was shown that such symptoms were more prevalent in elderly and in individuals with low educational levels, a fact also evidenced in a study by Paula et al.[21] which found that depressive

symptomatology was more evident among younger elderly people, women and the less educated. In terms of the clinical-laboratory data of this study, four relevant factors were observed in relation to the interviewed public: 1) the elderly with normal levels of cortisol are 66% less likely to become depressed; 2) those with hypovitaminosis D had a 10 times greater chance of suffering from depression; 3) those with low total testosterone levels tend to be 2.24 times more likely to become depressed; 4) those with high TSH levels were 15 times more likely to become depressed.

Vitamin D also plays an important role in depression. It has been revealed that depression is strongly associated with lower serum levels of Vitamin D, even after adjusting for age, gender, body mass index, smoking, health status, physical activity level and level of urbanization[22].

The geriatric population is more sensitive to hypovitaminosis D. This occurs for several reasons, both due to the inadequate intake of vitamin D, reduced exposure to the sun and the interference of polypharmacy in the metabolism of the vitamin[23]. A study conducted in Australia that sought to explore the association between serum levels of Vitamin D and a wide variety of health conditions to identify an optimal range for vitamin D concentrations, found that in men aged 70 years this level was between 50.0 and 74.9 nmol/l, with no additional benefits associated with levels above this[24].

In this study, those with high serum levels of thyroid stimulating hormone (TSH) had a 15-fold greater chance of developing depressive symptoms than elderly patients with low serum levels of TSH[25]. The association between depression and frank hypothyroidism has been described in scientific literature. The incidence of hypothyroidism increases after 60 years, often ranging from 0.5% to 5% in cases of frank hypothyroidism and 15% to 20% in cases of subclinical hypothyroidism. Thyroid hormone concentrations are associated with the severity of depression and may have an impact on the final clinical outcome[26].

To diagnosis hypothyroidism, however, it is necessary to evaluate other thyroid hormones, although the association in this study between TSH and predisposition to depression was statistically significant.

The population of this study with normal levels of the hormone Cortisol had a 66% greater chance of not developing depressive symptoms than individuals with low level of this hormone.

The population analyzed in this study with low levels of total testosterone (when compared to normal levels) had a 2.24 times greater chance of developing depression, corroborating studies by other authors in which psychological factors were related to low testosterone levels in men from an age group identical to that of our study population[27,28].

The screening instrument used was GDS-15. It was observed that three questions (dropped many activities and interests, prefer to stay at home, rather than going out and doing new thing, think that most people are better off) may be part of the reality of many elderly, without necessarily representing depressive symptomatology, and may reflect their socioeconomic or family situation, similar to that observed in another study[29]. These questions have the same weight as others aimed more directly at the diagnosis of depression, which makes the analysis more fragile, especially in the cut-off points.

According to Latent Class Analyzes, four ordinal classes were created from the results obtained: *happy and motivated*, *discouraged but motivated*, *bored and helpless* and *depressed and hopeless* (with similar proportional distribution at the extremes of 29%) for a better evaluation of results. This analysis allowed a new form of evaluation for the classification and screening of depressive symptomatology in the elderly, overcoming the typical limitations of the traditionally used cut-off points.

Bretanha et al.[30] concluded in their studies that the high prevalence of depressive symptoms in the population requires investment in prevention actions, focusing on practices that promote active aging, contributing to the improvement of self-perception of health and satisfaction with life. A need to expand the present study was noted, considering the importance of psychosocial factors that may also be associated with depression and which were not considered in depth here.

Due to the cross-sectional nature of the study causal association could not be established. The limitations that cut-off points impose on the analysis and the impossibility of ensuring that people with the same score would have answered the same questions in a similar way limit the traditional approach of the instrument used.

The imposition of cutoff points for the diagnostic classification of depression remains a typical limitation of this type of measurement, especially in borderline scores between one category and another, as well as the lack of weighting between the different questions used.

In addition, depression is a complex and difficult to observe/measure object of study, and the 15 questions of the instrument are an attempt to indirectly measure something that is hard to grasp in a single direct measure. However, Latent Class Analysis (LCA) represented an innovative aspect in the discussion of this emblematic phenomenon, which is increasingly present among the elderly, but little studied from a gender perspective.

CONCLUSION

The study concluded that Latent Class Analysis represented an innovative perspective on the phenomenon of depression, revealing a prevalence of 29% in the population studied, with expressive socioeconomic, demographic and clinical associations.

Studies that propose to investigate depression in the elderly male population and its associated correlates are rare. The present study represents an opportunity for an understanding of Depression through Latent Class Analysis, in which the condition is a non-directly observed phenomenon. Meanwhile, it can be measured by a greater probability of belonging to a given response profile, taken from the Geriatric Depression Scale used.

It was therefore proposed to identify the prevalence and factors associated with depression in elderly men treated in Primary Care. The increase in the number of depressive symptoms in the studied population was associated with a low level of education and alterations in the clinical data investigated. In addition, intermediate levels of depression were observed.

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In this context, an alternative view of elderly residents in this and similar communities is extremely valuable and can support agendas and educational activities in health and investment in the improvement of health services, through the extension of gerontological knowledge for multi and interdisciplinary teams, as well as encouraging the involvement of the family and society, contributing to an early diagnosis and the application of appropriate treatment.

A new scenario has emerged in clinical practice. The perception of the signs and symptoms of depression in the elderly (as well as the observation of related variables) and especially among elderly men is a great challenge for professionals, and fundamental for the prevention of injuries and correct interventions.

The health of elderly men needs to be properly evaluated. It is essential that new studies are carried out in the geriatric-gerontological area, in order to include more such elderly men and treat them more effectively, as well as to qualify and train health teams and continuously invest in the Health Service to meet the demands of this population. A healthier and longer life expectancy can subsequently be achieved.

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Geriatric dentistry teaching and the curricular guidelines in dental schools in South American countries

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Abstract

Objective: to analyze the teaching of geriatric dentistry from the perspective of the National Curricular Guidelines (NCG) for undergraduate courses in dentistry in South American countries. *Method:* an exploratory and descriptive study with a qualitative approach was carried out, covering the dental schools of public universities in five South American countries which included a geriatric dentistry module in their curriculums. Twenty intentionally selected participants were included. Semi-structured open interviews were recorded using digital media and the content was analyzed using the Thematic Analysis technique with Atlas-Ti® software, based on the current NCG in each country. *Results:* the NCG evaluated in the five countries were similar in terms of the norms that guide the education of the dental surgeon. Three categories of analysis were identified: professional profile, skill development and the geriatric dentistry teaching-learning process for the undergraduate student. *Conclusions:* dentistry teaching has sought to connect with the NCG. However, the simple insertion of a geriatric dentistry module in the curriculum is not sufficient to promote a teaching-learning process that allows the student to develop skills to provide better care for the elderly.

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INTRODUCTION

In recent decades there has been an accelerated increase in the length of human life in developing countries. In South American nations such as Brazil, Peru, Colombia, Chile and Argentina elderly persons represent an expressive proportion of the population[1-5]. According to projections by government bodies, the elderly represent approximately 15% of the total population in Chile and Argentina. In Brazil, this age group constitutes 12.5% of the total population, while in Colombia and Peru the percentages of elderly persons reach 11.9% and 10.2%, respectively[1-5].

Physical and social alterations that can compromise the health status of individuals occur throughout the aging process and are therefore considered a challenge to be tackled by society[6]. With the increase in the global elderly population, dentistry also faces different challenges. One is the professional training of those who will be responsible for the care of the elderly population. It is important that there is contact with geriatric and gerontology knowledge throughout the training and education process, as well as the development of appropriate teaching practices, including those relating to oral health[7].

Geriatric dentistry has been established in the curricula of undergraduate dentistry courses since the 1980s. In Brazil and other countries of South America, the subject is a recent addition to undergraduate studies. The general purpose of this is to enable students to meet the oral health needs of the elderly in a responsible and suitable manner[8]. In other words, it is not only about knowledge of the oral cavity of the elderly, but about integrated human recognition from a physical, emotional, intellectual and social point of view, as this age group is made up of people with highly heterogeneous characteristics[9]. The content of geriatric dentistry aims to allow students to develop the skills necessary to effectively manage this population group and to enable them to provide more humanized and quality care[10].

The training of the future dental surgeon occurs within different contexts, with the purpose of training professionals who are prepared to care for the well-being of the population. From this perspective, the National Curricular Guidelines (NCG) in dentistry courses were created by the need to make changes to the curriculum and for the professionalization of teaching work. NCG define how future dental surgeons should be trained in terms of principles, fundamentals, conditions and procedures. This professional training should allow the development of skills, ethics and the recognition of social reality, as well as enhancing the health of the population[11].

Curriculum related issues are considered crucial in professional training, as such documents represent the organized selection of content to be learnt and regulate didactic practice. This is directly related to the structuring of disciplines, the content to be taught by teachers and teaching methods. Thus, curricular guidelines indicate an institutional educational project considered appropriate for professional training at a higher level. They do not always constitute something neutral, universal and immobile, however, but can sometimes be controversial and conflicting[12].

Humanization is one of the central themes of NCG for dentistry courses, as it is associated with human rights and the possibility of establishing bonds of solidarity[13]. Humanization is people's ability to understand and respect one another. In health care, it is understood as the way of treating patients correctly, with respect, confidence and a broader view of the human being[14].

In this context, it is necessary that students develop some theoretical elements that help the development of the critical-reflexive capacity and value humanization, representing a position of respect for human life. There is therefore a need to adapt undergraduate courses to enable better training of health professionals and meet the demands of the population[13]. Other issues relate to the generalist training of future dental surgeons, so that they can offer integrated care, know how to work in a team and have a better understanding of reality[15].

Considering the future of geriatric dentistry, the demand for dental care will become ever greater, and curricula that allow for the improved preparation and development of the subject at undergraduate level will be required[16].

This aim of the present study was to analyze the teaching of geriatric dentistry from the perspective of the National Curricular Guidelines/Standards for dentistry degree courses in South American countries.

METHOD

An exploratory, descriptive study with a qualitative approach was performed, using secondary data collected from a larger scale study. The study universe was the dentistry courses of public universities in five countries in South America: Brazil, Peru, Argentina, Colombia and Chile which included the geriatric dentistry (or similar/equivalent) discipline in their curricula. The inclusion of the universities and of the research participants was performed by intentional sampling.

The participants were 20 professors of geriatric dentistry (or similar/equivalent) from dental education courses in these five countries. The inclusion criteria were the presence of the geriatric dentistry (or similar/equivalent) discipline in the curricula of the dentistry courses of public universities of the five countries, and that the professors had been responsible for the discipline for at least one year. The exclusion criteria were public universities that did not offer the discipline (or similar/equivalent), courses that did not respond or authorize the study after contact by e-mail, substitute professors and those with less than a year teaching the subject.

The baseline study was divided into four stages. In stage 1, the selection of universities was carried out to obtain information about the discipline (or similar/ equivalent), with 87 dentistry courses analyzed from the five countries. In stage 2, three criteria were established due to the absence of information on the geriatric dentistry (or similar/ equivalent) discipline. These were: type of discipline (mandatory or otherwise); nature of the discipline (theoretical-practical), and the course load of the discipline. Nine dentistry courses collaborated in

the research. In stage 3 the participants were invited to take part, and the coordinators of the dentistry courses were contacted via e-mail, with the approval of the universities. The individuals responsible for the geriatric dentistry (or similar/ equivalent) discipline were then contacted to determine which participants would collaborate with the research, and a total of 20 participating professors were identified. In stage 4 semi-structured open interviews were conducted, using a script in the language of each country. The interviews were conducted online in the second half of 2015 using Skype® software, recorded in digital media and stored using the qualitative data analysis software Atlas.ti® (Qualitative Research and Solutions version 7.1.7). A Free and Informed Consent Form (FICF) was issued to each university and participant in the respective language of each country, and all were returned signed by e-mail.

To respond to the proposed objective, the data of the thematic type were analyzed from a curricular perspective, or in other words, based on the formulation of previous categories focusing on the content of the National Curricular Guidelines/ Standards of the five participating countries (Chart 1).

The regulatory guidelines of research involving human being contained in CNS Resolution 466/2012 were followed, and the project was approved under opinion number 984.051.

RESULTS

The results are presented through the description and analysis of categories in Chart 2, formulated based on the content of the National Curricular Guidelines/Standards of the five countries studied.

Chart 1. Summary of National Curricular Guidelines/Standards of South American countries in the study. Florianópolis, 2016.

Countries	Document	Scope	Characteristics
Brazil	National Education Council. Chamber of Higher Education. CNE/CES Resolution dated February 19, 2002. Established national curricular guidelines for the undergraduate course in dentistry.	Profile of undergraduate/ professional in training	• Generalist professional Strong technical and scientific training Humanistic Ethical Train a dental surgeon with skills Social awareness Meet social needs Do not focus on a technical mindset Work in both private and public Commitment to society (citizenship)
		Skills	• Health care: develop prevention, promotion, protection and rehabilitation actions, both individual and collective • Communication: interaction with the public • Ethical responsibility • Critical attitude • Work in multi-professional team
		Teaching-learning for the education and training of the undergraduate student in dentistry	• Theoretical and practical content, as well as supervised internship in health and community services • Knowledge of collective health (knowledge of laws and public policies) • Active student participation • Research • Continuing Education • Sound scientific basis
Peru	Estándares para la acreditación de la carrera profesional universitaria de odontología (CONEAU)	Profile of undergraduate/ professional in training	• Humanist • Sense of social responsibility • Suitable academic training • Aware of the reality of the population • Ethics
		Skills	• Develop prevention, promotion, protection and rehabilitation actions in the community • Have an integral view of the community • Multidisciplinary work
		Teaching-learning for the education and training of the undergraduate student in dentistry	• Appropriate to reality • Knowledge should be provided to enable the care of patients with special needs • Theoretical and practical contents as well as supervised internship in health and community services • Knowledge of collective health (knowledge of laws and public policies). • Active student participation • Research • Continuing Education

Continuation of Chart 1

Countries	Document	Scope	Characteristics
Chile	Criterios de evaluación de carreras de odontología (Comisión Nacional de Acreditación)	Profile of undergraduate/ professional in training	• Solid knowledge • Humanist • Ethical • Generalist professional
		Skills	• Critical thought • Continuing learning • Communication with the community • Multidisciplinary work
		Teaching-learning for the education and training of the undergraduate student in dentistry	• Social reality • Theoretical and practical contents, with out-of-university visits • Continuing Education • Care for all types of patients • Research
Colombia	Hacia un consenso de las competencias de formación del odontólogo colombiano (Asociación Colombiana de Facultades de Odontología)	Profile of undergraduate/ professional in training	• Ethics • Morality • Humanist • Social responsibility • Generalist
		Skills	• Skills for the prevention, promotion, diagnosis and prognosis of the community • Acting in multi-professional team • Critical analysis • Communication with the community • Critical attitude • Knowledge of the population
		Teaching-learning for the education and training of the undergraduate student in dentistry	• Knowledge of reality • Work towards quality training • Research • Continuing Education • Knowledge of the country's public policies. • Humanist
Argentina	Apruébanse los contenidos curriculares básicos, la carga horaria mínima, los criterios de intensidad de la formación práctica y los estándares para la carrera de odontología. Ministerio de Educación. Resolución 1413/2008.	Profile of undergraduate/ professional in training	• Aware • Generalist dentistry • Ethic • Understand the social reality
		Skills	• Apt for development prevention, promotion, protection and rehabilitation actions, both individual and collective. • Multidisciplinary work • Critical attitude
		Teaching-learning for the education and training of the undergraduate student in dentistry	• Continuing Education • Care for all types of patients • Theoretical and practical contents, also outside the university • Active student participation • Knowledge of the reality of the population • Research

Chart 2. Analytical categories and their respective codes. Florianópolis, 2016.

Category	Code
Profile of Undergraduate/ Professional in training	• Humanist • Generalist • Strong Technical and Scientific training • Ethical • Socially responsible: Knowing, being sensitive and committed to social reality • Acting in the public and private spheres
Skills	• Apt to develop actions of prevention, promotion, protection and rehabilitation, both at individual and collective level • Multidisciplinary teamwork • Attitude, critical thinking and continuous learning • Communication with the community
Teaching-learning for the education and training of the undergraduate student in dentistry	• Equipped for the reality of the population • Provide knowledge that enables the care of all patients, including those with special needs • Theoretical and practical contents, with visits outside the university • Continuing Education • Knowledge of the country's public policies • Active student participation • Research and extension

Profile of the Undergraduate/Professional in Training in dentistry and the teaching of geriatric dentistry

The discourses of the participants indicated one key aspect of professional training: the insertion of the concept of humanization, based on practices that enable the creation of bonds of respect and trust and enabling improvements in people's living conditions and health. The profile required for the training of the future dental surgeon should be created from a new, more extended, concept of health, so that this professional is able to meet the demands of society.

The meaning of a general practitioner for most of the participants is related to the training of someone capable of knowing an individual in their entirety, in the different cycles of life. It is to educate the student to act in a resolutive manner and with responsibility. The participants reinforced the importance of the undergraduate student understanding the process of human aging, in its entirety, and the care required in this age group, with all its peculiarities.

For the participants, it is also important that the teaching-learning process is developed with quality, giving students a solid theoretical and practical training, which allows them to carry their learning into their future professional life. Also, aspects related to ethics are fundamental in the training of students, as they allow them to develop attitudes linked to feelings of citizenship, responsibility and commitment to society.

Professional undergraduate training should not only be aimed at dental care in the private sphere of health systems, but should also prepare students to act in public services, meeting the needs of the user population, especially the elderly. Thus, it is necessary to value and know how to apply preventive measures to the diseases that most affect this population group, as well as health promotion strategies, and not restrict performance to curative care through specific clinical procedures.

According to the statements of some participants, one of the relevant topics highlighted in the category of *Skills to be developed by undergraduate students in dentistry* are related to the formation of future health professionals in the expanded sense, including competences to be developed in actions of health promotion, the prevention and protection of diseases and illnesses, treatment and rehabilitation, allowing them to develop comprehensive care of the population at all levels. A university should

prepare its students to carry out these actions with the elderly, allowing them to have a better quality of life, since in this group there is a high prevalence of chronic conditions that cause their health status to deteriorate, with repercussions for oral health.

For the interviewees, the university is one of the institutions responsible for helping students to discover the necessary tools for a better understanding of teamwork, through participation and coexistence with professionals from other areas.

Students must be prepared to treat all kinds of people during their degree courses and teachers and professors can help them become more critical and able to solve problems and make decisions in a responsible way. Learning does not end with graduation and should continue throughout life, so students should be able to think clearly about their own learning process, noting successes and errors, leading to a successful professional life, according to the participants.

According to the interviewees, it is also important for students to learn to relate to and communicate with people, especially with elderly persons, so as to be more resolutive and confident when dealing with this population group.

In the discourses of some of the interviewees, it can be observed that one of the key topics in the *teaching-learning of geriatric dentistry for undergraduate students training in dentistry* is the knowledge that the undergraduate student should have about the social reality of his country. It is important that university curricula are flexible and adjusted to the local reality to train professionals who are more committed to the health of the population. The student should be aware that the population is aging and adopt an overview of the reality of living conditions and health of this population group. They should be prepared to perform care for people of all ages. Thus, the association between theory and practice, in the case of geriatric dentistry, helps the student to better understand the world of this population and know their specificities, resulting in a better professional performance in the care of the elderly.

The interviewees also point out that the participation of the teacher is fundamental in the student's teaching-learning process, as it provides students with the confidence to express and let their ideas flow, to help them feel confident, and to provide them, through a range of strategies, with the necessary tools that allow students to participate more actively in the classroom, so developing different important skills in the management of elderly patients.

The interviewees reported that with the passing of time people face changing difficulties, which can alter their health status, requiring a more individualized service. This is the situation in most countries in South America. Often, the elderly population is fragile, and not valued or respected, even when public policies protect them. Thus, it is important to train future professionals who enjoy working with the elderly and have the ability to articulate and defend the rights of this group.

DISCUSSION

The NCG serve as a guide in the curricular development of dentistry courses, enabling strategies for a successful teaching-learning process for future professionals[17]. The changes in the curricula of dentistry courses have transposed the traditional curriculum to form future generalist-based dentists with critical and reflexive capacities, in order to attend to the health needs of the population, enabling them to develop their activities in a responsible and creative way[18]. Thus, it is important to point out that curricula go beyond the content traditionally acquired in school subjects, circumscribing their educational objectives, with constant revision and modification. They therefore play important roles in broadening the world view of students and promoting citizenship, tolerance and solidarity[12].

NCG, in general, indicate the need to train humanized professionals, an essential aspect of caring for human beings. Unfortunately, this aspect has not been considered in student training[19]. By promoting humanization in dentistry courses, the guidelines contribute to the training of professionals who are more aware of reality[19].

It is important that students are able to perform dental care for people of different ages. The elderly in particular require diverse types of care, and so it is necessary to create environments in which the student broadens their knowledge and develops

care skills related to this population group[20]. With the objective of training future dental surgeons capable of caring for the elderly, it is necessary that the discipline of geriatric dentistry is present in dental curricula, addressing aspects of the oral health of the elderly and their particularities and allowing students to develop skills related to the care of this age group[11].

With regard to the development of the discipline of geriatric dentistry, it is necessary for universities to provide students with a number of situations that allow them to increase their awareness of these issues, leading to better management of the elderly, in order to offer a quality care, fulfilling one of the purposes proposed by the NCG for the suitable training and education of future professionals[10]. This topic was little explored by the participants of the study, which suggests some difficulty in the execution of the disciplines.

Other results highlighted in this study relate to the integrated training of the students, emphasizing technical, scientific, ethical and socially responsible training. With technological and scientific advances it is indispensable that higher education institutions focus more on student learning, with suitable educational environments and techniques. Dentistry courses should train future professionals to be aware of the social, economic and general health and oral reality of the population, and not just train technically competent and highly specialized students[21]. Ethics is also a major challenge in the training of future health professionals as it enables them to develop competently and be responsible professionals[22].

According to the National Curricular Guidelines[23], when training dentistry students need to be able to carry out health promotion, prevention and rehabilitation actions, either individually or collectively, in order to analyze and offer solutions to the problems of the population. Dentistry courses have difficulties in terms of their curricula, with shortcomings identified in relation to the preventive and promotional aspects of oral health[24].

The training of future dental surgeons should include preparing them to work in a multi-professional manner and to recognize the work of other health professionals[25]. The changes in dentistry curricula

seek to strengthen critical thinking as one of the fundamental skills in student training, allowing these individuals to better understand life and place themselves within reality to solve problems more effectively and make decisions in a responsible way[26]. Dentistry training must be combined with critical thinking, preparing the student for an integrated and more human formation[27].

Communication is among the skills that every good dental surgeon should possess. The teaching-learning process, based on the diversification of practical scenarios, will enable students to deal with the reality of this population and also to develop their communication skills[28].

Also highlighted in this study was the knowledge that dentistry students should have about the reality of their country. Curricula must be adapted to the reality of society, which poses new demands and challenges. The future dental surgeon must be prepared to understand the reality that surrounds the elderly population, the aging process and the living and health conditions of this age group[29].

The application of strategies related to theoretical-practical content for a more solid formation of the student was also discussed. With regard to the care of the elderly, in order for a student to better understand the world of this population group, and to know that they need a different type of service, it is necessary to combine the knowledge imparted in theory with practical activities, allowing them to develop the necessary skills for more effective management and oral health care of this age group[30].

Public policies for the elderly were created to guarantee their rights and allow them to live in safety and comfort. With the increase in the elderly population, it is important to implement well-structured policies for better population aging. In undergraduate courses, it is essential that dentistry students learn about public policies and how they affect society's problems[31].

One of the ways in which students can have greater contact with the elderly is through the implementation of university extension programs, allowing them to approach this population in a different manner[20].

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This study has some limitations, as it is a re-reading of data collected in another study with a broader scope. There were also no face-to-face interviews, which prevents real interaction with the participants. Finally, the documents relating to the National Curricular Guidelines/Standards were surveyed on electronic sites, meaning that there was no guarantee they had been updated, which may interfere in their interpretation.

CONCLUSION

The present study showed that the National Curricular Guidelines/Standards for dentistry courses in the five countries studied have similarities in terms of the norms that guide the training/education of future dental surgeons, as well as with regard to the competencies that dentistry aims to develop and the form of the teaching-learning process during their degree courses.

The data indicate that the teaching of dentistry seeks to establish a connection with the recommendations of the National Curricular Guidelines/Standards for the training of dental surgeons, since these refer, in a general way, to the form the preparation and development of the future professional should take. However, the simple insertion of the geriatric dentistry discipline into the curricula of the undergraduate courses is not enough to ensure a process of teaching and learning that allows the student to develop skills to provide better care for the elderly. These skills should be in line with the more general Curricular Guidelines/Standards, and thus, reflect on the formation of the student/ professional as a generalist professional.

The present study opens space for reflection on the importance of forming socially responsible dentists, the indispensable accomplishment of the National Curricular Guidelines/Standards for guiding dentistry courses towards better training/education of students and also the necessity that the teaching of geriatric dentistry is aligned and reflects the guidelines of the aforementioned National Curricular Guidelines/Standards to train future professionals who can impact the life and health of the elderly population in South America.

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Impacts of frailty on the negative health outcomes of elderly Brazilians

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Abstract

Objective: to verify the association between frailty and the occurrence of falls, hospitalization and death among Brazilian elderly persons. *Methods:* a representative sample of elderly persons from the city of Juiz de Fora, Minas Gerais, Brazil, who had been evaluated with regard to frailty, socio-demographic conditions and health in 2009, were reevaluated in terms of negative health outcomes between 2014 and 2015 (n=304). *Results:* The results revealed a greater incidence of falls, hospitalization, and death among frail elderly persons. The frail group also had an increased risk (1.5, crude estimate) of death during the follow-up period than the robust individuals. The pre-frail elderly had a 55% (crude) and 58% (adjusted) greater risk of falls, and an 89% (crude) greater risk of death than robust individuals. *Conclusion:* frailty, as well as pre-frailty, can increase the risk of adverse events in the health of the elderly.

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INTRODUCTION

Frailty is characterized as a syndrome with multiple causes and contributors resulting in declining physiological reserves and increased individual vulnerability. This profile is related to a high index and risk of falls, hospitalizations, functional incapacity and death among frail elderly persons[1,2]. Epidemiological studies have shown that frail elderly persons are up to 3.35 times more likely to fall than robust elderly persons[3], and have a 10.5 times greater risk of death[4].

It is known that genetic, physical, psychological, social and environmental factors, and the interactions between them, have considerable potential to elucidate the triggering of frailty and the aggravation of its consequences[1,5]. However, while evidence with elderly individuals of different nationalities suggests frailty has a considerable impact on the risk of negative health outcomes, there are no records of longitudinal studies on this subject involving the Brazilian elderly.

Therefore, the objective of the present study was to investigate whether negative health events among the elderly (falls, hospitalization and death) are influenced by the frailty syndrome during longitudinal follow-up.

METHOD

A longitudinal follow-up study was carried out of a population of elderly people evaluated in 2009 by the FIBRA (Frailty among Brazilian Elderly) network in Juiz de Fora[6]. All procedures performed in the study involving human participants were in accordance with the ethical standards of the national research committee and with the 1964 Declaration of Helsinki and its subsequent amendments and comparable ethical standards.

The baseline of the FIBRA study was determined from a sample obtained from a complex sampling design for a self-weighted two-stage household survey. The first stage involved the Territorial Units of the municipal region, and the second stage was the Census Sectors, both according to the criteria of the Brazilian Institute of Geography and Statistics.

Individuals over 65 years of age, with the physical-functional capability to perform the frailty tests and who were able to answer the questions alone, and who did not have severe cognitive deficits or received palliative care were involved. In total, 424 community-dwelling adults responded to the interview and performed the tests proposed during a home visit.

Some data from the FIBRA study were only considered in the present study for the sample characterization of the baseline. These included sociodemographic (age, gender, ethnicity, illiteracy, housing and income), clinical (presence of comorbidities previously diagnosed by physicians), functional (Lawton and Brody Instrumental Activities of Daily Living Scale[7]) and frailty factors.

Frailty was assessed according to the protocol established by Fried et al.[8] For this, muscle strength, gait speed, level of physical activity, exhaustion and unintentional weight loss were analyzed. Individuals who scored positively in three or more tests were classified as frail, in one or two as pre-frail and in none as robust.

The individuals who were evaluated in 2009 were subsequently traced by telephone from October 2014 to January 2015 using information from the database. A request for the longitudinal follow-up was approved by the Research Ethics Committee of the Universidade Federal de Juiz de Fora (Juiz de Fora Federal University), under approval number 715.314.

The elderly persons or those responsible for them, when located, were invited to respond to a telephone interview with questions regarding the occurrence of falls, hospitalizations and mortality since the first interview. When they did not answer after three attempts, or the number was found to be non-existent or not connected to the wanted party, relatives or those close to the elderly person (according to the FIBRA database) were called, or a new number was sought in the local phone book (2014-2015) or in a database of local health systems.

A free and informed consent form was read before the interview began (documented by recording the phone call).

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Excluded at this stage of the research were elderly persons who were not located, those who did not agree to respond to the interview by telephone or did not allow the recording of the phone call and, in cases where there was a need for help with answers (death or disability), relatives who did not agree to respond to the interview or did not allow the phone call to be recorded. Elderly persons or their relatives who did not reach the minimum score in the cognitive deficit screening tool, The Six Item Screener[9], were also excluded.

When not located, even after all the actions described, information on the possible death of the elderly was sought in the National Death Registry (CNF). For this the site www.falecidosnobrasil.org.br was accessed, with the full name of the elderly person being used in the search field.

For baseline descriptive analyzes, mean, median, percentage, and standard deviation (when appropriate) were used. Chi-squared and Fisher-dependent tests of subgroup size were used in the analysis of the categorical variables. For the continuous variables, the difference between groups was tested by the t-test or ANOVA Analysis of Variance, followed by Tukey Post Hoc. The same tests were used in the comparison between the group at baseline and the follow-up group to rule out any bias.

Survival analysis models were used exclusively in longitudinal analyzes to verify the impact of frailty and other variables of interest on the health outcomes. Estimates were made using crude or adjusted models for potential confounders (gender, age, comorbidities and functional capacity).

Poisson regression models were created to verify the rate of incidence of events for which it was impossible to obtain the exact time of occurrence (falls and hospitalization) and Cox regression was applied in the analysis of the mortality risk ratio. Cumulative incidence curves for mortality were plotted according to the Kaplan-Meier estimator.

A 95% confidence level was adopted for the presentation of the respective confidence intervals. The p-values were interpreted together with these intervals, following recommendations in literature[10-12].

RESULTS

Table 1 shows the data relating to the baseline descriptions of the sample and the divisions between frail, pre-frail and robust. Frail elderly persons had a significantly older mean age than the other categories of elderly persons, and there was a greater prevalence of women in this group. In addition, it was verified that not currently working and lower functional capacity were associated with frailty.

After an average period of 66.6 months (±1.88 months), approximately five and a half years, information was obtained on 304 elderly people, representing 72.4% of the participants in the first stage (186 interviews answered by the elderly, 102 interviews answered by relatives or those responsible, 19 elderly persons located by the site). The remaining elderly individuals were not included because they refused to participate (12 elderly), did not answer the telephone after the maximum number of attempts were made (25 elderly), the telephone number was found to be non-existent (70 elderly) or they were excluded from cognitive analysis (10 elderly).

Although 27.6% of the elderly did not participate in the second stage, it is important to note that there was no decharacterization of the sample (selection bias). The baseline and follow-up groups were similar in aspects traditionally referred to as confounders [age (p=0.275), gender (p=0.732), comorbidities (p=0.138), functional capacity (p=0.112), and frailty status (p=0.620)]. There were significant differences only in the item *living alone*, with a higher prevalence of this situation among those who were not found (p=0.02).

Regarding the outcomes analyzed, information was obtained from 237 elderly people regarding the occurrence of falls. Table 2 shows that frail individuals exhibited a greater incidence of falls than the robust population. In addition, pre-frail individuals had the highest occurrence of falls during the analyzed period.

In addition to the analysis of falls, history of and duration of hospitalizations for all causes were identified based on the responses from 237 respondents. The results are shown in table 2, which reveals the highest frequencies of hospitalization were among the frail group. Descriptively, the incidence

of hospitalization is almost twice as high as among robust individuals. In addition, there was a high prevalence of intercurrences in the pre-frail group.

Table 3 shows the data relating to regression analysis for the risk of falls and hospitalization. It can be seen that pre-frail individuals had a 55% greater risk of falls than robust individuals, while in analyzes adjusted by potential confounders this risk rose to 58%. Frail elderly persons, meanwhile, had a 69% (adjusted analysis) greater risk of falls, representing a warning regarding the potential dangers of this situation. In terms of hospitalization, the odds were 84% higher for frail individuals in comparison with robust elderly persons. Although p values were greater than the usual 5%, confidence intervals of 95% are much more inclined towards increased risk, resulting in a fourfold effect.

Table 1. Sociodemographic and clinical data of sample of elderly persons, stratified by frailty and total. Juiz de Fora, Minas Gerais. 2009.

Variables n (%)	Robust (n=143)	Pre-frail (n=241)	Frail (n=40)	Total (n=424)	p
Female	87 (60.8%)	174 (72.2%)	35 (87.5%)	295 (69.8%)	0.002
Age (years), mean (±standard deviation)	71.9 (±5.8)	75.1 (±6.8)	79.0 (±4.0)	74.46 (±6.8)	0.001*
Age (years)					
65 to 69	59 (41.2%)	59 (24.4%)	3 (7.5%)	121 (28.5%)	
70 to 79	66 (46.1%)	115 (47.7%)	22 (55%)	203 (47.8%)	0.001
80 or more	18 (12.5%)	67 (27.8%)	15 (37.5%)	100 (23.5%)	
Ethnicity					
White	97 (67.8%)	175 (72.6%)	32 (80.0%)	304 (71.7%)	
Black	16 (11.1%)	23 (9.5%)	2 (5%)	41 (9.7%)	0.719**
Mixed Race	30 (20.2%)	40 (16.6%)	6 (15.0%)	75 (17.7%)	
Ethnicity - Outros	0	3 (1.2%)	0	3 (0.7%)	
Currently working	27 (18.8%)	24 (9.9%)	1 (2.5%)	52 (12.3%)	0.005
Literacy	28 (19.6%)	49 (20.4%)	14 (35.0%)	91 (21.46%)	0.134
Functional Capacity (Instrumental Activities of Daily Living)	20.6 (± 0.8)	19.8 (2.0)	16.5 (3.9)	19.7 (±2.2)	0.001
Comorbidities	39 (27.2%)	71 (29.4%)	11 (27.5%)	121 (28.5%)	0.890

* Older frail individuals than Pre-frail and Robust; Pre-frail older than Robust; **Fisher Test.

Table 2. History and consequences of falls during follow-up period. Total values and stratified by frailty. Juiz de Fora, Minas Gerais. 2015.

Variables N (%)	Robust (n=90) (n=104)*	Pre-frail (n=131) (n=174)*	Frail (n=16) (n=26)*	Total (n=237) (n=304)*	p
Hospitalization	40 (38.8%)	70 (53.4%)	11 (68.7%)	115 (48.4%)	0.027
Number of hospitalizations	1.97 (2.3%)	1.98 (2.67%)	2.27 (2.83%)	2.00 (2.58%)	0.938
Total duration of hospitalizations (days), mean (±standard deviation)	13.42 (±21.3)	16.02 (±25.5)	27.72 (±26.1)	16.38 (±24.55)	0.224
Falls	30 (33.3%)	68 (51.9%)	7 (43.7%)	105 (44.30)	0.024
Need for medical services due to fall	15 (50.0%)	44 (64.7%)	5 (71.4%)	64 (60.95%)	0.327
Need for hospitalization due to fall	4 (13.3%)	13 (19.2%)	3 (42.86%)	20 (19.05%)	0.201
Duration of hospitalization due to fall, mean (± standard deviation)	9.60 (±12.5)	19.57 (±35.3)	24 (±21.5)	17.90 (±29.5)	0.770
Death*	14 (13.4%)	43 (24.7%)	10 (38.4%)	67 (22%)	0.010

* Data refers to analysis of mortality

Table 3. Rate ratio of incidence of falls and hospitalization and mortality risk ratio between the pre-frail and frail groups and the robust group over five and a half years of follow-up (Juiz de Fora, Minas Gerais. 2015).

Variables	Rate Ratio of Incidence							
	Pre-Frail				Frail			
	Crude (95% CI)	p	Adjusted (95% CI)	p	Crude (95% CI)	p	Adjusted (95% CI)	p
Falls*	1.55 (1.01 – 2.39)	0.043	1.58 (1.02 – 2.46)	0.038	1.31 (0.57 – 2.98)	0.517	1.69 (0.70 – 4.09)	0.238
Hospitalization*	1.37 (0.91 – 2.06)	0.125	1.43 (0.94 – 2.16)	0.091	1.76 (0.89 – 3.48)	0.099	1.84 (0.83 – 4.05)	0.127
Mortality**	1.89 (1.03 – 3.46)	0.038	1.49 (0.80 – 2.80)	0.206	2.52 (1.09 – 5.84)	0.030	1.32 (0.48 – 3.61)	0.589

*Poisson Regression; **Cox Regression; Adjusted: Model Adjusted by age, gender, comorbidities and functional capacity;

Finally, Table 2 also shows that the incidence of mortality among the 304 elderly persons for whom information was obtained was 22%, with a prevalence of mortality among frail individuals approximately three times greater than that found among the robust elderly. With respect to pre-frail cases, the incidence was close to twice that of robust individuals.

Complementing the findings, the cumulative mortality incidence curves according to the Kaplan-Meier model are shown in figure 1. The risk of incidence for the three categories of frailty can be determined, especially from the 20th month, where there is an increase in the rhythm of events that clearly differentiates the frail and pre-frail from the robust. Thus, we can conclude that the frail elderly die at an increasingly rapid rate in comparison with elderly persons in other categories. Cumulative incidence at the end of the follow-up differed by 15% between frail and robust individuals.
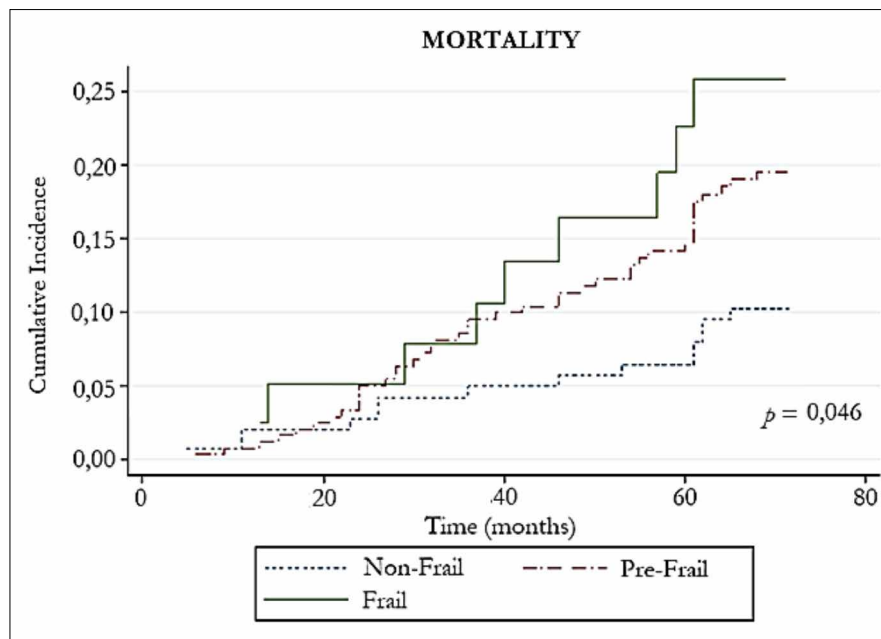
Figure 1. Cumulative incidence of mortality according to frailty status, Juiz de Fora, Minas Gerais, 2015.

In addition, in crude Cox regression analysis frail patients had a 2.5 times greater chance of dying during follow-up than robust individuals. Pre-frail patients, meanwhile, had an 89% greater risk of dying than robust individuals in the same period of time (Table 3).

DISCUSSION

It should be emphasized that the prevalence of frailty is similar to findings from other studies produced in Brazil, according to the multicenter data presented by Neri et al.[13]. An estimated national average shows values close to 9.0%, while the present study verified a prevalence of 9.4%. Compared with international studies, the figures found were lower than in Germany (12.1%), Denmark (12.4%), France (15.0%), Italy (23.0%) and Spain (27.3%)[14].

Neuromuscular changes, neuroendocrine dysregulation and immune system dysfunctions are common in the elderly and, individually or in combination, may result in frailty. As such, the current consensus is that frailty is one of the main syndromes related to aging, a fact corroborated by the results of the present study[15].

Also corroborating our results is a comprehensive systematic review conducted by Collard et al.[16] that revealed a significantly higher mean frailty among women than for men. This greater frequency was

justified mainly by lower muscle mass and strength and greater life expectancy, time burdened by chronic diseases and psychosocial problems, which could trigger the cycle of frailty[17].

The relationship between working practices and frailty is also demonstrated in literature. Studies have shown the protective effect of work on the syndrome, either through cooperation and interactivity or from daily demands that require maintenance of physical-functional qualities and certain levels of skill[18,19].

Finally, the relation between frailty and functional incapacity is explained, according to literature, by cognitive, proprioceptive, neurological and musculoskeletal disorders, as well as physical inactivity and medications[20].

The longitudinal analyzes of the present study found that the pre-frail have a higher incidence and risk of falls than robust or frail individuals. Tom et al.[3], based on a one-year follow-up of 48,154 European individuals over 55 years of age, found similar values in age-adjusted analyzes. Pre-frail individuals had a 57% greater risk of falling in up to one year than robust individuals. In a follow-up of approximately two years, pre-frail elderly in the Technology Research for Independent Living (TRIL) study also showed a risk for falls that was close to our findings, being 50% greater than robust individuals[21].

We believe that the reduction in the number of falls between pre-frail and frail individuals can be due to a lack of confidence and consequent restriction of physical, social or work activities and deteriorating health conditions, which exposes individual to a risk of falling, as reported by Fhon et al.[22].

Being frail was associated with higher incidences of hospitalization during the follow-up period. These results were found by other scientific evidence, especially as we verified a prevalence ranging from 50% to 80% of frailty among hospitalized elderly[23-25]. The greater number and length of hospitalizations found in our research is also evidenced in other studies. As revealed by Khandelwal et al.[26] in an analysis of hospitalized elderly patients, the average frequency of hospitalization among frail patients was three times higher than among robust individuals, and the mean time in hospital was nearly twice as

high. These results were similar to those of the present study.

However, unlike a significant number of studies on the subject, the risk of hospitalization found in the present study was not statistically significant for frail or pre-frail patients in comparison with robust individuals[27]. A plausible explanation for the differences between our findings on risk of hospitalization and those of other studies could be the fact that when the elderly person died, relatives were not questioned about previous hospitalizations (respecting ethical issues).

In terms of mortality, an increased risk of death was found among frail elderly persons. A recent systematic review by Chang and Lin[28], based on a sample of 35,538 elderly persons, found that the risk of mortality ratio of frail elderly persons was twice that of robust subjects over a mean follow-up period of six years (CI: $1.72 - 2.36$; $p=0.001$). The mortality risk found in our study was greater than eight of the 11 articles selected in our review. However, when the result of the adjusted analysis was considered the risk ratio loses its statistical significance due to the smaller sample in our study, although a similar degree of risk is maintained.

In spite of losing statistical power when adjusted, pre-frail elderly individuals had, in crude analysis, an 89% greater risk of dying than robust individuals. Chang and Lin[28] also found that pre-frail individuals had a 33% greater chance of dying than robust ones. It is therefore suggested that the elderly tend to aggravate their frailty at the beginning of the cycle.

It is also important to emphasize that frail and pre-frail elderly people die more quickly than robust individuals. A similar effect was observed by other authors, explained by the imbalance in homeostasis and increased individual vulnerability (mainly acute stresses) characteristic of the syndrome[18,29].

Despite the relevance of the study, it is necessary to highlight its limitations. In addition to the well-known biases for follow-ups of this type, the increase in telephone fraud in Brazil, especially among the elderly, may have meant respondents felt unsafe, so influencing their responses in some way and adding to the number of denials.

In closing, we emphasize that the present study represents an addition to a restricted group of longitudinal analyzes relating to frailty and negative outcomes in health, being to the best of our knowledge the first with such characteristics to be performed among the Brazilian elderly. From these results, it is recommended that strategies are implemented to prevent or reverse frailty. To this end, the elderly should be provided with opportunities for adequate health monitoring. It is also suggested that frailty is debated and considered in more detail within health teams. Complementary courses and materials should be used to continuously improve the knowledge of professionals, not only on frailty, but also other syndromes or common geriatric complications.

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Spatial temporal analysis of mortality by suicide among the elderly in Brazil

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Abstract

Objective: to perform spatiotemporal analysis of suicide mortality in the elderly in Brazil. *Methods:* a mixed ecological study was carried out in which deaths from suicide among the elderly were analyzed using data from the Mortality Information System (MIS) and socio-demographic variables, from 2000 to 2014, with a trend analysis of this period. Univariate and bivariate spatial analysis was performed using the Moran Global and Moran Map index to evaluate the intensity and significance of spatial clusters. *Results:* there were 19,806 deaths due to suicide among the elderly in Brazil between 2000 and 2014. The ratio of male and female mortality rates was 4:1, with increasing trends for both genders ($R^2>0.8$), but with greater intensity among men ($p=0.0293$). There was a moderate autocorrelation for men ($I>0.40$), with clusters forming for both genders in the south of Brazil. Bivariate analysis showed the formation of clusters in the southern region with the Human Development Index and aging variables and in the north and northeast regions based on dependence and illiteracy ratio. *Conclusions:* mortality due to suicide among the elderly has a tendency to increase and is unequally distributed in Brazil.

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INTRODUCTION

Population aging is a growing concern in developing countries due to the rapid demographic changes that have occurred in recent years. In Brazil, the growth of the elderly population, both in absolute and proportional terms, is increasingly significant. The effects of this increase are already a reality and can be perceived in social needs and in the areas of health and social security[1].

According to data from the Instituto Brasileiro de Geografia e Estatística (the Brazilian Institute of Geography and Statistics) (IBGE)[2], the Brazilian elderly population was 14,235,731 in the year 2000, with the projection for the year 2030 some 41,541,763 individuals. The proportion of individuals aged 60 years or older presents an upward trend in Brazil, due to higher life expectancy and better access to goods and services that assist in the aging process[3].

Highly devitalizing situations are also observed during the aging process, with the frequent underlying impairment of mental health, leading to depression, which can often determine the occurrence of suicidal thoughts and/or the execution of suicide itself[4]. It is believed that two-thirds of suicides in the elderly population are related to depression[5]. The large number of suicides in the elderly population is notable among the causes of deaths in this population group, and is considered a global public health problem[6].

Risk factors for geriatric suicide can be medical – such as chronic and disabling diseases, recurrent hospitalization and frequent surgeries, psychiatric and/or psychological factors; and family-related factors, such as the loss of family ties, intrafamily violence and the impact of changes and losses[7,8].

There is no single explanation for suicide, with the interaction of various factors such as social, psychological and cultural elements, as well as suicide attempts, constituting an important risk factor[6]. The manifestation of suicidal behavior in the elderly is different from in other age groups. Its signs are more difficult to detect, and more lethal methods, non-impulsive acts and passive suicide, such as abstaining from eating, are involved[7].

Suicide rates for both genders present large regional and socioeconomic disparities in all regions of the world. A study with elderly people in Portugal showed that those with inferior socioeconomic conditions and greater dependence had greater suicidal ideation[9]. In the USA, a sample of urban and non-urban areas between 1999 and 2015 found that rates increased since 2000, and were higher in non-urban areas throughout the period[10]. In Brazil, suicide rates are low compared to most countries, ranging from 3.50 to 5.80/100,000 inhabitants. However, the rates for elderly people, understood as individuals aged 60 years or over, are twice those of the general population, and there are differences between the states of the country over time[11,12].

Some social and political initiatives that ensure the right to health of the elderly have been implemented, including the Statute of the Elderly (2003)[13] and the National Policy on the Health of the Elderly (2006)[14]. More specific actions have focused on suicide prevention, such as the National Policy for the Reduction of Morbidity and Mortality by Accidents and Violence (2000)[15], the National Strategy for Suicide Prevention (2006)[16], and initiatives of the Ministry of Health, which aim to reduce the rates of death by suicide and harm caused to those directly and indirectly involved in this act.

To understand this phenomenon, it is important to consider ecological studies that analyze contextual factors related to suicide mortality. In addition, the monitoring of mortality trends over the years and knowledge of the geographical distribution of suicide are of great importance for the planning and evaluation of prevention policies, with the possibility of identifying areas of greater vulnerability and the development of more effective strategies for populations at risk. It is worth highlighting studies that analyze the different forms of spatial organization of society in the Brazilian urban network, among them the Urban Articulation Regions, areas defined by the IBGE, which conceptually include the reduction of social inequalities, preserving the cultural, environmental and economic diversity that exists within the country[17].

In view of the magnitude and complexity of suicide in the elderly population, the objective of this study was to perform a spatial-temporal analysis of suicide mortality in the elderly in the Immediate Urban Articulation Regions (IUAR) of Brazil.

METHOD

A mixed ecological study was performed which analyzed the mortality by suicide of individuals aged 60 years or older between January 1, 2000 and December 31, 2014, according to the 482 Immediate Urban Articulation regions (IUAR) in Brazil.

Deaths from self-inflicted injuries, according to the individual's age group and gender, were categorized according to the International Statistical Classification of Diseases and Related Health Problems - 10[th] Revision (X60-84). Data on deaths were collected from the Mortality Information System (MIS) of the Department of Informatics of the National Health System (Datasus).

The crude mortality rates were calculated by year and by gender, adjusted by the direct method according to the world population and expressed per 100,000 inhabitants per year[18]. Population data by IUAR, by gender and by age group were obtained from the Demographic Censuses and Inter-Census Projections information on the IBGE website. To analyze mortality trends by gender, the standardized mortality rates for 2000 to 2014 were analyzed by the linear regression method, evaluated by the coefficient of determination (R^2). The level of significance was 95%.

To analyze the Moran Local and Global spatial statistics, the Mean Suicide Standardized Mortality Ratio (SMR) was calculated by quinquennium and by gender. Spatial dependence analysis was performed using the Moran Global index, estimating the spatial autocorrelation, which can vary between -1 and +1, in addition to providing the statistical significance (p-value). After the general analysis, the presence of clusters was evaluated through Moran Local (Local Indicators of Spatial Association – LISA). Therefore, the MoranMap for suicide mortality rates was constructed, including only those clusters with a value of $p<0.05$. For validation of the Moran Global Index, the random permutation test with 99 permutations was used[19]. For the production of thematic maps in quintiles and the calculation of the Local and Global Moran Index, the Terraview 4.2.2 (INPE, 2011, Tecgraf PUC-Rio/FUNCAT, Brazil) software was used.

Based on the SMR for the five-year period from 2010 to 2014, bivariate spatial statistical analysis was applied and was considered the dependent variable. The independent variables, represented by the socioeconomic indicators of Brazilian municipal regions, were: (a) Municipal Human Development Index (M-HDI); (b) Dependency ratio; (c) Aging rate; (d) Illiteracy rate of people aged 25 years and over; (e) Gini index; (f) Unemployment rate of people aged 18 years and over. Socioeconomic indicators for the year 2010 were collected from the Atlas of Human Development of Brazil of the United Nations Development Program (UNDP).

Bivariate LISA analysis was performed with GeoDa 1.6.61 software (Spatial Analysis Laboratory, University of Illinois, Urbana Champaign, USA) to evaluate the spatial correlation between the outcome variable (suicide standardized mortality rates) and the independent variables. To do this, thematic maps were constructed with each pair of variables and the spatial dependence pattern and its statistical significance.

This research used secondary data available on official websites of the Department of Health of Brazil without the identification of subjects, and as such was exempt from evaluation by an ethics research committee, in accordance with Resolution 466/2012 of the National Health Council.

RESULTS

From 2000 to 2014, there were 19,806 suicide deaths in Brazil. Of these, 40.37% (n=7,998) occurred in the period from 2010 to 2014. The average mortality rate for suicide in the elderly registered in Brazil for the years 2010 to 2014 was 1,149 deaths per 100,000 inhabitants. The highest average rates observed in the period studied were 1,740/100,000 inhabitants for men and 0.452/100,000 inhabitants for women, which occurred between 2010 and 2014 (Table 1).

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Table 1. Descriptive analysis of socioeconomic indicators and Suicide Standardized Mortality Ratio (100,000 inhab.), according to gender. Immediate Urban Articulation Regions of Brazil, 2000-2014.

Variables	Minimum	Maximum	Mean	Median	Standard Deviation	Percentile 25	Percentile 75
SMR 2000-2004 women	0.000	5.720	0.310	0.060	0.628	0.000	0.360
SMR 2005-2009 women	0.000	4.780	0.326	0.090	0.566	0.000	0.440
SMR 2010-2014 women	0.000	4.760	0.452	0.170	0.731	0.000	0.530
SMR 2000-2004 men	0.000	13.79	1.211	0.780	1.402	0.310	1.610
SMR 2005-2009 men	0.000	8.400	1.490	1.140	1.417	0.530	1.940
SMR 2010-2014 men	0.000	9.360	1.740	1.260	1.489	0.690	2.340
SMR both genders 2010-2014	0.000	5.35	1.149	0.850	0.962	0.457	1.594
Gini	0.361	0.670	0.497	0.495	0.052	0.463	0.532
Unemployment (%)	0.824	18.355	6.100	5.767	2.961	4.153	7.729
HDI	0.477	0.774	0.660	0.675	0.065	0.601	0.712
Dependence (%)	36.761	86.628	51.466	48.645	8.297	45.190	56.555
Aging	2.320	15.356	8.244	8.309	2.204	6.831	9.762
Illiterate (%)	2.731	49.904	19.931	15.340	12.022	10.044	31.029

Source: Mortality Information System (MIS); Atlas Brasil, 2013. SMR: Standardized Mortality Rate. HDI: Human Development Ratio

The ratio of male to female mortality rates was 4:1. The growth of the standardized mortality rate throughout the historical sequence analyzed for both sexes was observed with a statistically significant trend. The slope of the line, equivalent to the Effect Index, is ascending. On average, the coefficient was 0.0293 in SMR per 100,000 inhabitants with a variation of 88% in men, and 0.0096 in SMR per 100,000 inhabitants and a variation of 80% in women (Figure 1).
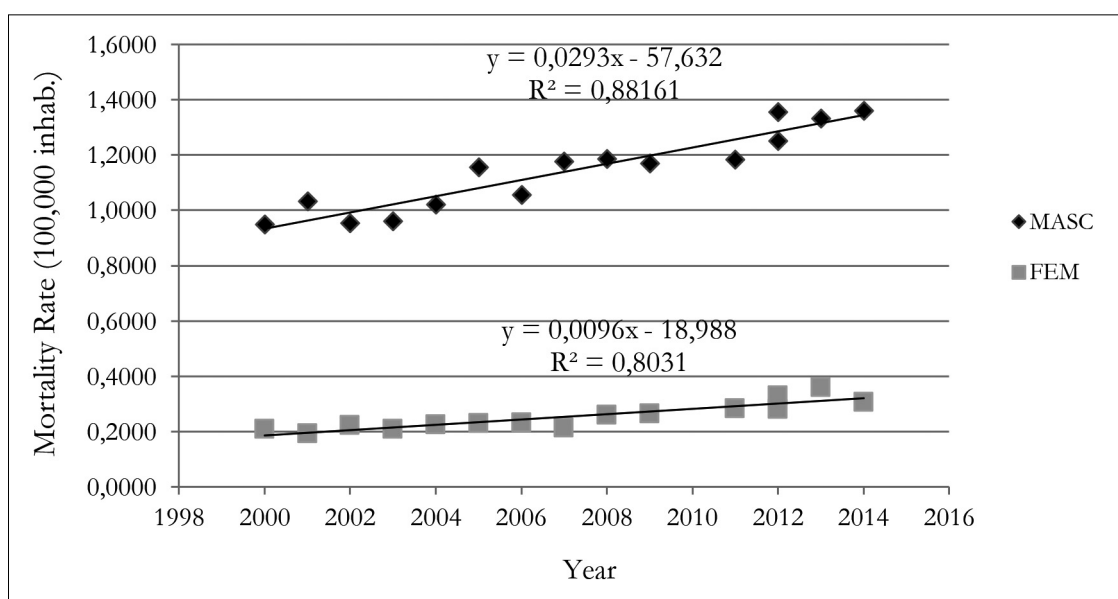
Source: Mortality Information System (MIS).

Figure 1. Analysis of temporal trend of mortality due to suicide in the elderly, according to gender. Brazil, 2000 to 2014.

No spatial autocorrelation was observed for SMR due to suicide in elderly women in Brazil. The Moran Global value obtained exhibited a weak spatial autocorrelation, although this value was statistically significant. For the male population, however, a spatial autocorrelation of suicide mortality was observed in the three quinquennia analyzed, highlighting the increase in mortality rates due to suicide in men in the northeast region over the five-year period (Figure 2).
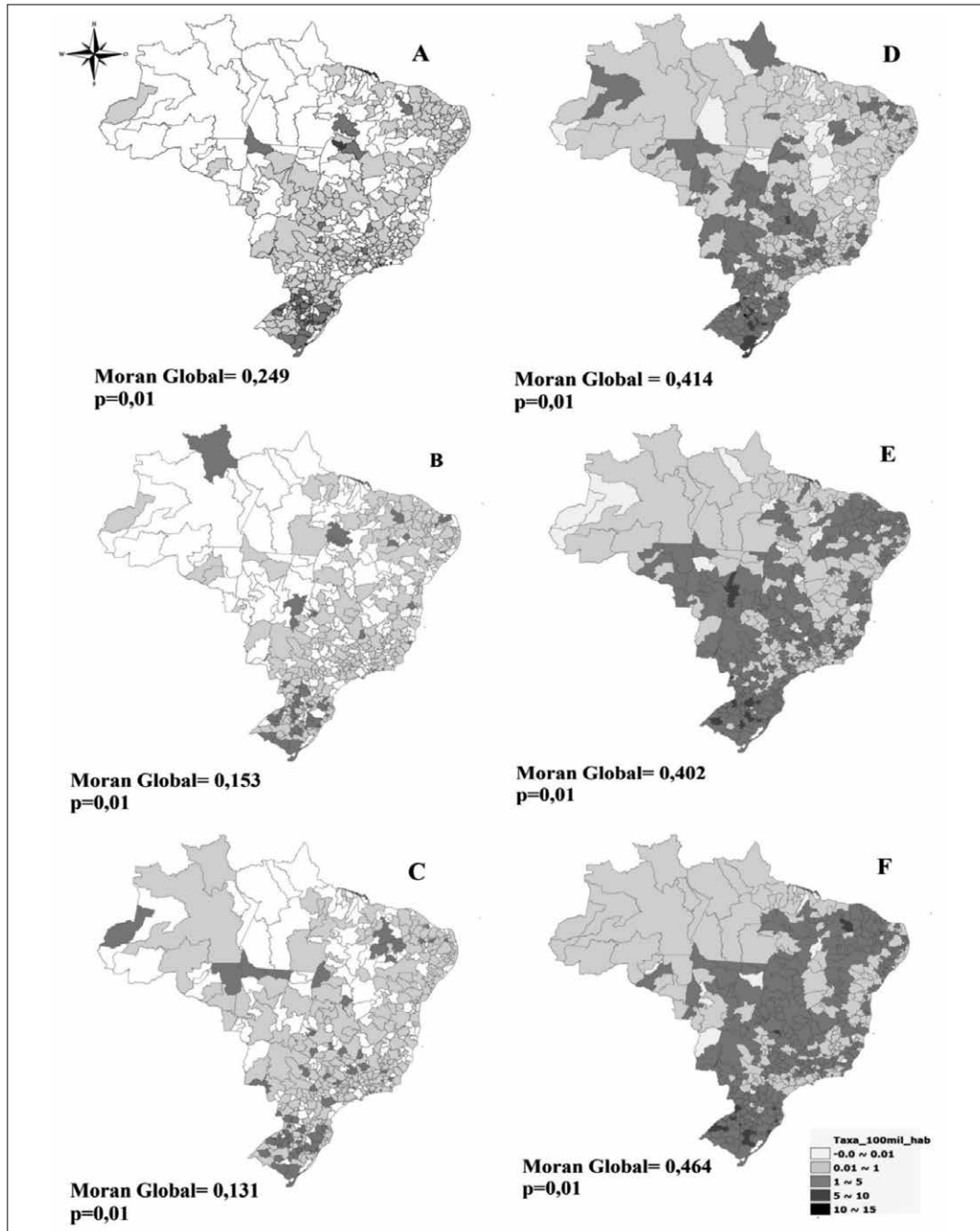
Figure 2. Spatial distribution of Standardized Mortality Rate (SMR) by suicide according to gender in Brazil and respective Moran Global values. 2A: SMR for women in the period 2000-2004; 2B: SMR for women in the 2005-2009 period; 2C: SMR for women in the period 2010-2014; 2D: SMR for men in the period 2000-2004; 2E: SMR for men in the 2005-2009 period; 2F: SMR for men in the period 2010-2014.

Source: Mortality Information System (MIS).

MoranMap analysis revealed the presence of clusters with high mortality rates in the south of the country, especially among men. In the north, meanwhile, there are clusters of low mortality rates (Figure 3).

Bivariate spatial analysis with Bivariate Moran Local Index (LISA) revealed a poor spatial autocorrelation between the studied socioeconomic variables and SMR due to suicide in the elderly (Figure 4). However, the formation of clusters of high SMR in the south of Brazil was observed, with high HDI values and aging rate. For the dependency and illiteracy variables clusters with high SMR levels were found in northeast Brazil (Figure 4).
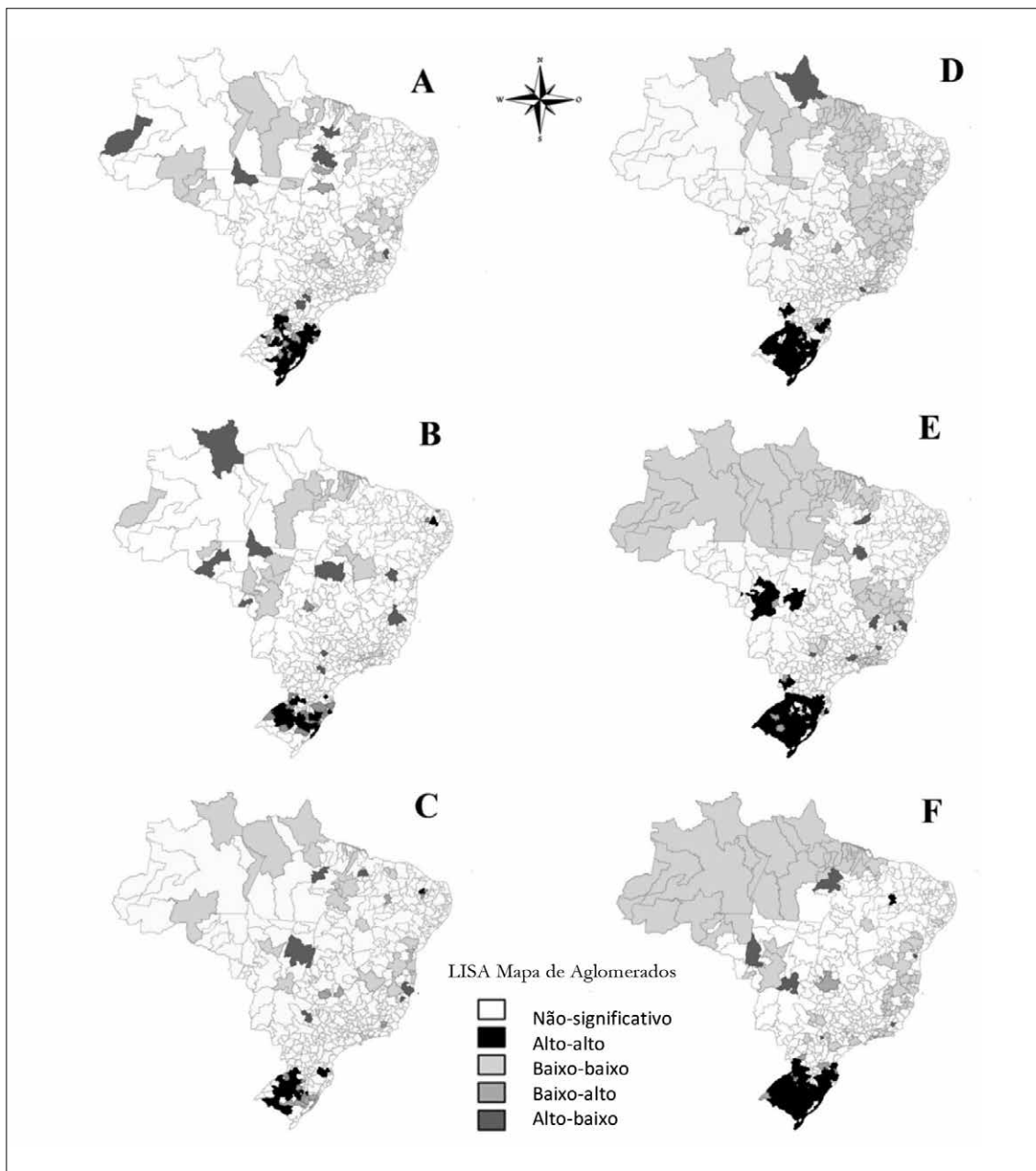
Figure 3. MoranMap of Standardized Mortality Rate (SMR) by suicide in Brazil according to gender and quinquennia. 3A: MoranMap of SMR for women in period 2000-2004; 3B: MoranMap of SMR for women in period 2005-2009; 3C: MoranMap of SMR for women in period 2010-2014; 3D: MoranMap of SMR for men in period 2000-2004; 3E: MoranMap of SMR for men in period 2005-2009; 3F: MoranMap of SMR for men in period 2010-2014.

Source: Mortality Information System (MIS).
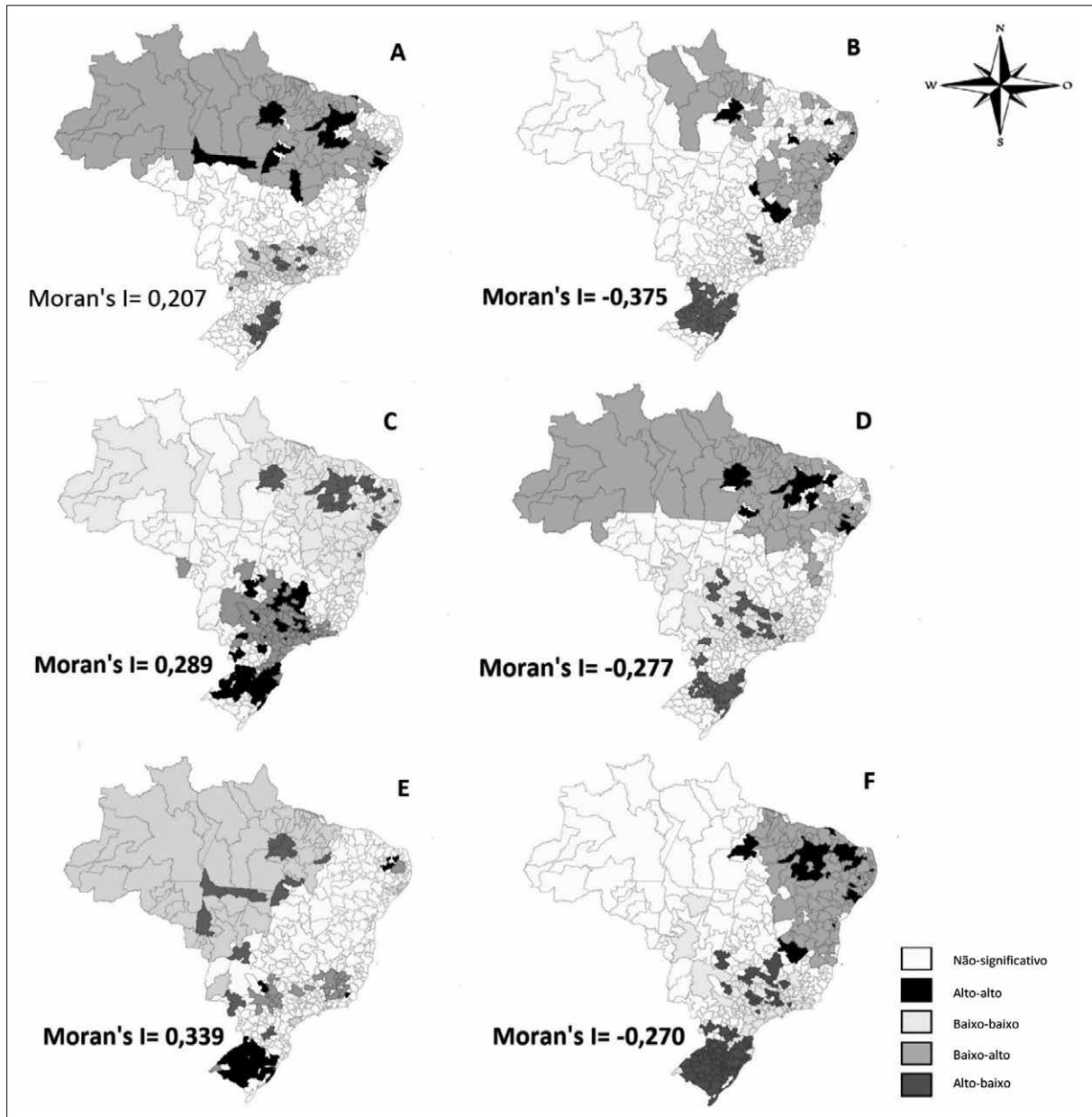
Figure 4. Moran bivariate LISA (Moran's I) between Standardized Suicide Mortality Rates in the period 2010-2014 for both genders and the socioeconomic variables of the Immediate Urban Articulation Regions. 4A: GINI; 4B: Unemployment rate; 4C: HDI; 4D: Dependency Ratio; 4E: Aging; 4F: Illiteracy.

Source: Mortality Information System (MIS); Atlas Brasil, 2013.

DISCUSSION

In the present study, the mortality rate due to suicide in the elderly presented a statistically significant increasing trend for both genders in the study period, with higher rates for men and marked geographical inequality in distribution.

This trend of suicide rates in the elderly population, especially among men, has already been reported in Brazil in a study by Minayo et al.[20], which evaluated the trend of suicide in the elderly population in Brazil and Rio de Janeiro in the period 1980-2006, and also found an increase in the rates of suicide among the elderly, with a rise from 595.3 deaths/year in 1980 to 7.994

deaths/year in 2006, with the same ratio of 4 male deaths to 1 female death by suicide in 2006. A study on suicide mortality in the elderly in Brazilian municipal regions in the period 1996-2007[12] showed that more than half of the municipal regions had deaths by this cause, with rates rising in the last triennium analyzed (2005-2007), with a mortality male/female ratio of 2.8, increasing to 4:1 in 25% of cases.

While suicide mortality rates among the elderly in Brazil are still considered low on a global scale, the growth trend is worrying. The WHO considers the increase in the deaths of the elderly in relation to 50 years ago when there was little variation due to age to be notable[20,21].

There are consistent data in literature that indicate higher rates of suicide in all age groups for men[21-24]. In old age, when professional life ends, many men associate the new phase of their lives with the loss of their traditional role of economic provider and head of family, and withdraw socially, leading to a high risk of isolation, sadness, stress and the desire to end their life. Situations of social isolation and loneliness mainly affect men, becoming, in their case, a risk factor for suicide[23].

When the spatial distribution of standardized rates of death by suicide in the elderly were analyzed, no spatial patterns were observed in distribution among women. Among men, however, the formation of two well defined clusters was noted: a region of high rates in the south of Brazil and another region of low rates in the north of the country. Despite not forming statistically significant clusters, the increase in mortality rates by suicide among the elderly over time in the northeast region was noted. Similar results were found in a study that evaluated the spatial distribution of suicide in Brazil in the general population, with clusters of high mortality rates in the south of the country, with no significant spatial autocorrelation values and no association with the socioeconomic factors analyzed[25]. Similar results were also found in a study of the spatial distribution of suicide mortality in the northeast of Brazil, which was found to be random, without the formation of clusters when associated with the socioeconomic factors analyzed[26].

Suicide rates show great variation between different countries and within the countries themselves, which is a reflection of the complexity of this phenomenon. In this context, in a country like Brazil with more than 200 million inhabitants and regions with different socioeconomic and cultural characteristics, the heterogeneous distribution of suicide mortality rates is expected[27]. Historically, the states of the south of the country, specifically Rio Grande do Sul, have the highest suicide rates, with an average of 10.2/100,000 inhabitants in 1980-1999[28]. Pinto et al.[12] evaluating suicide among the elderly in Brazilian municipal regions, also pointed out that the regions with the highest rates are concentrated in the south of the country, especially in Rio Grande do Sul. Ethnic origin (descendants of Europeans), culture, social crises and even the climatic aspects of the region have been suggested as possible causes[28].

Suicide is a complex phenomenon, and therefore can be investigated through an individual approach, where psychological, psychiatric variables and incapacitating clinical conditions are analyzed, along with the social context in which the phenomenon occurs, through sociodemographic variables[24]. Since the mid-nineteenth century, researchers have attempted to understand the temporal and geographic variations of suicide. One of the most important studies in this area was that carried out in France by Durkheim at the end of the nineteenth century. Using mortality statistics, this researcher analyzed suicide as a collective phenomenon, based on its social causes. According to his theory, social integration and regulation protect individuals from suicide. He postulates that there are therefore higher rates of suicide in urban regions among more educated people and individuals without companions[29,30].

In the present study, bivariate spatial analysis between the standardized suicide mortality rates of elderly persons and sociodemographic variables was performed in order to better understand the geographic distribution of suicide rates among the elderly in Brazil and the possible influence of social context on this event. The influence of social and economic factors was observed when comparing the southern region of the country, traditionally an area with higher rates of suicide and which is more economically developed, with the north and northeast regions, which have low suicide rates and unfavorable socioeconomic indicators.

There was a weak and direct spatial autocorrelation between suicide mortality rates in the elderly and the

Gini, HDI and Aging indexes, with clusters of high suicide SMR with high HDI and aging in the south of the country, showing that the problem persists even under more favorable socioeconomic conditions. For the unemployment rate, dependency ratio and illiteracy variables, the spatial correlation was weak and negative, with the formation of clusters of the low-high type in the north and northeast regions, revealing that suicide rates remained low in an area of unfavorable social and economic indicators. Factors such as social inequality, low income and unemployment, as well as schooling, influence the occurrence of suicide. One possible explanation is that socioeconomic status promotes different patterns of life with different levels of exposure to environmental risk factors and access to resources, including behavioral and psychosocial factors such as perceived violence, feelings of deprivation and stress. In this way, economic factors influence the health of the individual, including their mental health[31].

Most of the studies that investigate this issue have been carried out in Europe and other equally wealthy countries, such as the USA and Japan, and there is little knowledge of the influence of these factors on suicide rates in South America, especially in Brazil, a country that is known to have an unequal society.

This study has limitations, such as the impossibility of transposing the results obtained at the ecological level to the individual level, a limit of the type of study employed; the quality of records in suicide mortality information systems, where it is recognized that this event is still underreported, and the fact that there may be regional differences in the quality of these records. In order to overcome fluctuations in suicide rates that could lead to erroneous conclusions, in this study it was decided to use IUAR to evaluate the distribution of this phenomenon in Brazil.

CONCLUSIONS

The present study, which used an ecological approach with spatial analysis methods, found that suicide in the Brazilian elderly population has been increasing in recent years, especially in males, and that this event is unevenly distributed, reflecting socioeconomic differences between regions with high and low suicide rates. Although suicide is a complex and multifactorial phenomenon, the ecological approach combined with spatial distribution analysis makes it possible to identify how it manifests itself in different population groups, showing how the social environment can affect the health of the population, and is particularly useful to identify areas of risk and thus the most appropriate planning of interventions. More detailed studies are needed, especially in regions of greater risk, so that a more complete analysis of the factors that can influence the increase of death by suicide of the elderly in Brazil can be carried out, allowing the planning of interventions that reduce the impact of these deaths, which are considered to be preventable and unnecessary.

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Halitosis and associated factors in institutionalized elderly persons

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Abstract

Objective: to evaluate the prevalence of halitosis and associated factors in institutionalized elderly persons. *Methods:* a sectional study was performed with 268 elderly persons from 11 long-term care institutions in Natal in the northeast of Brazil. Data collection included an oral epidemiologic examination and questions about self-perception of oral health, as well as a consultation of medical records and the application of a questionnaire to the directors of the institutions. Halitosis was measured using the organoleptic test. The independent variables were oral, sociodemographic, institutional, general health and functional conditions. Bivariate analysis was performed using the Pearson chi-square test and Fisher's exact test, and the magnitude of effect was verified by the prevalence ratio for the independent variables in relation to the outcome, with a 95% confidence level. *Results:* the prevalence of halitosis was 26.1%, which was exhaled by the mouth in 98.57% of cases and by the nose in 10% of cases. Prevalence was 43% higher among non-white individuals ($p=0.006$); 65% higher among those living in non-profit institutions ($p=0.039$); 52% higher in elderly persons with oriented cognitive status ($p=0.047$); 41% higher in elderly persons with root caries ($p=0.029$); 62% higher in those who did not use dentures ($p=0.046$); 57% lower in edentulous persons ($p<0.001$); and 73% higher in elderly individuals with tongue biofilm ($p=0.001$). *Conclusion:* The occurrence of halitosis in institutionalized elderly persons was similar to other studies, but there was an expressive number of extrabuccal cases and an association with oral health problems, as well as sociodemographic, institutional and functional factors.

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INTRODUCTION

While the global phenomenon of population aging has occurred gradually in developed countries, in developing countries such as Brazil it has occurred in an accelerated manner and in an unfavorable socioeconomic context, resulting in a significant impact on social requirements[1].

In terms of health the process has resulted in a greater burden of diseases and disability among the population and an increase in the use of health services[2], notably in terms of an increase in demand for places in Long Term Care Facilities (LTCFs) as a form of social care for the elderly[3].

Elderly persons living in LTCFs are potentially frail, with a greater risk of multi-morbidities, polypharmacy, immobility and impairments in cognitive ability and functionality[4].

In terms of oral health, institutionalized elderly persons have more unfavorable oral conditions than those living in the community[5,6], with a high prevalence of edentulism or periodontal disease and an elevated need for dental extraction and use of dental prostheses identified in several studies in different countries, such as Brazil[7,8], Spain[9], Romania[10], India[11] and Malta[12].

It is important to remember that oral problems cause not only pain and discomfort but also have broad repercussions for health. They can predispose individuals to the development of infectious diseases such as endocarditis[13] and pneumonia[10], lead to dietary restrictions, weight loss and malnutrition[14] and also generate impairment in self-esteem and interpersonal relationships, resulting in social isolation and depressive disorders[15].

Halitosis is defined as a change in the quality of the odor of air exhaled during breathing through the mouth or nostrils, and can range from physiological and adaptive processes to pathological changes. Although it can be caused by extraoral factors such as otorhinolaryngological, gastric, pulmonary and systemic problems, most cases (around 90% to 95%) originate from the mouth, and are especially related to the accumulation of tongue biofilm and to periodontal disorders[16, 17].

In addition to an unpleasant odor which results in negative impacts on quality of life[15,17], halitosis can be a sign of several important systemic diseases such as diabetes, renal and hepatic insufficiency which can directly provoke the problem or function as cofactors[16,17].

Even oral halitosis, inadvertently considered harmless, can function as a morbidity and mortality factor in institutionalized elderly persons, as their mouths are frequently colonized by a more pathogenic microbiota than that of non-institutionalized dependent elderly persons, the independent elderly, and young adults[18]. Inadequate saliva and oral hygiene predispose the individual to the accumulation of tongue biofilm, which functions as a potential reservoir for respiratory pathogens. These, when aspirated, reach the lower airways and can result in pneumonia[19], which represents an even more troubling burden in institutionalized elderly persons due to the higher rates of hospitalization and associated mortality[20].

In addition, as the mouth is the primary source of halitosis and the oral health of the institutionalized elderly is generally precarious, assessing the breath quality of these individuals has a broader and more inclusive purpose than has been considered by most oral health studies of this group, which focus on the oral health of predominantly edentulous people through the evaluation of the few teeth present, their periodontal condition and the rare use of dentures.

Perhaps because halitosis is understood as a purely cosmetic issue or as a problem that only interferes with social relations which rarely affect the institutionalized elderly, literature on the prevalence of halitosis among this group is scarce. Only one publication[21] of 124 elderly persons from three LTCFs in Sweden was found, which detected halitosis in 50% of the subjects examined.

With the aim of contributing to the understanding of this theme, the objective of the present study was to evaluate the prevalence of halitosis and associated factors in institutionalized elderly persons.

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METHODS

The structure of this study was based on the STROBE22 protocol for observational studies. A population-based cross-sectional study of elderly persons living in the city of Natal, Brazil in 2017 was carried out. At the time, there were 13 institutions registered with the Municipal Sanitary Department, with a population of around 330 elderly persons. Of these institutions, two refused to participate, meaning that 11 took part in the study, of which five were for profit and six were non-profit, resulting in 302 elderly persons eligible to comprise the sample.

The inclusion criteria were: elderly (age 60 and over), reside in a listed LTCF and be in a cognitive condition to collaborate with the necessary procedures for the measurement of breath. The elderly persons were hospitalized or in the process of palliative care. The sample therefore comprised all those who met the eligibility criteria, agreed to participate in the survey and who were present in the institutions on the day of data collection, generating a final sample of 268 elderly people.

Data collection included an oral epidemiological examination of the sample group, based on the SB Brasil 2010[23] model, as well as questions about the oral self-perception of the elderly with oriented cognitive status on the day of the evaluations. In addition, the medical records of the elderly persons were consulted and interviews with institution directors were carried out using a form developed specifically for the study.

For the oral epidemiological examination, complete personal protective equipment, a high-power head torch with zoom function (Albatroz®/ALA-09/made in China), disposable wooden spatulas, gauze, mouth mirrors and previously sterilized WHO millimeter probes were used, along with a clinical data form prepared for the study.

In order to standardizing the understanding, interpretation and application of the evaluated criteria, the examiners were previously trained and calibrated. In this process, the data collection instrument was initially presented and discussed to clarify the details of the variables, codes and criteria of the indices used in the evaluation. Secondly,

calibration was carried out by the "in lux" method[23], by means of the projection and discussion of images of the main oral diseases that affected a population of institutionalized elderly persons evaluated in a survey in the same municipal region in 2013. Good reproducibility between the examiners was observed with values of the coefficients used equal to and over 0.60 considered acceptable.

The data were obtained by three pairs of examiners under the direct supervision of the coordinator. When there was discrepancy in the oral evaluation, the diagnosis was concluded by consensus between the pair of examiners and the coordinator. The evaluation of breath was performed by the coordinator, a dentist with more than ten years of specific experience in the diagnosis and treatment of breath disorders.

The dependent variable of the study was the presence/absence of halitosis, as measured by the organoleptic breath test[24], where the examiner uses the perception of their sense of smell and qualifies the odor of air eliminated by the patient's mouth and nostrils (respectively) based on a scale of six points, determined by the degree and distance of perception of the odor, with a score of 0 for no odor and 1 for natural odor, indicating the absence of halitosis, and scores of 2 and above representing halitosis (2:mild, 3:moderate, 4:strong and 5:severe). When only oral breath is altered and nasal breath is natural, the halitosis is said to be of oral origin, while if the nasal air odor is altered, halitosis is classified as extraoral (either isolated or combined with oral halitosis). Such differentiation is of paramount importance, since it guides the diagnosis and, with it, the treatment of the problem.

The main independent variable was tongue biofilm, recorded as present or absent[25], and evaluated by thirds of the dorsal lingual surface[26] (biofilm present only in the posterior third, present in the posterior or middle thirds and visible throughout the dorsal lingual surface).

The independent variables of oral health included the number of decayed and decayed teeth (DMF-T), gingival bleeding, dental calculus, periodontal pocket, root caries, use of dentures and an evaluation of saliva through the signs and symptoms of hyposalivation of the Hyposalivation Detection Questionnaire[27],

with nine questions and scores varying from 0 to 9. This is a useful instrument for screening of the need for more thorough saliva examinations. In addition, self-perception of oral health was evaluated by the following questions: *When was your last visit to the dentist?; Do you have a problem with your breath?; Do you have a problem with your saliva?*

Independent variables related to the LTCFs (both for profit and non-profit) were also evaluated; as were those regarding the sociodemographic characteristics of the elderly persons (age, length of institutionalization, gender, ethnicity/skin color and health plan); their general health (number of morbidities, occurrence of multimorbidities - two or more morbidities diagnosed, diabetes, number of daily medications, occurrence of polypharmacy - use of five or more drugs); of functionality, including cognitive state evaluated by the Pfeiffer index[28] and categorized (oriented/non-oriented), mobility status and degree of dependence for the performance of activities of daily living (ADL), as measured by the Barthel Index[29], both with scores of 0 to 100 and categorized (independent/dependent).

Descriptive analysis was performed, followed by bivariate analysis using Pearson's chi-square test and Fisher's exact test, with magnitude of effect verified by the prevalence ratio for each of the independent variables in relation to the outcome at a confidence level of 95%.

The present study was approved by the Ethics Research Committee of the Universidade Federal do Rio Grande do Norte (CAAE 73343717.3.0000.5292, approval n° 2.315.009). The elderly participants, their caregivers and curators and the directors of the institutions were informed about the study and those who agreed to participate signed a Free and Informed Consent Form.

RESULTS

The mean age of the elderly persons was 82.18 years (±8.610), with a mean residence time in the LTCFs of 6.34 years (± 4.914). Most were female, of white ethnicity/skin color, did not have health insurance and were residents of non-profit LTCFs (Table 1).

Some degree of cognitive impairment occurred in 92.4% of the elderly, with a predominance of severe cognitive decline, third-party dependence for some ADLs in 76.7% of those examined, and some restriction in mobility in 74.6% of the elderly (table 1).

In relation to morbidities, an average of 2.87 (±1.119) diseases per elderly person was observed, of which 29.4% were diabetes, while 88.1% of the sample had multimorbidities. Regarding the continuous use of medication, the elderly consumed, on average, 5.62 (±2.281) drugs/day and 76.5% of the sample exhibited polypharmacy, as described in table 1.

In terms of oral conditions, the mean DMF-T index was high and root caries affected almost half of the dentate elderly. Despite the high occurrence of edentulism, most of the elderly did not use any type of dentures to rehabilitate lost teeth (table 2).

The mean number of valid sextants for periodontal evaluation using the community periodontal index was low and the occurrence of excluded sextants was high, so that periodontal evaluation was performed in only a portion of the sample. In these cases, gingival bleeding and dental calculus were found, and there was a prevalence balanced between absent and present periodontal pockets and normal and missing periodontal attachment (Table 2).

There were few cases of signs and symptoms of xerostomia/hyposalivation and positive responses to the question *Do you have a problem with your saliva?* (table 2).

Regarding oral hygiene condition (table 2), tongue biofilm occurred in most of the elderly persons, covering more than half the surface of the tongue and being mostly thick, with taste buds totally covered by biofilm.

There was a prevalence of general halitosis (perceived as oral, nasal or both simultaneously) of 26.1% in the sample. Of the elderly persons with halitosis, almost all had bad odor exhaled through the mouth (98.57% had oral halitosis alone or concomitant with extraoral) and 10% through the nostrils (cases of extraoral origin), one of which was nasal odor only (otolaryngologic origin), while six

others had a simultaneously oral and nasal odor, which indicates oral halitosis concomitant with a gastric, pulmonary or blood-borne etiology. Of the total cases, mild or intimate halitosis predominated. In addition, self-assessment of breath revealed few complaints (table 2).

Table 1. Characterization of elderly persons in relation to sociodemographic, institution-related and general health variables. Natal, Rio Grande do Norte, 2017.

Variables	n (%)
Gender	
Female	195 (72.8)
Male	73 (27.2)
Ethnicity/Skin Color	
White	169 (67.5)
Brown	57 (21.5)
Black	26 (9.8)
Yellow	03 (1.1)
Type of Institution	
Non-profit	180 (67.2)
For profit	88 (38.2)
Health Plan	
No	92 (66.2)
Yes	47 (33.8)
Multimorbidity	
No	32 (11.9)
Yes	236 (88.1)
Diabetes	
No	93 (70.6)
Yes	39 (29.5)
Polypharmacy	
No	63 (23.5)
Yes	205 (76.5)
Dependence for ADL	
Independent	57 (23.3)
Dependent	188 (76.7)
Cognitive state (Pfeiffer)	
Intact	10 (7.5)
Mild Cognitive Decline	10 (7.5)
Moderate Cognitive Decline	39 (29.3)
Severe Cognitive Decline	74 (55.6)
Cognitive state (binary)	
Oriented	145 (54.1)
Non-oriented	123 (45.9)
Mobility	
Bedridden	12 (8.7)
Wheelchair	37 (26.8)
Walk with assistance	54 (39.1)
Walk without assistance	35 (25.4)
Variables	Mean (±sd)
Age of elderly person	82.18 (±8.610)
Time in institution	6.34 (±4.914)
Number of morbidities	2.87 (±1.119)
Number of drugs	5.68 (±2.281)

Table 2. Characterization of sample by oral health variables. Natal, Rio Grande do Norte, 2017.

Variables	n (%)
Overall halitosis (oral or nasal)	
Absent	198 (73.9)
Present	70 (26.1)
Oral halitosis (binary)	
Absent	199 (74.3)
Present	69 (25.7)
Oral halitosis (ordinal)	
Absence of halitosis	194 (74.0)
Mild (or intimate) halitosis	44 (18.8)
Moderate (or interlocutor) halitosis	23 (8.8)
Severe (or social) halitosis	01 (0.4)
Nasal halitosis (binary)	
Absent	259 (97.4)
Present	07 (2.6)
Problem with halitosis (self-perceived)	
No	113 (81.9)
Yes	18 (13.0)
No opinion	07 (5.1)
Last visit to dentist	
Less than one year	27 (18.8)
More than one year	117 (8.3)
Gingival bleeding	
Absent	43 (16.7)
Present	55 (21.3)
Excluded sextant	160 (62.0)
Periodontal calculus	
Absent	14 (5.4)
Present	86 (33.0)
Excluded sextant	161 (61.7)
Periodontal pocket	
Absent	54 (21.0)
Shallow pocket	33 (12.9)
Deep pocket	09 (3.4)
Excluded sextant	160 (62.5)
Loss of Periodontal Attachment (LPA)	
0-3mm	43 (16.8)
4-5mm	34 (13.3)
6-8mm	10 (6.6)
9mm or more	09 (2.7)
Excluded sextant	160 (62.5)
Number of teeth	
Number (0)	154 (57.5)
1-20	104 (38.8)
>20	10 (3.7)
Root caries	
Absent	65 (56.0)
Present	51 (44.0)
Denture	
Don't use	181 (67.5)
Use	87 (32.5)

Continuation of Table 2

Variables	n (%)
Thick tongue biofilm	
No	120 (46.0)
Yes	141 (54.0)
Tongue biofilm (binary)	
Absent	54 (20.5)
Present	209 (79.5)
Tongue Biofilm (thirds)	
Absent	56 (21.3)
Present only in posterior third	39 (14.8)
Present in posterior and middle thirds	85 (32.3)
Present throughout dorsal lingual surface	86 (31.6)
Variables	Mean (±sd)
DMF-T	28.63 (±5.11)
Number of sextants CPI and PIP	0.66 (±1.18)
Xerostomia score (0 to 10)	1.86 (±2.11)

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The results of the bivariate analyzes of the occurrence of halitosis and the independent variables showed a significant association between halitosis and ethnicity/skin color, type of LTCF, cognitive status, presence of root caries, use of dentures, edentulism and tongue biofilm accumulation (Tables 3 and 4).

Table 3. Bivariate analysis of the independent sociodemographic and general health variables on the halitosis variable. Natal, Rio Grande do Norte, 2017.

	Present	Absent	p	
	n (%)	n (%)		PR (CI 95%)
Age (years)				
From 60 to 79	26 (27.7)	68 (72.3)	0.637	1.09
80 or more	44 (25.3)	130 (74.7)		(0.72-1.65)
Time of institutionalization (years)				
Up to 5	39 (25.0)	87 (75.5)	0.716	0.92
Six or more	41 (27.0)	111 (73.0)		(0.61-1.39)
Gender				
Male	22 (30.1)	51 (69.9)	0.360	1.22
Female	48 (24.6)	147 (75.4)		(0.79-1.87)
Ethnicity/Skin Color				
White	38 (21.2)	141 (78.8)	0.006	0.57
Non-white	32 (37.2)	54 (62.8)		(0.38-0.84)
Type of LTCF				
Non-profit	54 (30.0)	126 (70.0)	0.039	1.65
For profit	16 (18.2)	72 (81.8)		(1.01-2.71)
Health plan				
No	23 (25.0)	69 (75.0)	0.438	1.30
Yes	09 (19.1)	38 (80.9)		(0.65-2.59)
Multimorbidities				
No	08 (25.0)	24 (75.0)	0.878	0.95
Yes	62 (26.3)	174 (73.7)		(0.50- 1.79)

to be continued

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Continuation of Table 3

	Present n (%)	Absent n (%)	p	PR (CI 95%)
Presence diabetes				
Yes	11 (28.2)	28 (71.8)	0.491	1.24
No	21 (26.6)	72 (74.4)		(0.66-2.33)
Polypharmacy				
No	16 (25.4)	47 (74.6)	0.881	0.96
Yes	54 (26.3)	151 (73.7)		(0.59-1.56)
Dependency for ADL (Barthel)				
Independent	16 (28.1)	41 (71.9)	0.527	1.17
Dependent	45 (23.9)	143 (46.1)		(0.72-1.90)
Cognitive state (Pfeiffer)				
Intact or mild decline	02 (10.0)	18 (90.0)	0.111	0.38
Moderate or severe decline	30 (26.5)	83 (73.5)		(0.09-1.45)
Cognitive state (binary)				
Oriented	45 (31.0)	100 (69.0)	0.047	1.52
Non-oriented	25 (20.3)	98 (79.7)		(0.99-2.33)

Table 4. Bivariate analysis of independent oral health variables in relation to the Halitosis variable. Natal, Rio Grande do Norte, 2017.

Outcome: halitosis					
	Present n (%)	Absent n (%)	p n (%)	PR (CI 95%)	PR (CI 95%)
Root caries					
Present	19 (29.2)	26 (51.1)	0.029	0.59	0.59
Absent	25 (49.0)	46 (70.8)		(0.37-0.95)	(0.37-0.95)
Use of dentures					
Don't use	54 (29.8)	127 (70.2)	0.046	1.62	1.62
Use	16 (18.4)	71 (81.6)		(0.99-2.66)	(0.99-2.66)
"Dry Mouth" complaint					
No complaint	06 (24.0)	19 (76.0)	0.665	0.82	0.82
At least one complaint	11 (28.9)	27 (71.1)		(0.35-1.95)	(0.35-1.95)
"Dry mouth" complaint					
03 or more positive responses	16 (41.0)	23 (59.0)	0.083	1.57	1.57
None or 02 positive responses	26 (26.0)	74 (74.0)		(0.95-2.60)	(0.95-2.60)
Gingival bleeding					
Absent	13 (30.2)	30 (69.8)	0.317	0.75	0.75
Present	22 (40.0)	33 (60.0)		(0.43-1.32)	(0.43-1.32)
Dental calculus					
Absent	04 (28.6)	10 (71.4)	0.481	0.75	0.75
Present	33 (38.4)	53 (61.6)		(0.32-1.77)	(0.32-1.77)
Periodontal pocket					
Absent	16 (29.6)	38 (70.4)	0.267	0.73	0.73
Present	17 (40.5)	25 (59.5)		(0.83-1.60)	(0.83-1.60)
Problems with halitosis (self-perceived)					
No	33 (29.2)	80 (70.8)	0.407	0.71	0.71
Yes	07 (38.9)	11 (31.1)		(0.39-1.43)	(0.39-1.43)
Problems with saliva					
No	31 (30.4)	71 (69.6)	0.694	1.14	1.14
Yes	08 (26.7)	22 (73.3)		(0.58-2.21)	(0.58-2.21)

to be continued

Continuation of Table 4

Outcome: halitosis					
	Present n (%)	Absent n (%)	p n (%)	PR (CI 95%)	PR (CI 95%)
Presence of teeth					
Edentulous	26 (16.9)	128 (83.1)	<0.001	0.43	0.43
Toothed	44 (38.6)	70 (61.4)		(0.28-0.66)	(0.28-0.66)
Tongue biofilm					
Absent	05 (8.9)	51 (91.1)	0.001	0.27	0.27
Present in three thirds of the dorsum of the tongue	27 (32.5)	56 (67.1)		(0.11-0.67)	(0.11-0.67)
Tongue biofilm					
Absent	05 (9.3)	49 (90.7)	0.001	0.29	0.29
Present (in any region of tongue)	65 (31.1)	114 (68.9)		(0.12-0.70)	(0.12-0.70)
Thick tongue biofilm					
No	24 (20.0)	96 (80.0)	0.053	0.65	0.65
Yes	43 (30.5)	98 (69.5)		(0.42-1.01)	(0.42-1.01)

The prevalence of halitosis was 43% higher for individuals of non-white ethnicity/skin color than for white individuals; 65% higher in elderly people residing in non-profit LTCFs than in residents of for profit institutions; 52% higher in the elderly with an oriented cognitive condition, as opposed to non-oriented; 41% higher in the elderly with root caries, in comparison with those with no root caries; 62% higher in the elderly who did not use dentures, in relation to denture users; 57% lower in the edentulous elderly than in the dentate; and 73% lower in the elderly without visible biofilm than in those with biofilm on the entire tongue.

DISCUSSION

The present study corroborates the deficient oral health conditions found by other publications[7,8,10-12], with dental caries causing dental loss and edentulism, resulting in a minor presence of periodontal issues due to the widespread occurrence of excluded sextants. There was also a high prevalence of root caries and low use of dentures (despite significant need) and inadequate access to dental care, based on the majority of the elderly in the study stating that their last visit to the dentist was more than one year ago.

The prevalence of halitosis observed in the present study is in agreement with a meta-analysis[30] that verified variations in studies with adolescents and adults of between 20 and 55% and calculated a summary measurement of 31.8% (95% CI 24.6-39.0%). However, it must be considered that the population groups are completely different.

On the other hand, the prevalence of oral halitosis in a Swedish study with institutionalized elderly persons[21] was considerably higher than in the present study (50% x 25.7%, respectively). This was probably due to differences in the oral conditions of Swedish elderly persons in comparison with Brazilians, with the former having a higher presence of teeth, periodontal disease and greater use of dentures. This hypothesis is reinforced by a survey[31] that compared Brazilian and Spanish institutionalized elderly people, which found precarious oral conditions in both, but with a different profile due to the sociodemographic discrepancies between the countries, where the Spanish sample population had a lower prevalence of edentulism and greater periodontal disease than the Brazilian elderly persons.

The isolated use of the organoleptic test could be considered as a limitation of the presence study, as it is subjective and depends on human standards. However, an article[24] which summarizes an International Consensus of Halitosis Authorities argues that the use of this test for the diagnosis of halitosis is indispensable, even if detection using instruments is also applied.

The ideal situation would have been to combine the organoleptic test and evaluation with devices

such as Halimeter® or Oral Chroma®. This was attempted in the present study, but the use of such devices was not feasible due to a considerable part of the sample presenting cognitive, mobility and functional limitations, resulting in difficulty in following the steps necessary to performing these exams, such as moving to the environment where the Halimeter® was connected to the electricity, or keeping a straw inside the mouth for the time necessary for the measurement of the gases or, in the case of Oral Chroma®, keeping the lips sealed for the time necessary for the collection of air with the syringe device.

In addition, these devices are specific for measuring only sulfur-derived substances[24], and do not detect organic or aromatic compounds, which play an important role in the etiology of halitosis, especially in disorders of extraoral origin[17]. Thus, if these substances were present and contributed to halitosis, the devices would show false negative results, unlike an organoleptic test carried out by a well-trained and calibrated operator which distinguishes a variety of odors and is also capable of determining the origin of the odor, when performed with nasal and oral air simultaneously.

Based on these considerations, the use of the organoleptic test in the institutionalized elderly persons group is important as it is a quick procedure that is inexpensive, simple to execute and of broad scope – as it depends little on the collaboration of those evaluated, and allows a diagnosis of cases of extraoral origin.

In this context, the present study found a higher occurrence of extraoral halitosis than some estimates in literature[16,17], which is understandable for people with multimorbidities and polypharmacy and less frequent oral-origin halitosis than estimates of other age groups[16,17,30].

Regarding the self-assessment of breath by the elderly persons in the study, complaints of halitosis represented about half the actual prevalence found. It should be emphasized that self-assessment of breath is not reliable, due to a phenomenon called olfactory fatigue, where an individual becomes used to a smell after a certain period of exposure and so can no longer effectively perceive their own

breath[24]. Another factor to consider is that self-perception is subjective and has a multidimensional character, and reports by institutionalized elderly people of good and excellent oral conditions is common, despite the precarious situations identified by clinical examination[8]. Finally, a Japanese study[32] that evaluated institutionalized elderly persons regarding the occurrence of halitosis found that the disorder did not influence their quality of life (measured via SF-36). The confinement of the LTCF environment, with restricted interpersonal relations, and the finding of the present study that most cases of halitosis were of mild intensity, may diminish the psychosocial impact of halitosis and reduce the number of complaints about this condition.

In the present study, two variables (ethnicity/skin color and type of LTCF) which demonstrated a significant association with halitosis relate to the living conditions of the elderly: there was a higher prevalence of halitosis in non-white elderly individuals living in non-profit LTCFs, while white people predominated in for profit LTCFs and non-white people predominated in non-profit LTCFs. The most unfavorable sociodemographic conditions were observed in elderly people living in non-profit LTCFs[33], which reflects the social inequality in their lives. Based on this, it is plausible to consider that elderly people with less favorable living conditions have worse health and care situations, favoring the occurrence of halitosis.

From this perspective, it was observed during data collection that only one non-profit LTCF had a dental clinic and, despite possessing the physical structure, its multi-professional team did not include a dentist, meaning dental care was provided through a voluntary service. Moreover, even though they are located in areas covered by the Brazilian public health service, institutionalized elderly persons are not formally included in this system. In contrast, the elderly living in for profit LTCFs had a privileged socioeconomic status, and thus, even in the absence of dentists in the LTCF or access to public services, could visit private dental clinics or pay for home care dental services. In addition, the private institutions offered greater caregiver and health professional support, so that elderly persons in such facilities received better care.

On the same subject, it was found that none of the LTCFs had a doctor as a member of the clinical staff, so that health assessments occurred on request. Periodic preventive care was therefore rare and ease of access to medical care occurred among the elderly with a health plan or those with favorable socioeconomic conditions, which represented, as a rule, elderly people living in for profit LTCFs. In non-profit institutions, access to medical care was restricted to public health services (which do not include the institutionalized elderly in their coverage), or efforts to meet the financial cost of a private consultation, or to the care provided by volunteers, universities and institutions, which is also occasional and insufficient.

In this context, it is possible that the quality of the information on the diagnosis of morbidities and the use of drugs represents a limitation of this study, since it was obtained through secondary data recorded in the institutional records and, therefore, subject to diagnostic and registration bias. It should be noted that the information on medication use was probably more reliable than that on morbidities, as the former derives from medical prescriptions attached to medical records, while there is not always a medical report contained in the records for the latter.

Another important point to be discussed in the present study is that the prevalence of halitosis was higher in dentate elderly patients with root caries and those who did not use dentures. Such variables are directly related to dental conditions: the sample of the present study was predominantly edentulous and the few dentate elderly persons had root caries and did not generally use dentures, since almost all the dentures used were complete. A study with 115 elderly people from LTCFs in Japan[32] corroborates the positive association between halitosis and the presence of teeth, while a Swedish study[21] found associations between halitosis and fixed dentures and periodontal variables, directly related to the presence of teeth.

Regarding halitosis and hyposalivation, a significant association was found in the study by Zellmer et al.[21], in contrast to the present study, which may be due to the difference in salivary evaluation methods: the Zellmer study used sialometry (the gold standard to assess hyposalivation), while the present study used a questionnaire[27], which may be considered a limitation.

The greater prevalence of halitosis in the elderly with oriented cognitive status than among the non-oriented is also indirectly related to the presence of teeth and the use of dentures and not only to cognition itself. In the sample of the present study, the oriented elderly retained more teeth and used dentures more frequently than non-oriented individuals (who were generally edentulous and without dentures). In this context, a Swedish study[21] found an association between halitosis and dementia, although the category "dementia" can be considered vague, as elderly persons in early dementia may have preserved cognition which is affected by other conditions besides dementia.

Regarding halitosis and the presence of tongue biofilm, there was a significant association in the present study, which is corroborated by Aizawa et al.[32] and other studies[16,17] for different age groups. Zellmer et al.[21] did not include analysis of tongue biofilm in their study on halitosis with institutionalized elderly people, and recognized this as a significant limitation.

The high occurrence of tongue biofilm verified in this study is evidence of the likelihood of deficient oral hygiene which, among other consequences, can influence the quality of the breath of the evaluated elderly persons. Due to the high prevalence of edentulism in this group, it is suggested that tongue biofilm is adopted as a routine part of oral health evaluations in this population segment. As well as being an instrument that is simple to understand and apply (which gives it both sensitivity and specificity), it has a universal scope. In addition, the importance of tongue hygiene in the study group should be reinforced with a view to preventing halitosis and other health problems[34].

The foregoing confirms the relationship between halitosis in the institutionalized elderly and proximal factors, directly related to oral and general health, and distal factors, as halitosis is a reflection of the precarious environment in which these elderly people live and the social inequality they experience during their lives[33], including prior to institutionalization.

Public health policies should therefore contemplate actions to promote healthy aging throughout life, but also include the institutionalized - those that have already aged with sequelae - in their coverage in an efficient manner, so that factors related to morbidity and mortality indicators (which include halitosis) are minimized and the elderly not only achieve longevity, but live with quality.

CONCLUSION

The occurrence of halitosis in the institutionalized elderly was similar to that in studies with other age groups and demonstrated an association with both oral problems and sociodemographic, institutional and functional factors.

It is hoped that the results of the present study will encourage reflections that contribute to the understanding of the oral health of the institutionalized elderly. In the academic environment, it is hoped that it will support other epidemiological studies. As practical approaches should be backed by scientific evidence, it is also estimated that these results will help health services to adopt innovative interventions to improve the oral health of this segment of the population.

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Coping strategies used by the elderly regarding aging and death: an integrative review

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Abstract

Objective: to identify and synthesize studies that approach the coping strategies used by the elderly to deal with aging and death. *Method:* an integrative review was performed in seven databases with the following descriptors: psychological adaptation, the elderly, death and aging. *Results:* 73 articles were identified. After applying the inclusion and exclusion criteria, six articles that identified multiple losses experienced by the elderly and included coping strategies were selected and analyzed. The main losses were: loss of health; physical capacity and functionality; loss in quality of emotional relationships; death of loved ones; reduced social integration; fewer material goods; financial loss; lower cognitive resources; lower perceived mastery; loss of feeling useful; reduction in subjective well-being and quality of life. We also identified the following coping strategies used to deal with losses related to aging and finitude: anticipated grieving; wish to die; isolation; submission; negotiation; acceptance; accommodation; support seeking; living in the moment; seeking spiritual comfort. *Conclusion:* the elderly experience aging and finitude with coping strategies that can generate both unfavorable and favorable health outcomes. In this context, some coped through anticipated mourning and the desire to die, while others looked for spiritual comfort, social support and acceptance.

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INTRODUCTION

Understanding death and old age depends on cultural definitions. Culture is extremely important for gerontology, as the way in which a society defines concepts such as the person, age and life course varies greatly depending on the cultural context in which it is inserted[1].

Despite the different cultural understandings of each culture, however, aging is a phase of life permeated by multiple losses. There is the loss of youth, sometimes accompanied by the loss of health and independence. Without denying the virtues and wisdom that accompany aging, we must recognize that for most people this process is not easy[2].

From this perspective, it can be said that aging represents an accumulation of successive losses throughout life that include physical limitations, illness, retirement and other losses that are characterized as symbolic deaths[3].

The meaning of death is not only present at the end of life, but pervades the process of human development and is present in daily life. It can be said that the more we live, the more we risk losing something or someone important, and that this fact can generate stress due to being out of our control[3].

In this context, stressful situations can be classified into two categories: traumatic events, or in other words external situations or people who present themselves as a threat to the well-being of an individual; and uncontrollable events, which are situations that challenge the limits of our capacities and our concepts of ourselves, such as death and aging[4].

Stress and coping are therefore closely related concepts; stress is not only a response to the physiological and emotional reactions of the body but is understood as the result of the interaction between the individual and the environment[4,5].

Such coping consists of the individual effort required to handle stressful problems and emotions that affect the psychological and physical results of a destabilizing situation. It is a multidimensional, dynamic process that raises a number of responses and encompasses the individual's interaction with their environment, using mechanisms to manage an impending threat and difficult life situations[4,6].

Coping for elderly persons is different from coping for people of other age groups, as stressors also change with age. While young adults experience more stress in areas related to work, their finances, home maintenance, their personal life, family, and friends; the elderly tend to experience stress related to the limitations of aging[1].

Stress among the young is therefore more related to the roles they play, while stress among the elderly occurs due to reduced skills arising from aging [1].

As we age, we begin to use our past coping experiences as a guide to dealing with the stressful situations of the present[1].

This review therefore aims to identify and synthesize studies that deal with coping strategies used by elderly people to deal with aging and death.

METHOD

An integrative review was carried out in a systematic and orderly manner, based on six steps: 1) the creation of a guiding question that defines which articles should be included, 2) a search of scientific literature which should be broad enough to answering the guiding question, 3) the collecting of the data of the selected articles using a previously elaborated instrument to extract the necessary information, 4) critical analysis of the included articles, considering the methodological rigor and the characteristics of each study, 5) discussion of results with other articles 6) presentation of the review in a clear and objective manner[7].

To support the development of the study, the following guiding question was created: *what coping strategies are used by elderly people when faced with aging and death*? From this question, the following search descriptors were defined: psychological adaptation, elderly, death and aging.

The descriptor "psychological adaptation" was chosen because it encompasses the concept of

confrontation as defined by the Health Sciences Descriptors, while the descriptor "death" had the purpose of representing finitude and symbolic deaths, that is, losses over the course of life. The descriptors "elderly" and "aging", meanwhile, were chosen to delimit the study population.

The descriptors were grouped using the Boolean operator AND in the following databases: Latin American and Caribbean Literature in Health Sciences (LILACS), the Nursing Database (BDENF), Medical Literature Analysis and Retrieval System Online (MEDLINE), US National Library of Medicine (PUBMED) and American Psychological Association (APA), Cumulative Index of Nursing and Allied Health Literature (CINAHL) and Scopus.

The search was performed in June 2016 and the following inclusion criteria were adopted: original articles published in Portuguese, English and Spanish from January 2010 to June 2016, available online and in full text format. The exclusion criteria were: repeated articles, sample of elderly persons with dementia, sample of relatives and articles

that did not address the theme of psychological adaptation and death.

After the selection of the articles, the information was organized in a framework with the objective of evaluating the methodological rigor and characteristics of each study. After being subjected to a critical analysis, the information was discussed with other authors in order to better elucidate the subject, and finally, the conclusions of the review were elaborated and presented.

RESULTS

A total of 73 articles were identified, of which six were selected for analysis (figure 1).

The six articles selected were from South America, North America, Europe and Asia, with one study carried out in Brazil. The objectives of the articles addressed the research question and the methodologies used were qualitative, quantitative and mixed (Chart 1).
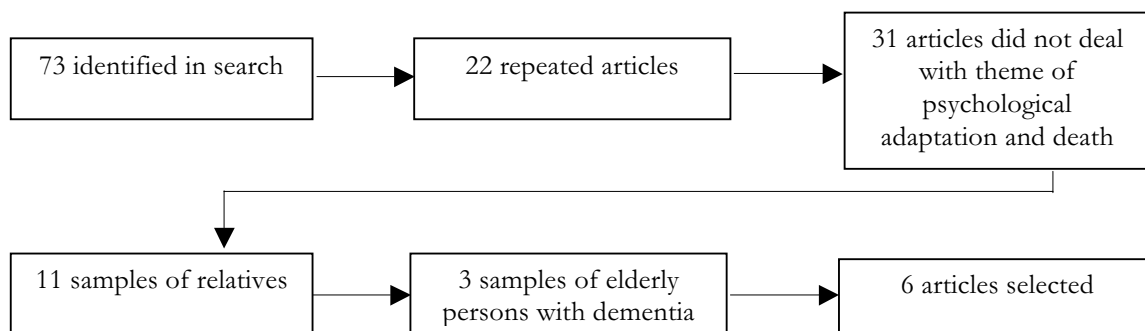

Figure 1. Selection process of articles in Lilacs, Medline, Bdenf, Pubmed, Apa, Cinahl and Scopus databases. Brasília, Distrito Federal, 2016.

Chart 1. Synthesis of articles selected by author, journal, year, location, objective and method. Brasília, Distrito Federal, 2016.

Authors	Journal, location and year	Objective and method
Ho AH, Chan CL, Leung PP, Chochinov HM, Neimeyer RA, Pang SM, et al.	Age and Ageing (China, 2013).	Examine the concept of living and dying with dignity in a Chinese context and explore the generality of the model of dignity for terminally ill elderly persons in Hong Kong. Qualitative.
Maxfield M, Pyszczynski T, Greenberg J, Pepin R, Davis HP.	Psychology and Aging (USA, 2012).	Test the hypothesis that the greater the executive functioning of an elderly person, the greater the tolerance for reminders of death. Quantitative.
Dockendorff DCT.	Educational Gerontology (Chile, 2014).	Report healthy ways of dealing with the losses related to the aging process. Mixed Method.
Palgi Y, Shrira A, Ben-Ezra M, Spalter T, Shmotkin D, Kavé G.	Journal of Gerontology: Psychological Sciences (Israel, 2010).	To investigate whether several indicators of subjective well-being and subjective health decline with the approach of death and which of these shows a greater decline. Quantitative.
Giacomin KC, Santos WJ, Firmo JOA.	Ciência & Saúde Coletiva (Science and Collective Health) (Brazil, 2013).	To understand anticipated mourning, perceived in the interaction between old age and the health-disease and incapacity processes, in the views of the elderly when faced with their own finitude. Qualitative.
Rurup ML, Deeg DJ, Poppelaars JL, Kerkhof AJ, Onwuteaka-Philipsen BD.	Crisis (Holland, 2011).	Improve understanding of why some older people develop the desire to die. Qualitative.

The selected articles addressed two main themes: a) symbolic deaths, that is, the losses experienced by elderly people due to the aging process; and b) the coping strategies used to deal with these and with finitude.

The main losses were: loss of health and/or physical capacity; loss of functionality; loss of quality of emotional relationships; death of loved ones; reduced social integration; reduction of material assets; financial loss; reduction of cognition; loss of feeling of mastery; loss of feeling of being useful, reduction of subjective well-being and quality of life.

The main coping strategies were: anticipatory mourning, the desire to die, isolation, submission, negotiation, acceptance, accommodation, seeking social support, seeking spiritual comfort and living in the moment.

DISCUSSION

The connection between the health professional and the patient is an essential element of the quality of care provided[8]. For this reason, it is important to understand each person on an individual basis, considering how they experience losses and the coping strategies they use when faced with numerous adverse situations.

In this context, the present discussion is structured based on the two main results found: losses and coping.

Losses

In order to understand the losses experienced by elderly people, a study conducted in Chile carried out thirty-six semi-structured interviews with individuals aged over 65 years and listed the following losses: a) loss of health and/or physical capacity; b) loss of quality in emotional relationships; c) the death of loved ones; d) reduced social integration; e) reduction of quality of life in a material sense; f) reduction of the quality of life in a cognitive sense[9].

The physical limitations relating to aging and illness were the most commonly reported losses

among the elderly. Losses in health and/or physical ability are evidenced as: a decline in psychomotor ability, sensory losses, a reduced perception of strength and energy, and sexual difficulties[9].

When faced with losses, mainly related to physical limitations, the elderly person may fear becoming dependent and being a burden on family members[10]. A longitudinal study conducted in New Zealand which accompanied the transition from independence to dependency and death of twenty-five elderly patients with severe heart disease confirmed that participants reported experiencing fear of becoming dependent on their partners, friends and family[11].

Physical limitations with lower levels of independence were also a relevant theme in a study in China that sought to explore the generality of the model of dignity for the elderly. While some points were different in the Chinese context, however, physical limitations with a loss of independence and functional limitations with negative implications on quality of life were similar to the Western context[12].

A study carried out in the Netherlands with 31 elderly persons who had experienced the desire to die at some point in their life showed that dependence generated a loss of the feeling of mastery in many elderly people; the subjects reported that people decided for them and interfered in decision-making in daily life, leading to a reduction in their freedom. It can be said that the elderly persons no longer felt able to control their problems or their own lives[13].

It was perceived that dependence due to physical limitations is a cross-sectional theme found in several countries, including in the Western context. While old age brings with it a sense of approaching death, the greatest fear for the elderly is dependence, not death itself. It is important to consider that the losses experienced by these individuals are not only physical, but also emotional and social[9,10].

The loss of quality in emotional relationships refers to the negative perception of important changes in the affective relationships associated with aging. A weakening of emotional bonds was noted, and it was felt that while people are physically present, they can be emotionally absent[9].

The death of loved ones is demonstrated by the loss of significant persons. Widowhood is the most common and also one of the most affecting of such deaths, although the deaths of friends and relatives should also be considered[9,10]. In this case, loneliness is a frequent theme and is interpreted as a reduction in one's social support network, since the feeling is aggravated when the person who died was close to the elderly person[13].

In this context, widowhood overburdens old age with the effects of continuous solitude. One loses one's companion of many years and of a life built for two, leaving a feeling of emptiness. Associated with the loss of affection with widowhood are losses of the guarantee of social and family status, the security of the bond, the sense of tranquility of having someone to grow old with, economic stability and the comforting sensation of having someone who can be counted on[2].

Reduced social integration is another loss noted in the reports, based on the feeling of no longer feeling welcome in social spaces due to the aging process. There is a loss of social roles, such as retirement before it is desired[9]. In this sense, elderly persons can experience a sense of uselessness and describe difficulties in not feeling more useful, due to the fact that they no longer work. In some cases this means finding it difficult to identify a reason to live[13].

Accompanying retirement is the reduction in purchasing power, which constitutes financial loss. Financial problems can be categorized as not having enough money to live comfortably or for leisure activities[13].

The reduction in quality of life in a material sense is demonstrated by the loss of material goods, such as having to leave the house in which an elderly person has always lived because he or she can no longer live alone[9].

The reduction in cognitive sense is revealed by a decreased ability to respond to intellectual challenges. This even affects elderly persons without dementia, who reported realizing that their thinking is not agile as before and said they had greater difficulty to remember aspects of daily life[9].

A cognition survey of 79 people between the ages of 56 and 89 in the USA attempted to test the hypothesis that the greater the executive functioning of a person, the greater the tolerance for death reminders; it was believed that people with lower executive functioning might not have the cognitive resources needed to implement changes aimed at more flexible strategies in response to reminders of death[14].

The findings of the study found that executive function only influenced how reminders of death are dealt with by the elderly and not by younger people. Elderly persons and those with greater executive functioning responded to reminders of mortality with greater tolerance[14].

Another study, however, found that elderly persons developed the desire to die due to a reduced quality of life as a consequence of aging and illness, as well as dependence, limitations in hearing and sight, among others[13].

A survey of 16 centenarians in the UK also identified many losses experienced by elderly persons: from physical limitations, including gait and vision, to the death of loved ones and the lack of these people in their lives. On the other hand, in the present study, the participants were able to deal with their losses through the understanding that despite death, the loved one remains present in their life; and that although they have experienced the losses and tragic moments of two world wars, these people were able to recognize the beauty in their lives, with moments of joy, pleasurable activities and loved ones who lived and live throughout their lives[15].

Coping

Coping, in the model by Lazarus and Folkman, is defined as the cognitive and behavioral actions and strategies used when faced with stressful situations arising from internal or external demands which are perceived as overburdening the personal resources of the individual[5].

Coping is subdivided into two groups according to the function it performs: emotion-focused coping and problem-focused coping[5].

On the other hand, Skinner et. al. suggests that the division between emotion-focused and problem-focused coping should no longer be used. Instead, these authors argue in favor of a hierarchical system of ways of acting which was constructed from the analysis of one hundred coping systems in which potential coping families were categorized (Chart 2)[16].

Chart 2. Synthesis of coping families according to study by Skinner; et. al. Portland, Oregon, 2003.

Coping families	Components
Problem solving	Developing strategy; instrumental action; planning
Seeking information	Reading; observation; asking others.
Inability to help oneself	Confusion; cognitive interference; cognitive exhaustion.
Escape	Cognitive avoidance; behavioral avoidance; denial; illusory thinking.
Self confidence	Emotional regulation; behavioral regulation; emotional expression; emotional approach.
Seeking social support	Search for contact; search for comfort; instrumental help; spiritual support.
Delegation	Seeks for maladaptive help; complaining; regret; feeling sorry for oneself.
Isolation	Withdrawal from social life; concealment; avoiding other people.
Accommodation	Distraction; cognitive restructuring; minimization; acceptance.
Negotiation	Bargaining; persuasion; setting priorities.
Submission	Rumination; rigid perseverance; intrusive thoughts.
Opposition	Blame the other; projection; aggression.

A study conducted in 2014 used forms of coping classified according to Skinner's study and associated them with levels of subjective well-being. Subjective well-being was related to the different ways of coping with the losses related to aging[9,16].

The search for social support as well as negotiation and accommodation were the coping strategies most associated with high levels of subjective well-being. On the other hand, the isolation, hopelessness, escape and submission coping strategies were associated with lower levels of subjective well-being[9].

Coping can generate favorable or unfavorable results for health, as it consists of the actions taken to deal with a stressful situation that can either help or cause harmr[4].

In the articles analyzed, some coping strategies may be considered unfavorable to health, such as anticipated mourning and the desire to die; evidenced in the speech of an eighty-six-year-old woman with a desire to die, in which she perceives death as representing the possibility of freedom from a meaningless and worthless life; although she also says she cannot kill herself and must wait for God's will. Thus, one notices the need to seek to repel the idea of suicide and support life in old age and in sickness[10].

A study of thirty-one elderly people with the desire to die was carried out in the Netherlands to understand why some elderly people develop this feeling. Most participants had a moderate to strong desire to die. The elderly persons described the loss of a partner, work or independence and no longer feeling meaning or importance in their own lives, and reported that they were just waiting for their final moment[13].

In a situation where one is simply waiting for death, social interaction, leaving the house and seeking entertainment become meaningless activities; favoring isolation, evidenced by the report of a 74-year-old woman who hardly left her house and no longer had an interest in talking to her relatives because she does not feel understood[9].

Hopelessness was also evidenced by a man of seventy-two who described feeling despair, anger, and no longer felt able to do some of his daily activities. Loneliness and a reduced sense of mastery

over their own lives were also factors associated with the desire to die in the elderly[13].

On the other hand, accommodation was an effective coping strategy associated with high levels of subjective well-being. This consists of using flexibility to adjust one's preferences to the available options. Accommodation was used by elderly people to adjust their goals and preferences by accepting and redefining a situation, as in the case of a female interviewee who described accepting Parkinson's disease and seeking to learn from it[9,16].

When someone does not adjust their preferences to a new situation, but has their desires restrained by a context that prevents satisfaction, then the individual is using the coping strategy known as submission, which was associated with higher levels of subjective well-being in the study[9].

Negotiation is another coping strategy in which the individual seeks to adjust their preferences to the available options, but rather than accommodation, where the person yields their goals, in negotiation the individuals seeks alternatives to satisfy their goals and preferences. This strategy, when used by elderly people, was also associated with high levels of subjective well-being[9].

On the other hand, a study conducted in Israel identified a reduction in subjective well-being in participants and found that the effect of the dying process is greater than aging itself. It is possible that at an advanced age of life, subjective well-being is less associated with chronological age and more associated with the still unexplained mechanisms of the dying process[17].

In China, a survey of elderly persons in palliative care revealed the physical limitations that significantly affected the participants, who reported that they no longer felt able to enjoy food, engage in leisure activities, or maintain close relationships. However, despite these adversities, the participants reported dealing with a disease without a cure: living in the moment, maintaining normalcy and seeking spiritual comfort[12].

In terms of the recognition of their finitude, the elderly interviewed reported the need to maintain normality while facing a disease without a cure,

the importance of living in the moment without worrying about the future, and the search for spiritual comfort through forgiveness, renouncing grudges and broadening their perspectives of life[12].

In New Zealand, a longitudinal study of 25 elderly patients with severe heart disease which sought to follow the transition from independence to dependency and death identified the following results: for the participants, the transition was not a simple but a challenging and complex linear process. The losses during the transition were manifold: ranging from the loss of relationships with friends to hobbies and the loss of one's own home, as for some there was a need for a change of residence[11].

Multiple losses, meanwhile, led some elderly people with severe heart disease to the desire to speed their deaths as they lost hope as they looked to the future and failed to find meaning or anything to look forward to. On the other hand, despite knowing that the end was near, others wanted to live and fulfill their desires and had the support of friends, family and the community. Faced with the uncertainty of death, some elderly persons opted to live by taking full advantage of each day as it comes[11].

CONCLUSION

Aging leads to the accumulation of losses, which means symbolic deaths through the loss of physical vigor, loved ones, the strength of emotional relationships and a social life and also one's value as a person in a society based on productivity.

The synthesis of the analyzed studies indicates that when faced with aging and death, whether it is a symbolic death or the perception of their own finitude, the elderly used a coping strategy with favorable and unfavorable results for health. The favorable strategies were: negotiation, acceptance, accommodation, the search for social support, the search for spiritual comfort and living in the moment; while the unfavorable strategies were: anticipated mourning, a desire to die, isolation and submission.

Thus, it can be said that while some elderly people faced aging and finitude with anticipated mourning and the desire to die, due to the fear of dependency and of becoming a burden for relatives; others faced aging, loss, and finitude by seeking spiritual comfort, social support, and acceptance.

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Healthy aging from the perspective of the elderly: an integrative review

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Abstract

Objective: to identify the perspective of elderly persons on healthy aging as described by scientific literature. *Method*: a descriptive integrative review type study was performed, guided by the question: what knowledge has been produced about healthy aging from the perspective of the elderly? It was carried out using the Scopus Info Site (SCOPUS), Cumulative Index to Nursing & Allied Health Literature (CINAHL), Medical Literature Analysis and Retrieval System Online (MEDLINE), Literature of Latin America and the Caribbean (LILACS), EMBASE and WEB OF SCIENCE databases and in the directory of the Scientific Electronic Library Online Journals (SciELO), for literature published in the period between 2005 and 2016. *Result*: Eleven papers were regarded as eligible for this review. These studies revealed that healthy aging is related to different health dimensions: biological (adoption of healthy habits and behaviors with self-responsibility), psychological (feelings of optimism and happiness), spiritual (faith and religiosity) and social (reciprocity in social support factors and the capacity to live autonomously and independently). *Conclusion*: the synthesis of knowledge on healthy aging from the perspective of the elderly can support the actions of professionals who work with this population group to encourage and value the social determinants involved, so overcoming the exclusive focusing on the adoption of habits and behaviors inherent to lifestyle to achieve aging in a healthy way.

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INTRODUCTION

The elderly represent 12% of the world's population, and this figure is expected to double by 2050[1] and triple by 2100[2]. Greater longevity can be considered a success story for mankind[3], and these extra years of life allow people to plan their future in a different manner to previous generations, depending on one central element: health[4].

With this understanding, public policies have emphasized the positive meaning of aging and the contribution the elderly can make to society with their wealth of knowledge, skills and experiences in everyday life and work[3,5]. For this positive sense of aging, different terms are used: successful aging, active aging and, more recently, the resumption of the term healthy aging, proposed by the World Health Organization (WHO)[3].

The WHO defines healthy aging as the "process of development and maintenance of functional capacity that allows well-being at an advanced age"[3,4]. Functional capacity, in turn, can be understood as the combination of the intrinsic capacity of the individual, the relevant environmental characteristics and the interactions between the individual and these characteristics[3]. Intrinsic capacity is the articulation of physical and mental abilities (including psychosocial)[3]. Environmental characteristics are the context of life, including social relations. Well-being is unique and permeated with subjective aspirations, including feelings of fulfillment, satisfaction and happiness[3].

Thus, the understanding of healthy aging, as defined by the WHO, is comprehensive and relevant for all elderly people, even for those living with chronic diseases. It is also not centered on the absence of aggravations, nor is it restricted to the functionality of the elderly. Instead, it is based on a process that will allow the construction of skills that will enable elderly individuals to experience aging in the best possible way[4].

In addition to the comprehensive WHO understanding of healthy aging, it is also worth exploring the collected scientific evidence on the perspective of the elderly on this issue, as they are the main actors in this context. This knowledge may provide additional information to support

interventions and care for this group, and contribute to one of the guidelines of the Global Strategy and Plan of Action for Aging and Health 2016-2020, which encourages the construction and synthesis of evidence on healthy aging[6]. In this context, the present study aimed to identify the perspective of the elderly on healthy aging as described in scientific productions.

METHOD

An integrative literature review was performed, allowing the identification of themes or problems relevant to the field of health and public policy, through the gathering, critical appreciation and synthesis of knowledge about the subject under investigation[7]. Such a method contributes to Evidence-Based Practice, following a standard of excellence regarding methodological rigor[8].

This integrative review was performed in five stages[7]: in the first stage, the research question was formulated: what knowledge has been produced about healthy aging from the perspective of the elderly? The second stage involved the literature search through a survey of the scientific productions carried out in February 2017 in the main databases of the area of health: Scopus Info Site (SCOPUS), Cumulative Index to Nursing & Allied Health Literature (CINAHL), Medical Literature Analysis and Retrieval System Online (MEDLINE), Literature of Latin America and the Caribbean (LILACS), EMBASE, WEB OF SCIENCE and in the journal directory of the Scientific Electronic Library Online (SciELO). The period from 2005 to 2016 was used as a temporal cut-off point, with the start date based on the publication of the document Active aging: a WHO health policy[9].

The search was carried out based on the key-word "Healthy aging" and the descriptor "Aged", obtained from the Health Sciences Descriptors (DECS) and the synonyms "elderly", "senior" and "older people". It was decided to use terms in English and the Bolean operators AND and OR, as shown in Chart 1.

To compose the sample, the following inclusion criteria were used: original articles published in the period from 2005 to 2016, electronically available in full in the English language, which addressed the

perspective of the elderly on healthy aging. Literature reviews, annals of scientific events, experiment reports, dissertations and theses were excluded.

The inclusion and exclusion criteria were applied and allowed the selection of 11 articles to make up the study sample, as shown in Figure 1.

Chart 1. Search strategy and articles found in databases and in the search directory. São Paulo, 2017.

| Database	Search strategy	Articles found
SCOPUS	"Healthy aging" AND ("aged" OR "elderly" OR "senior" OR "older people")	77
CINAHL	"Healthy aging" AND ("aged" OR "elderly" OR "senior" OR "older people")	14
MEDLINE	"Healthy aging" AND ("aged" OR "elderly" OR "senior" OR "older people")	24
LILACS	"Healthy aging" AND ("aged" OR "elderly" OR "senior" OR "older people")	2
EMBASE	Emtree terms: "Healthy aging" AND "aged"	6
WEB OF SCIENCE	"Healthy aging" AND ("aged" OR "elderly" OR "senior" OR "older people")	43
SciELO	Keywords: "Healthy aging" AND "elderly"	11
Total		177
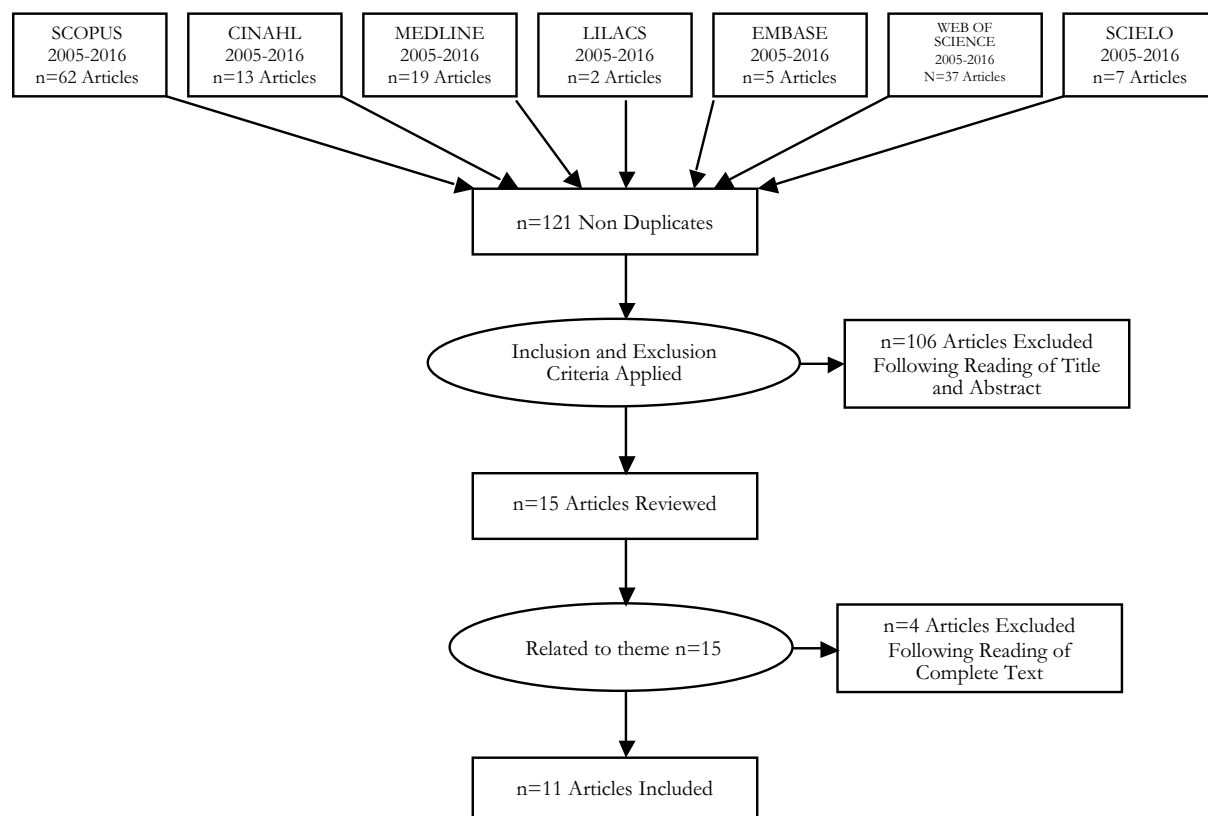
Figure 1. Diagram of the result of applying the inclusion and exclusion criteria of the study. São Paulo, 2017.

Figure created by authors based on PRISMA diagram.

In the third stage a critical evaluation of the scientific productions that met the established criteria was carried out. The identified articles were evaluated for rigor, credibility, and relevance through the Critical Appraisal Skills Programme checklist (CASP). This instrument classifies the studies into two categories: A and B. Those classified as Category A present a small risk of bias, as they meet at least nine of the ten topics: 1) clear and justified objective; 2) methodological design appropriate for the objectives; 3) methodological procedures presented and discussed; 4) intentional sample selection; 5) data collection, instruments and saturation process described; 6) relationship between researcher and researched; 7) ethical aspects; 8) dense and substantiated analysis; 9) results presented and discussed, pointing out the credibility and use of triangulation; 10) description of the contributions, implications of the knowledge generated and its limitations[10]. Category B included those with a moderate risk of bias, that is, those that meet at least five of the ten topics[10].

The CASP checklist was applied independently by three of the authors in order to guarantee the reliability of the present study. After CASP classification, a database was elaborated that made it possible to organize and compile the following information from the selected studies: article title, profession of the first author, year of publication, country, journal title, method and results (perspectives of the elderly about healthy aging).

In the fourth stage, the perspectives of the elderly on healthy aging were grouped by similarity of content (Table 2). The results were interpreted based on the literature related to the study theme. Finally, the fifth stage included the presentation of the synthesis of knowledge, contained in the discussion and final considerations section.

RESULTS

The highest proportion of articles (27.3%) was published in 2014. The countries that published the most articles were Brazil (36.3%), Canada (18.1%) and Thailand (18.1%). The professional area which published the most studies were psychologists (54.5%), followed by nurses (27.2%). Most of the journals (63.6%) were not specific to geriatrics or gerontology.

All the sampled articles were classified as Category A according to the CASP checklist[10]. In terms of content, the selected studies found that the perspective of the elderly on healthy aging covered the biological, psychological, spiritual and social dimensions.

Chart 2 represents the synopsis of the sampled articles of the integrative review.

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Chart 2. Synopsis of articles included in the integrative review. São Paulo, 2017.

Authors/Title	Year/Country	Method/Participants/Objectives	Elderly persons perception of healthy aging
Wallack EM, Wiseman HD, Ploughman M/ Healthy Aging from the Perspectives of 683 Older People with Multiple Sclerosis[11].	2016/ Canada	Quantitative-qualitative/ n=683. Age: 55 to 88 years / Determine which factors contributed most to healthy aging for people with multiple sclerosis.	Social relationships, positive thinking, determination, maintain identity, eat healthily, adequate sleep and rest, high quality of health care, medication management, alternative therapies, weight control, being independent, volunteering, developing spirituality, practice a religion and have financial security.
Stephens C, Breheny M, Mansvelt J/ Healthy ageing from the perspective of older people: A capability approach to resilience[12].	2015/ New Zealand	Qualitative/ n=145. Age: 63 to 93 years/ Use Sem theory to analyze "functionings" from the perspective of elderly persons.	Have physical comfort (adequate housing), security (financial and physical), autonomy, happiness, social integration and be able to contribute (voluntary work).
Valer DB, Bierhals CCBK, Aires M, Paskulin LMG/ The significance of healthy aging for older persons who participated in health education groups[13].	2015/ Brasil	Qualitative/ n=30. Age: 62 to 82 years/ Describe the meaning of healthy aging for elderly people who participated in health education groups of a Basic Health Unit. in Porto Alegre, Rio Grande do Sul.	Be physically active, eat suitable food, care for oneself, don't smoke or drink alcohol, have adequate sleep and rest, socialize, perform leisure activities, seek out healthcare (routine medical check-ups, examinations, vaccination and absence of disease), be independent and have positive feelings.
Sixsmith J, Sixsmith A, Fänge AM, Naumann D, Kucsera C, Tomsone S et al./ Healthy ageing and home: The perspectives of very old people in five European countries[14].	2014/ Germany Hungary Latvia Sweden United Kingdom	Qualitative/ n=190. Age: 75 to 89 years/ Understanding the perspectives of the elderly on the relationship between healthy aging and the home among very old people in five European countries.	Feel independent, be able to manage one's home and have financial security. Have hobbies and do individual or collective leisure activities. Eat healthily, don't smoke or drink alcohol and do physical activities.
Waites CE, Onolemhemhen DN/ Perceptions of healthy aging among african-american and ethiopian elders[15].	2014/ EUA Ethiopia	Quantitative-qualitative/ n=165. Age: 50 to 81 (Ethiopia, n=100) and 60 to 81 years (USA, n=65)/ Explore the perception of healthy aging and health promotion preferences and practices of African American and Ethiopian elderly persons.	Healthy aging for African Americans is to be independent and able to take care of oneself; while for Ethiopians, it is to perform physical activity, the absence of disease and maintenance of family life. Both expressed faith and spirituality.
Bacsu J, Jeffery B, Abonyi S, Johnson S, Novik N, Martz D et al./ Healthy aging in place: perceptions of rural older adults[16].	2014/ Canada	Qualitative/ n=40. Age: 65 to 85 years/ Explore the meanings, experiences and perceptions of healthy aging among rural elderly persons.	Interact socially, stay active, independent, optimistic and maintain cognitive health.
Boratti KLP, Soriano FS/ The perception of elderly persons about beliefs on self-efficacy and healthy aging[17].	2013/ Brazil	Qualitative/ n=6. Age: 60 to 80 years/ To verify the perception of the elderly about the beliefs of self-efficacy and healthy aging.	Perform routine activities, contribute, accept life as it is, have positive thoughts, believe in God and have health.

Continuation of Chart 1

Authors/Title	Year/Country	Method/Participants/Objectives	Elderly persons perception of healthy aging
Thanakwang K, Soonthorndhada K, Mongkolprasoet J/ Perspectives on healthy aging among Thai elderly: a qualitative study[18].	2012/Thailand	Qualitative/ n=160. Age: 60 to 88 years/ Describe the aspects of healthy aging and the factors that contribute to healthy aging in Thailand.	Absence of serious chronic diseases, functional independence, a positive psycho-emotional perspective, spirituality and make a social contribution; perform physical activity, have good nutritional habits, do not smoke or drink alcohol and manage disease well.
Deponti RN, Acosta MAF/ Understanding of the elderly of factors that influence healthy aging[19].	2010/Brazil	Qualitative/ n=30. Age: 56 to 85 years/ Investigate the elderly person's understanding of what factors influence Healthy Aging.	Be enthusiastic, have a positive attitude, be active, live with joy/fun, be optimistic, have a young spirit, good memory, friendships, coexistence with other people and count on the support of the family.
Danyuthasilpe C, Amnatsatsue K, Tanasugarn C, Kerdmongkol P, Steckler AB/ Ways of healthy aging: a case study of elderly people in a Northern Thai village[20].	2009/Thailand	Qualitative/ n=7. age: 78 to 85 years/ Explore the forms of healthy aging among a specific group of elderly persons in order to understand the connection between healthy aging and culture.	Eat well, have support from one's family, practice physical activity and healing, worship ancestors, don't smoke or drink alcohol, perform spiritual services and be interdependent.
Cupertino APFB, Rosa FHM, Ribeiro PCC/ Definition of Healthy Aging from the Perspective of Elderly Individuals[21].	2007/Brazil	Qualitative/ n=501. Age: 60 to 93 years/ to examine the definition of healthy aging in a sample of the elderly living in the community, seeking to identify the multidimensions perceived by the same.	To have physical health, social relations, eat healthily, do physical activities, don't smoke or drink alcohol, leisure, acceptance of this phase, have faith and spirituality, family structure, financial stability, do good.

Chart created by authors.

DISCUSSION

The sample of articles analyzed was diverse, with studies from each continent: America (Canada, USA, Brazil), Oceania (New Zealand), Europe (Germany, Hungary, Latvia, Sweden, United Kingdom), Africa (Ethiopia) and Asia (Thailand). It has been found that, as addressed in the scientific literature, healthy aging is a global concern[3].

In terms of the participants, individuals under 60 years of age were considered in two studies. An Ethiopian article included Ethiopians over 50 years of age due to the expectation of life in this country being 54[15]. And in New Zealand, New Zealanders aged 55 and over were considered elderly[11.]

The knowledge produced about the perception of elderly people about healthy aging was discussed through the biological, psychological, spiritual and social dimensions.

Biological dimension

The elderly perceive healthy aging as the adoption of habits and behaviors inherent to lifestyle, with emphasis on healthy eating[11,13,14,18,19-21], physical activities[13-15,18,20-21], and not smoking or drinking alcohol[13,14,18,20,21]. These habits and behaviors are protective factors and help control chronic noncommunicable diseases (CNCDs)[22],

which represent the major causes of mortality in the elderly population through outcomes such as ischemic heart disease, strokes and chronic obstructive pulmonary disease[4,22].

The set of habits and behaviors described by the elderly is a priority theme in the National Health Promotion Policy (NHPP) in Brazil[23], and is expected to form part of Primary Health Care (PHC) through advice provided in educational groups on health, medical and nursing consultations and home visits, among other opportunities[22].

Thus, the efforts of professionals to prevent or control CNCDs focus heavily on the lifestyle of the individual. Such action contributes to the elderly assuming, in an isolated manner, the self-responsibility of acquiring a healthy lifestyle. From this perspective, scientific literature encompasses two distinct approaches, which involve either stimulating this posture or encouraging it with caution.

An American study[24] which stimulated self-responsibility in acquiring a healthy lifestyle considered a model described as a possible basis for enhancing PHC actions among the elderly with chronic conditions. This model consists of four pillars: "centered on the perspective of the elderly" – the elderly population considered as a heterogeneous group that requires individualized attention; "goal-oriented approach" – setting individualized, specific and achievable goals to be shared with the elderly; "individualized 'training' strategy for behavior change in health" – focused on the elderly and based on instrumentalization with knowledge that allows the awareness that triggers behavioral change to be achieved; and the "context in which healthy behavior occurs" – a network of meaningful relationships for the elderly that contribute to achieving their goals.

In contrast, another American study advocated cautiously encouraging actions aimed at self-responsibility in the adoption of a healthy lifestyle. It presented in a broad manner the discussion about the poor efficacy of actions directed at an individual lifestyle, emphasizing the need to tackle the deeper causes of CNCDs. It recognizes that the economic and social environment is capable of restricting or increasing opportunities as it interferes in the behavior of the population[25]. As a result, not

everyone is able to eat healthily, exercise properly, lose weight and avoid using tobacco, alcohol and other drugs[25].

In addition to understanding healthy aging as the adoption of habits and behaviors inherent to lifestyle, the elderly emphasized the importance of taking care of one's health. This involves performing routine medical check-ups, examinations, vaccinations[13] and managing diseases efficiently[11,18]. However, they did not associate healthy aging with disease[11-17,19-21].

Psychological Dimension

In the psychological dimension, the perspectives of the elderly on healthy aging were aggregated, with optimism appearing most frequently[11,13,16,18,19]. The older persons revealed that being positive and optimistic is an essential part of healthy aging, with optimism understood as the expectation that something positive will happen[26].

Optimism in aging may result from the presence of a social support network, quality of life and individual and social activities within the daily lives of the elderly[27]. Based on this understanding, a Brazilian study brought together scientific productions about optimism and health, and found a significant number of international studies with this theme, considering people with CNCDs. According to these individuals, optimism is considered a factor of protection and coping with the consequences of these injuries[28].

There is no well-defined concept for happiness as it varies according to the cultural and social context of each country[29]. In South Korea, a study of the elderly revealed an association between family and the perception of happiness. These individuals often described the importance of being together with family and living in peace with relatives[29]. It therefore appears that elderly persons with significant contact with family members and people close to them enjoy a broader sense of well-being than those without such contacts[30].

The welfare of the elderly is a vital component to be considered in public policies. In 2002, in Madrid, the Second World Assembly on Aging established the International Plan of Action on Aging, listing

priorities for action which included "well-being in old age"[31]. In 2015, the WHO report on aging and health encompassed well-being in the concept of healthy aging, emphasizing the importance of "promoting health and well-being throughout life"[3].

Accordingly, in this report, the WHO recommends that to achieve healthy aging, public policies, health services and professionals should work from an intersectoral perspective, connecting the elderly, family and society, and develop actions that promote the development and maintenance of functional capacity as a strategy that allows the well-being of the elderly population[3].

Spiritual dimension

This dimension brings together the perspectives of the elderly on healthy aging in relation to faith and spirituality. According to the studies that composed the analyzed sample, faith and spirituality provide support for dealing with the challenges of living with multiple sclerosis[11] and facing daily difficulties[19]. Most of these studies, however, while recognizing the importance of this theme for healthy aging, did not explore it further[12,15,17,21], with the exception of the articles on elderly Thai people[18,20].

For these individuals, food and care of the body are related to spirituality, as well as the practice of healing and worshipping of ancestors. The practice of healing involves taking care of oneself before consulting a doctor (such as body massages with a piece of wood to relieve muscle pain) and worshiping one's ancestors to preserve health, as failing to do so may result in one falling ill[18,20].

There is evidence that older people tend to be more religious than younger people[32]. Still, the elderly who live with chronic diseases often have a need to feel close to a higher power which gives them the strength to face difficulties[33].

Religiousness and spirituality can contribute to healthier lifestyles by assigning negative points of view to the consumption of drugs and alcoholic beverages, tobacco use and nonmarital sex, among others[32]. In addition, they can make it possible to deal with stressful life events[30], contribute to overcoming adversities, such as the loss of loved ones, the loss of physical abilities, and promote meaning in life. Faith can promote virtues such as humility, altruism, compassion, wisdom and gratitude[32].

Social dimension

The perspective of the elderly on healthy aging is closely related to social relationships. For these individuals, relating socially[11,13,16,21], with the family[12,15,19-21], friends[12,14,19], or with a partner[12] or engaging in collective leisure activities[13] are ingredients for healthy aging.

It was also emphasized that social relations with family members, children and partners or informal relationships with friends, neighbors and colleagues, as well as formal relationships with health and community services, are fundamental to the well-being of the elderly[30] and to healthy aging[3]. Yet strong social relationships can increase quality of life, and longevity and promote resilience[3].

There is ambivalence[3] involved with social relations as both actors involved in the relationship are influenced in a reciprocal and singular way. At the same time, one person may influence or contribute to a greater extent than the other. In this case, when the elderly participant in the social relationship receives support through such an interaction, it can be said that social support is provided[34]. This can alleviate everyday problems and promote physical and mental health[35]. As a support for health actions, social support can also contribute to increasing the sense of joy, self-esteem and self-confidence of an individual[34,35].

In addition to being supported, the elderly can also provide support. For many, supporting others is more important than receiving support, contributing to a strengthening of their self-esteem and social involvement[30]. This can be seen by their social contributions[17,18] and desire to do good[21] through voluntary work[11,18].

According to the WHO, voluntary work can positively influence the health of the elderly, favoring self-perception of health, reducing systemic arterial hypertension, increasing physical strength and gait

speed and reducing depressive symptoms[3], especially as it is socially valued and publicly recognized. It is worth mentioning that voluntary work should respect the autonomy of the elderly, or it may influence their mental health in a harmful way instead of bringing benefits[36].

Autonomy and independence were also perceived by the elderly as components for healthy aging. Autonomy is the ability to act and take decisions[13] while independence is the ability to perform activities without the help of other people. In this sense, the studies reviewed related autonomy to financial security[11,12,14], which has also been found to be a component of healthy aging[3]. In Brazil, the National Policy for the Health of the Elderly states that income contributes to the health of the elderly, demonstrating that being healthy should include financial independence, physical health, mental health, functional capacity and social support[37]. This policy also stresses that care for the elderly, at all levels, must preserve their autonomy and independence[37].

Independence for the elderly involves caring for oneself[15,16] and for others[13], enjoying activities[13,16] and home management[14]. Elderly persons with multiple sclerosis connected the environment with independence when they noted the need to adapt the environment in which they lived to be able to live independently[11]. It is because of this insight that the WHO highlights the importance of considering the environment in the promotion of healthy aging, noting that it can be a resource or a barrier[3].

Unlike Western cultures, studies that focused on Thai seniors discussed interdependence, rather than autonomy and independence. In the Thai culture the elderly are a central part of rituals, their children and grandchildren demonstrate love and respect towards them, they receive support from their families in many ways (respect, love, care, financial, clothing, among others) and they are honored in village festivals[18,20]. This interdependence favors self-esteem, involves companionship, contact, concern and reciprocity in care[18,20].

One of the limitations of this study was that it featured a small sample of articles, although the survey reflected the perception of the elderly in diversified countries in relation to cultural, political and social aspects, which influence the population's perception of healthy aging directly and indirectly.

The synthesis of knowledge about healthy aging from the perspective of the elderly can support the actions of professionals who work with this population in order to stimulate and value the social determinants involved, leading to guidance directed exclusively towards the adoption of habits and behaviors inherent to lifestyle in order to age in a healthy manner.

CONCLUSION

The study revealed that the perception of healthy aging brings together biological, psychological, spiritual and social dimensions. In the biological dimension, the need to adopt habits and behaviors inherent to lifestyle to age in a healthy way was clear. Such a position encompasses two distinct discussions: stimulating this behavior or encouraging it with caution, recognizing that the economic and social environment can restrict or expand opportunities, and as a consequence interfere in the behavior of the population.

In the psychological dimension, the elderly described optimism and happiness as important for healthy aging. In the spiritual dimension, most of the elderly recognized faith and spirituality as elements for healthy aging, yet the authors of the studies did not explore this dimension further, except for studies involving Thai seniors.

In the social dimension, social relationships with family, friends and partners were highlighted. There is some ambivalence in this dimension, which is evidenced by the need to receive support and simultaneously support and contribute, mainly through voluntary work.

In this context, further studies are recommended to broaden knowledge of the perspective of the elderly on healthy aging in order to contribute to one of the guidelines of the Global Strategy and Plan of Action for Aging and Health 2016-2020, and to strengthen the relationship between social determinants and healthy aging.

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