Vulnerability and Functional Decline in older people in Primary Health Care: a longitudinal study

Juliana Fernandes Cabral[1]
Ageo Mário Cândido da Silva[2]
Amanda Cristina de Souza Andrade[2]
Edilene Gianelli Lopes[2]
Inês Echenique Mattos[3]

Abstract

Objective: To assess the association between vulnerability and functional decline for Instrumental Activities of Daily Living (IADL) in older people treated in Primary Health Care (PHC) units in the municipality of Várzea Grande (MT), Brazil. *Method*: A longitudinal study was carried out with 304 older people with a 24-month follow-up. The main exposure variable vulnerability was measured at baseline using the Vulnerable Elders Survey (VES-13). The dependent variable was "functional decline in IADL" defined as the decrease of at least one point in the score of functional capacity assessed by the Lawton and Brody Scale between baseline evaluation and the end of follow-up. The associations between the functional decline in IADL and vulnerability, health conditions, sociodemographic factors, self-rated health, lifestyle, and adverse health events were estimated using the Odds Ratio (OR) with binary logistic regression. *Results*: A decline in functional capacity in IADL was observed in 35,20% of the cohort members. In the final model, functional decline was associated with the interaction between vulnerability and physical inactivity (OR = 3.12, 95%CI, 1.42-6.86), dissatisfaction with life (OR = 2.23, 95%CI, 1.09-4.56), and hospitalization (OR = 2.01, 95%CI, 1.18-3.41). *Conclusion*: Functional decline in IADL was greater in vulnerable older people who were physically inactive, in those dissatisfied with life, and those who were hospitalized during the follow-up period. These conditions must be identified early so that actions to prevent functional decline could be implemented in addition to programs to encourage older people to exercise.

Keywords: Health of the Elderly. Frailty. Longitudinal Studies. Primary Health Care.

[1] Universidade do Estado de Mato Grosso (Unemat), Departamento de Enfermagem, Tangará da Serra, MT, Brasil.

[2] Universidade Federal de Mato Grosso (UFMT), Instituto de Saúde Coletiva, Programa de Pós-graduação em Saúde Coletiva. Cuiabá, MT, Brasil.

[3] Fundação Oswaldo Cruz (FIOCRUZ), Escola Nacional de Saúde Pública, Departamento de Epidemiologia. Rio de Janeiro, RJ, Brasil.

The authors declare there are no conflicts of interest in relation to the present study.

No funding was received in relation to the present study.

Correspondence
Juliana Fernandes Cabral
julianacabral@unemat.br

Received: October 9, 2020
Approved: May 20, 2021

http://dx.doi.org/10.1590/1981-22562021024.200302

INTRODUCTION

Functional capacity is an important indicator of how independent the older person is. Population-based studies generally assess functional capacity through the ability to perform Basic Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL), with the Katz Index and the Lawton and Brody scale being the most used instruments for the respective assessments[1].

National studies on the subject are mostly cross-sectional[2-8]. However, longitudinal studies are needed to assess changes in the functional capacity of the older person over time so that longevity with greater independence, autonomy, and quality of life can be achieved[9].

In Brazil, few longitudinal studies with older people living in the community addressed the risk factors for functional decline in basic and/or instrumental activities of daily living[10-12]. Among the risks identified are being 80 years old and over, low education, no professional activity, physical inactivity, not having a partner, presenting symptoms of depression, and using psychotropic drugs.

Although functional decline is mostly linked to the aging process, it cannot be related to normal aging, but to the most frequent disabilities in the older person, such as cognitive disability, postural instability, lack of mobility, incontinence, communicative disability, and iatrogenesis[13]. These disabilities are predictors of mortality, hospitalization, and institutionalization in older people[13]. Based on this premise, the Vulnerable Elders Survey (VES-13)[14] was developed. It is a simple and effective tool to identify vulnerable older persons with an increased risk of functional decline or death in two years.

The VES-13 is the instrument recommended by the Ministry of Health (MoH) to assess older people and is part of the Health Record Booklet of the Older Person[15], with the advantage of being short and easy to apply[14]. In Brazil, the original version of the VES-13[14] underwent a cross-cultural adaptation[16] and validation[17]. Although the condition of vulnerability predicts adverse health events including functional decline, none of the aforementioned studies[10-12] assessed the association between physical vulnerability and functional decline, and no longitudinal studies were found in the Brazilian context discussing this association with a follow-up greater than six months.

Considering the use of the VES-13 instrument recommended by the MoH, and due to the importance of monitoring vulnerable older people for adverse health outcomes, the present study aimed to assess the association between vulnerability and functional decline for Instrumental Activities of Daily Living (IADL) of older people treated in Primary Health Care (PHC) units in the municipality of Várzea Grande (MT).

METHOD

A longitudinal study with a 24-month follow-up of older people registered in PHC units in the municipality of Várzea Grande, MT, Brazil. Baseline data were collected from March to June 2016, and the follow-up period was from July to October 2018. Várzea Grande (MT) is the second-largest city in the state with an estimated population of 287,526 inhabitants in 2020[18]. In 2016, the municipality had 15 PHC units, and 11 of them were selected to comprise the study sample as they offer curricular internships in public health.

In the baseline, a two-stage cluster sampling was adopted: I) PHC units; II) older people selected in proportion to the size of the population of people aged 60 or over registered in each unit. The sample size followed the procedures proposed for finite populations using a confidence level of 0.95, a tolerable sampling error of 0.05, and an assumed prevalence of vulnerability of 0.50; 10% were added to compensate for possible losses totaling 377 older people. More details on baseline sampling and data collection can be found in the publication of the initial study[19].

Of the 377 older people in the baseline, 304 participated in the follow-up. The losses during the follow-up were due to the older person not being found after 3 visits to their home at different times and unsuccessful telephone contact (n=49), and deaths (n=24) during the follow-up period. Confirmatory data referring to deaths were collected

in the records of the Mortality Information System (SIM) made available by the Municipal Health Department of Várzea Grande.

To test the power of the follow-up sample (n=304), a post-hoc test was carried out considering an Odds Ratio of 2.3, and an exposure ratio of 0.5 and 0.3 between the comparison groups and the significance level of 0.05; the study sample showed a power of 91.2%.

The exclusion criteria from the baseline study[19] were older persons who presented cognitive impairment detected by the application of the Mini-Mental State Examination (MMSE) and cases of severe impairment of sight and hearing or severe sequelae of Cerebrovascular Accident (CVA) preventing the older person from responding to the questionnaire. In cases of refusal, when the older person was not at home at the moment of the interview, or when they had a cognitive deficit, they were replaced by the nearest resident older person who was also registered in the PHC units.

The participants were interviewed at home by trained interviewers guided by the Interviewer's Manual after carrying out a pilot study and a calibration process. In the baseline, older people were accessed during the visit of the Community Health Agent, and they were invited to voluntarily participate in the research. In case they accepted, they were interviewed by the interviewer; if it was not possible at that moment, it was scheduled for another time. The follow-up was based on the address list and the identification of the older people participating in the baseline, and the interviewers visited their homes to invite them to participate again in the research.

The study response variable was assessed by the functional capacity in IADL measured at the baseline and in the follow-up by the Lawton and Brody Scale adapted for the Brazilian population[20]. The functional decline (yes, no) was defined as a decrease of at least 1 point in the score of the functional capacity in IADL between the baseline collection and the follow-up regardless of the degree of dependence of the older person in the baseline[21].

The scale assesses eight activities such as using the telephone, using means of transportation, shopping, tidying the house, cooking meals, doing the laundry, controlling money, and taking medication. Each question has three possible answers, and each answer generates a score from 1 to 3: 1 point for those who do not perform the said activity (dependent); 2 points for those who perform the activity with assistance (partially dependent), and 3 points for those who perform the activity without assistance (independent). The final score is the sum of the eight domains and can vary from 8 to 24 points; the higher the score, the more independent is that individual[21].

The main exposure variable of the study was vulnerability (yes; no) measured only at the baseline by the instrument Vulnerable Elders Survey (VES-13) adapted and validated to use in the Brazilian population[16,17]. The instrument comprises 13 items including age, self-reported health, physical capacity, and functional capacity. The score varies between 0 and 13 points, with a score equal to or greater than three (3.0) being considered as the cutoff point to classify the individual as vulnerable[14].

The covariables related to health conditions were assessed at the baseline and are explained in the initial study[19]: The Geriatric Depression Scale 15 (GDS-15)[22] used to assess depressive symptoms (score ≤5 points without depressive symptoms, and score ≥6 points with depressive symptoms), the Reduced Mini Nutritional Assessment (MNA)[23] to assess the nutritional status. The sum of the scores obtained in each MNA item is used to classify individuals into three categories (malnutrition: 0 to 7 points; at risk of malnutrition: 8 to 11 points; and good malnutrition: 12 to 14 points). In the present study, we combined the categories of malnutrition and at risk of malnutrition. The Cumulative Illness Rating Scale - Geriatric (CIRS-G)[24] was used to assess comorbidity (without comorbidity of severity level 3 or 4; with comorbidity of severity level 3 or 4), and the instrument Tilburg Frailty Indicator (TFI)[25] was used to assess frailty (yes: ≥ 5 points; no: <5 points), in addition to polypharmacy (yes; no) that is considered as the continuous use of 5 or more medications.

Other covariables in the study were sociodemographic conditions, self-rated health, lifestyle, and adverse health events collected in

the follow-up. Sociodemographic conditions: a) gender (male; female); b) age group (60 to 69 years; 70 years and over); c) marital status (lives without a partner, lives with a partner); d) education (illiterate; literate); per capita income (up to ½ minimum wage; >½ minimum wage). Self-rated health: positive assessment (self-reported good or very good health), and negative assessment (self-reported regular, bad, or very bad health). Lifestyle: a) satisfaction with life (no; yes); b) smoking (yes for those who currently smoke or have already smoked, no for those who have never smoked); c) drinking alcohol (yes for those who currently drink alcohol or have already had this habit, no for those who have never drunk alcohol); d) regular exercise in the 12 months before data collection (no; yes). Adverse health events: a) refer at least one morbidity (yes; no); b) severe illness in the last 12 months before data collection (yes; no); c) hospitalization, falls, and fractures in the last 24 months before data collection (yes; no).

The Odds Ratio (OR) (with 95%CI for OR) was used to measure the associations between the dependent variable (functional decline) and the independent variables: vulnerability, health and sociodemographic conditions, self-rated health, lifestyle, and adverse health events and were estimated by Logistic Regression. The covariables presenting *p*-value <0.20 in the bivariate analysis were included in the multiple analysis. The stepwise backward model was used, in which variables that were not statistically significant were progressively removed from the model, with variables with *p*-value <0.05 being maintained in the final model. The main exposure variable vulnerability and the adjustment variables gender and age group were maintained in the multiple models, regardless of statistical significance. The interactions between vulnerability and the covariables of the final model were tested.

The present study was submitted and approved by the Research Ethics Committee of Universidade do Estado de Mato Grosso under number 2,771,193 and followed all the recommendations of Resolutions 466/2012, 510/2016, and 580/2018 of the Brazilian National Health Council.

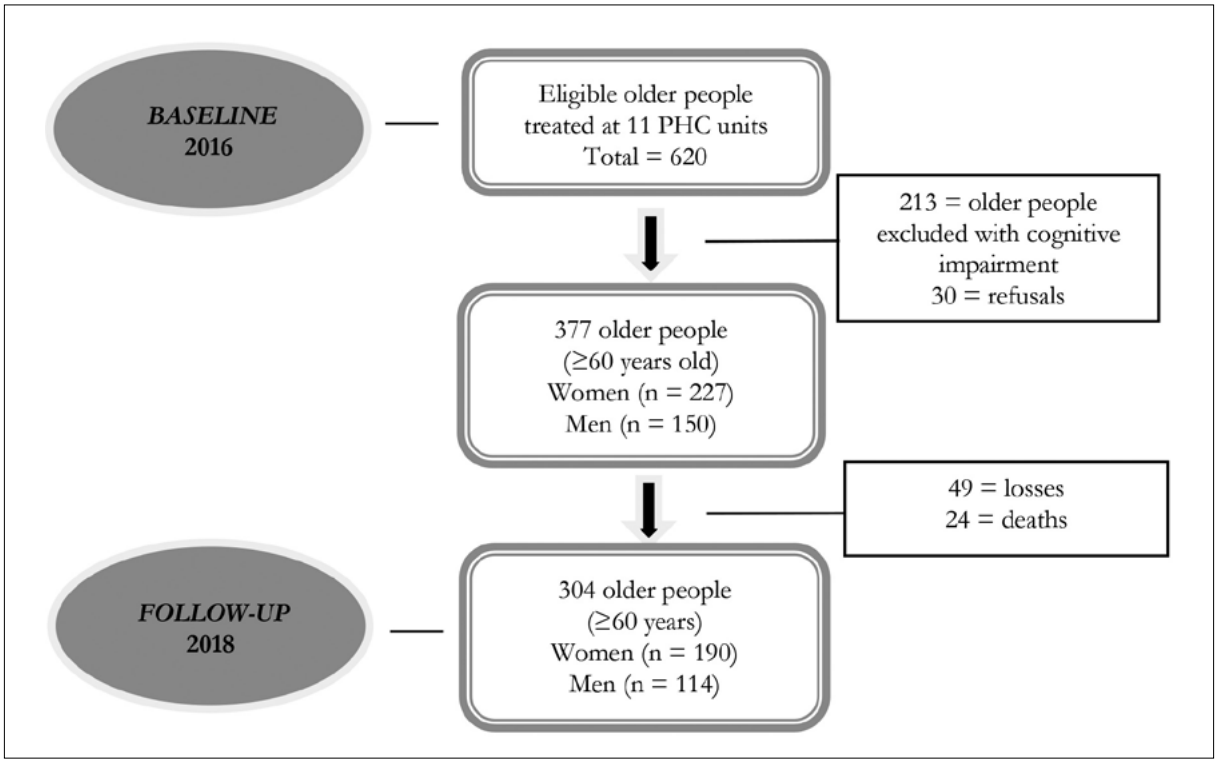

Figure 1. Flowchart of older people participating in the longitudinal study (2016/2018). Várzea Grande (MT), 2020.

RESULTS

The study had the participation of 304 older people, and in the baseline 62.30% of them were dependent for IADLs and 49.07% were vulnerable. In the follow-up, 62.50% were dependent on IADLs and the decline in functional capacity for IADL corresponded to 35.20%. As for the sociodemographic profile, the majority were females (62.50%) aged 70 years and over (53.29%) with an average of 71.79 years and a median of 70 years (SD±7.42); 78.62% self-declared black and brown; 55.92% had a partner (married or were in a common-law marriage); 66.12% attended elementary school; 53.95% had a monthly income per capita >½ minimum wage.

The crude analysis of sociodemographic variables, self-rated health, and lifestyle showed a functional decline of older people who reported being dissatisfied with life (OR =2.43, 95%CI, 1.21-8.8) and who did not exercise (OR =2.50, 95%CI, 1.40-4.44) (Table 1).

In the crude analysis none of variables related to health conditions showed a statistically significant association (Table 2).

The crude analysis of the variables related to adverse health events showed a functional decline in older people who had some serious illness during the follow-up (OR =2.10, 95%CI, 1.23-3.61), were hospitalized (OR =1.96, 95%CI, 1.17-3.27), suffered falls (OR =1.67, 95%CI, 1.03-2.71) or fractures (OR =2.80, 95%CI %, 1.03-7.58) (Table 3).

The variables that remained with a statistically significant association with functional decline in the final model were the interaction between vulnerability and physical inactivity (OR = 3.12, 95%CI, 1.42-6.86), being dissatisfied with life (OR = 2.23, 95%CI, 1.09-4.56) and having been hospitalized in the 24 months before the follow-up data collection (OR = 2.01, 95%CI, 1.18-3, 41) (Table 4).

Table 1. Functional decline in Instrumental Activities of Daily Living of older people according to sociodemographic variables, self-rated health, and lifestyle, measured in the follow-up. Várzea Grande, MT, Brazil, 2020.

Variables	Functional decline				
	n/N	%	OR	95%CI	*p*-value
Gender					
Male	38/112	33.93	1	0.67-1.78	0.724
Female	69/192	35.94	1.09		
Age group (years)					
60 a 69	56/167	33.53	1	0.73-1.89	0.502
70 and over	51/137	37.23	1.18		
Marital status					
Lives with a partner	62/170	36.47	1	0.55-1.42	0.601
Lives without a partner	45/134	33.58	0.88		
Education					
Literate	68/195	34.87	1	0.64-1.70	0.874
Non-literate	39/109	35.78	1.04		
Per capita income (in minimum wages)					
Up to 1 minimum wage	34/96	35.42	1	0.59-1.64	0.957
≥1 minimum wage	73/208	35.10	0.99		
Self-rated health					
Positive rating	26/95	27.37	1	0.99-2.85	0.055
Negative rating	81/209	38.76	1.68		

to be continued

Continuation of Table 1

Variables	Functional decline				
	n/N	%	OR	95%CI	*p*-value
Satisfaction with life					
Yes	87/267	32.58	1	1.21-4.88	**0.012**
No	20/37	54.05	2.43		
Smoking					
No	48/147	32.65	1	0.76-1.96	0.409
Yes	58/157	37.18	1.22		
Drinking alcohol					
No	53/145	36.55	1	0.56-1.43	0.637
Yes	54/159	33.96	0.89		
Physical Activity					
Yes	19/88	21.59	1	1.40-4.44	**0.002**
No	88/216	40.74	2.50		

OR: *Odds Ratio*; 95%CI: 95% Confidence Interval; Minimum Wage: 954,00 BRL.

Table 2. Functional decline in Instrumental Activities of Daily Living for older people according to variables of health conditions measured in the baseline. Várzea Grande, MT, Brazil, 2020.

Variables	Functional decline				
	n/N	%	OR	95%CI	*p*-value
Vulnerability (VES-13)					
Not vulnerable	49/156	31.41	1	0.88-2.26	0.156
Vulnerable	58/148	39.19	1.41		
Comorbidity level 3 or 4 (CIRS-G)					
No	66/183	36.07	1	0.56-1.47	0.697
Yes	41/121	33.88	0.91		
Nutrition (MNA)					
No nutritional risk	57/166	34.34	1	0.68-1.74	0.731
Malnutrition and at risk	50/138	36.23	1.09		
Depression (GDS-15)					
No depressive symptoms	74/212	34.91	1	0.63-1.74	0.872
With depressive symptoms	33/92	35.87	1.04		
Fragility (TFI)					
Not frail	38/105	36.19	1	0.57-1.53	0.792
Frail	69/199	34.67	0.94		
Polypharmacy*					
No	76/218	34.86	1	0.60-1.89	0.823
Yes	24/66	36.36	1.07		

OR: *Odds Ratio*; 95%CI: 95% Confidence Interval. * Use of ≥5 medications.

Table 3. Functional decline in Instrumental Activities of Daily Living of older people according to variables of adverse health events measured in the follow-up. Várzea Grande, MT, Brazil, 2020.

Variables	Functional decline				
	n/N	%	OR	95%CI	*p*-value
Refers to at least one morbidity					
No	2/11	18.18	1	0.53-11.85	0.244
Yes	105/293	35.84	2.51		
Severe illness					
No	72/232	31.03	1	1.23-3.61	**0.007**
Yes	35/72	48.61	2.10		
Hospitalization					
No	67/218	30.73	1	1.17-3.27	**0.010**
Yes	40/86	46.51	1.96		
Falls					
No	60/194	30.93	1	1.03-2.71	**0.039**
Yes	47/110	42.73	1.67		
Fractures					
No	97/287	33.80	1	1.03-7.58	**0.043**
Yes	10/17	58.82	2.80		

OR: *Odds Ratio*; 95%CI: 95% Confidence Interval.

Table 4. Results of the adjusted Logistic Regression between the independent variables and the functional decline (dependent variable). Várzea Grande, MT, Brazil, 2020.

Variables		OR Adjusted	(95%)CI	*p*-value
Gender				
Male		1	0.60-1.62	0.857
Female		0.95		
Age group (years)				
60 to 69		1	0.73-1.97	0.481
70 and over		1.20		
Interaction between Vulnerability and Physical Activity				
Not vulnerable	Active	1		
Not vulnerable	Inactive	2.22	0.99-4.90	0,049
Vulnerable	Active	1.23	0.43-3.54	0,695
Vulnerable	Inactive	3.12	1.42-6.86	**0,005**
Satisfaction with life				
Yes		1	1.09-4.56	**0.029**
No		2.23		
Hospitalization				
No		1	1.18-3.41	**0.010**
Yes		2.01		

OR: *Odds Ratio*; 95%CI: 95% Confidence Interval.

DISCUSSION

This is a longitudinal study with a 24-month follow-up of older people registered in PHC units in the municipality of Várzea Grande (MT). The study findings showed positive association between functional decline and the interaction between vulnerability and physical inactivity, along with positive associations between functional decline and dissatisfaction with life and hospitalization in the 24 months before the follow-up data collection.

The functional decline ratio among the older people surveyed was high when compared to other studies carried out with older people living in communities who also used the Lawton and Brody scale in the assessment[5,6]. However, comparison with other studies is made difficult by the variety of functional capacity measurement scales used, different definitions of functional decline, types of study, and target populations. In Brazil, longitudinal studies on the functional decline for the IADLs are still scarce, especially among older people living in the community[11].

A longitudinal study[26] carried out with institutionalized Brazilian older people living in nursing homes in the city of Natal (RN) analyzing the probability of maintaining the functional capacity for Basic Activities of Daily Living (ADL) showed an incidence of functional decline of 54% in two years. The longitudinal study[11] carried out in Lafaiete Coutinho (BA) with older people living in the community who were initially independent for ADL showed that the incidence of functional decline was 15.3% in a three-year follow-up. A population-based longitudinal study[12] with data from the cohort of older people from the Bambuí Project (MG) between the years 1998 and 2011 with independent older people for IADL and ADL at the baseline showed an incidence of functional decline of 58% for IADL, and 44.5% for ADL. The discrepant results of the incidence of functional decline for ADLs were probably due to the target population in the first study[26] being of institutionalized older people who are physically more vulnerable when compared to older people living in the community in the second study[11], and with the longest follow-up period in the Bambuí cohort[12].

Vulnerability was associated with functional decline among inactive older people. A cohort study[27] monitoring 635 older people in the Primary Health Care in the city of Rio de Janeiro (RJ) using VES-13 to assess vulnerability and the Lawton and Brody scale to assess the functional capacity in IADL identified that the functional decline was greater among vulnerable individuals in a six-month follow-up (OR =1.95; 95%IC 1.49–2.54).

Vulnerability and physical inactivity in represented a greater risk for the development of functional decline in IADL. This association can be explained by the fact that physical inactivity worsens the condition of vulnerability and makes the older person stop improving their cardiorespiratory and muscular fitness, bone and functional health[28]. The World Health Organization (WHO) encourages the practice of physical activities, which includes activities for recreation or leisure, transportation (walking or cycling), occupation (if the older person still works), housework, sports or planned exercises within the scope of daily, family, and community activities[28].

The more the older person practice physical activities, the lower the risk to develop disabilities in the ADL and IADL[28,29]. According to the new WHO Guidelines (2020) on physical activity and sedentary behavior resulting from a comprehensive systematic review, there is strong evidence of an inverse dose-response relationship between the amount of aerobic activity and the risk of functional physical limitations of the older people[28].

Population-based research following multiple cohorts and assessing risk factors for functionality loss in older people concluded that those with low socioeconomic status and the presence of risk factors such as chronic diseases, physical inactivity, high alcohol and tobacco consumption, in addition to obesity, had a greater loss of functional capacity[9].

Two cohorts of older people living in the community were monitored, one with 403 Italian older people and the other with 395 Dutch older people aged 60 to 70 years and assessed the functional decline in a 9-year follow-up period using some items from the ADL and IADL. Most older people reported having no functional decline in the baseline[30]. The

predictors for functional limitations in men were fear of falling and alcohol consumption, whereas in women the predictors were age, physical activity, living alone, economic satisfaction, gait speed, Body Mass Index, and cardiovascular diseases[30].

Studies carried out with Brazilian older people living in the community found an association between lower level of physical activity and functional disability in the IADL[7,10]. However, physical inactivity alone does not always explain disability, as evidenced in the longitudinal study[11] in a municipality of Bahia with non-institutionalized older people showing no association between functional decline and insufficient physical activity.

The fact that the older person is dissatisfied with life was also associated with functional decline, which corroborates the findings of Nunes et. al.[5] showing that the more the older person is satisfied with life, the lower the prevalence of functional disability. This positive association between greater satisfaction with life and independence in IADLs is justified by the fact that functionality is related to better maintenance of health and quality of life of the older person, and therefore greater satisfaction with life during aging[31].

A study assessing depression in older people living in the community in southern Brazil found a strong association with dissatisfaction with life indicating that this variable is a good marker for tracking depressive symptoms in older people[8]. In turn, good economic conditions, high education, absence of physical disabilities, positive self-rated health, cognitive ability, and access to healthcare services are aspects to explain higher levels of satisfaction with life[32]. Functional disability in ADL and IADL was also associated with the use of benzodiazepines, antidepressants, and antipsychotics, drugs used for mood and behavioral disorders[12].

Hospitalization of the older person in the period between baseline and the follow-up data collection was associated with functional decline in IADL. Hospitalization of older people leads to functional decline, disability, morbidity, and mortality[33]. Hospitalization is a risk for the older population, with increased chances for the development of adverse events, with the most important one being functional decline. The main risk factors for functional decline associated with hospitalization are age, immobility, cognitive impairment, and functional status before hospitalization[34]. Admi et. al.[33] found disagreements in the studies regarding the timing of the functional decline, pointing out that it may occur at pre-admission, admission, during hospitalization, and even after hospital discharge. A cohort of hospitalized older people showed a worsening of functionality after hospital discharge[35].

One of the advantages of our study was the longitudinal 24-month follow-up of the older people. However, the loss of participants during the follow-up may represent a limitation for this type of study. Interviews carried out by trained staff may have minimized both losses and information bias due to the standardization of data collection. Another probable limitation of the present study was that the information on functional capacity was self-reported, and it was not possible to assess the risk of developing a functional decline since there was already a high ratio of older people with disabilities in the baseline.

The follow-up study of this population was important for a better understanding of the conditions associated with functional decline of older people treated in the PHC units. The results of the present study reinforce the importance of the early identification of events that could cause functional decline of the older person in order to intervene and prevent the development of dependence.

CONCLUSION

The functional decline of older people treated in the PHC units was associated with the interaction between vulnerability and physical inactivity, dissatisfaction with life, and hospitalization in a two-year follow-up period.

These results show the importance of knowing the condition of vulnerability of older people in the community because it can indicate adverse health conditions such as functional decline, which can lead to the social isolation of the older person, dependence on care, financial dependence and physical limitations, among others.

It is suggested that longitudinal studies must follow independent older people for Instrumental Activities of Daily Living at the baseline for a longer period to favor a more extensive assessment of the outcomes related to vulnerability and its predicting factors, besides assessing the effect of physical activity in reversing vulnerability. It would also be important to develop a gerontological care plan identifying the vulnerable older people living in the community, and subsequently make a multidimensional geriatric assessment to investigate the causes and intervene on them, thus preventing functional decline and/or reversing it. Besides, programs to encourage the practice of physical activities should be implemented, thus favoring the improvement of functional capacity, quality of life, and autonomy of these older people.

Editado por: Ana Carolina Lima Cavaletti

REFERENCES

1. Veras RP. Guia dos Instrumentos de Avaliação Geriátrica [Internet]. Rio de Janeiro: Unati/UERJ; 2019 [cited 17 Abr. 2021]. Available from: https://www.unatiuerj.com.br/Guia%20dos%20instrumentos%20Avaliacao%20Geriatrica.pdf.
2. Gavasso WC, Beltrame V. Capacidade funcional e morbidades referidas: uma análise comparativa em idosos. Rev Bras Geriatr Gerontol. 2017;20(3):399-409. Available from: https://doi.org/10.1590/1981-22562017020.160080.
3. Aguiar BM, Silva PO, Vieira MS, Costa FM, Carneiro JA. Avaliação da incapacidade funcional e fatores associados em idosos. Rev Bras Geriatr Gerontol. 2019;22(2):e180163. Available from: https://doi.org/10.1590/1981-22562019022.180163.
4. Cardoso JDC, Oliveira AD, Cunha CRT, Silva KM. Capacidade funcional de idosos residentes em zona urbana. Rev Enferm UFSM. 2019;9(19):1-14. Available from: https://doi.org/10.5902/2179769234095.
5. Nunes JD, Saes MO, Nunes BP, Siqueira FCV, Soares DC, Fassa MEG, et al. Indicadores de incapacidade funcional e fatores associados em idosos: estudo de base populacional em Bagé, Rio Grande do Sul. Epidemiol Serv Saúde. 2017;26(2):295-304. Available from: https://doi.org/10.5123/s1679-49742017000200007.
6. Pereira LC, Figueiredo MLF, Beleza CMF, Andrade EMLR, Silva MJ, Pereira AFM. Fatores preditores para incapacidade funcional de idosos atendidos na atenção básica. Rev Bras Enferm. 2017;70(1):112-8. Available from: https://doi.org/10.1590/0034-7167-2016-0046.
7. Virtuoso-Júnior JS, Tribess S, Smith Menezes A, Meneguci J, Sasaki JE. Fatores associados à incapacidade funcional em idosos brasileiros. Rev Andal Med Deporte. 2016. Available from: https://doi.org/10.1016/j.ramd.2016.05.003.
8. Bretanha AF, Facchini LA, Nunes BP, Munhoz TN, Tomasi El, Thumé E. Sintomas depressivos em idosos residentes em áreas de abrangência das Unidades Básicas de Saúde da zona urbana de Bagé, RS. Rev Bras Epidemiol. 2015;18(1):1-12. Available from: https://doi.org/10.1590/1980-5497201500010001.
9. Stringhini S, Carmeli C, Jokela M, Avendaño M, McCrory C, d'Errico A, et al. Socioeconomic status, non-communicable disease risk factors, and walking speed in older adults: multi-cohort population based study. BMJ. 2018;360:k1046. Available from: https://doi.org/10.1136/bmj.k1046.
10. Ikegami EM, Souza LA, Tavares DMS, Rodrigues LR. Capacidade funcional e desempenho físico de idosos comunitários: um estudo longitudinal. Ciênc Saúde Colet. 2020;25(3):1083-90. Available from: https://doi.org/10.1590/1413-81232020253.18512018.
11. Matos FS, Jesus CS, Carneiro JAO, Coqueiro RS, Fernandes MH, Brito TA. Redução da capacidade funcional de idosos residentes em comunidade: estudo longitudinal. Ciênc Saúde Colet. 2018;23(10):3393-401. Available from: https://doi.org/10.1590/1413-812320182310.23382016.
12. Falci DM, Mambrini JVM, Castro-Costa E, Firmo JOA, Lima-Costa MF, Loyola Filho AI. Uso de psicofármacos prediz incapacidade funcional entre idosos. Rev Saúde Pública. 2019;53(21):1-10. Available from: https://doi.org/10.11606/s1518-8787.2019053000675.
13. Moraes EM. Atenção à saúde do Idoso: aspectos conceituais. Brasília, DF: OPAS; 2012. Available from: https://bibliodigital.unijui.edu.br:8443/xmlui/bitstream/handle/123456789/5574/aten%c3%a7%c3%a3o%20a%20saude%20do%20idoso.pdf?sequence=1&isAllowed=y.

14. Saliba D, Elliott M, Rubenstein LZ, Solomon DH, Young RT, Kamberg CJ, et al. The Vulnerable elders survey: a tool for identifying vulnerable older people in the community. J Am Geriatr Soc. 2001;49(12):1691-9. Available from: https://doi.org/10.1046/j.1532-5415.2001.49281.x.

15. Brasil. Ministério da Saúde, Secretaria de Atenção à Saúde. Manual para utilização da Caderneta de Saúde da Pessoa Idosa. Brasília, DF: Ministério da Saúde; 2018. Available from: http://bvsms.saude.gov.br/bvs/publicacoes/manual_utilizacao_caderneta_pessoa_idosa.pdf.

16. Luz LL, Santiago LM, Silva JFS, Mattos IE. Primeira etapa da adaptação transcultural do instrumento The Vulnerable Elders Survey (VES-13) para o Português. Cad Saúde Pública. 2013;29(3):621-8. Available from: https://www.scielosp.org/pdf/csp/2013.v29n3/621-628/pt .

17. Luz LL, Santiago LM, Silva JFS, Mattos IE. Psychometric properties of the Brazilian version of the Vulnerable Elders Survey-13 (VES-13). Cad Saúde Pública. 2015;31(3):507-15. Available from: https://doi.org/10.1590/0102-311x00011714.

18. Instituto Brasileiro de Geografia e Estatística, Diretoria de Pesquisas, Coordenação de População e Indicadores Sociais. Estimativas da população residente com data de referência 1ª de julho de 2020: Várzea Grande: IBGE; 2020. Available from: https://cidades.ibge.gov.br/brasil/mt/varzea-grande/panorama.

19. Cabral JF, Silva AMC, Mattos IE, Neves AQ, Luz LL, Ferreira DB, et al. Vulnerabilidade e fatores associados em idosos atendidos pela Estratégia Saúde da Família. Ciênc Saúde Colet. 2019;24(9):3227-36. Available from: https://doi.org/10.1590/1413-81232018249.22962017.

20. Santos RL, Virtuoso-Júnior JS. Confiabilidade da versão brasileira da escala de atividades instrumentais de vida diária. Rev Bras Promoç Saúde. 2008;21(4):290-6. Available from: https://doi.org/10.5020/575.

21. Lawton MP, Brody EM. Assessment of older people: self-maintaining and instrumental activities of daily living. Gerontologist. 1969;9:179-86. Available from: https://doi.org/10.1093/geront/9.3_Part_1.179.

22. Almeida OP, Almeida SA. Short versions of the geriatric depression scale: a study of their validity for the diagnosis of a major depressive episode according to ICD-10 and DSM-IV. Int J Geriatr Psychiatry. 1999;14(10):858-65. Available from: https://doi.org/10.1002/(sici)1099-1166(199910)14:10%3C858::aid-gps35%3E3.0.co;2-8.

23. Kaiser MJ, Bauer JM, Ramsch C, Uter W, Guigoz Y, Cederholm T, et al. Validation of the Mini Nutritional Assessment Short-Form (MNA-SF): a practical tool for identification of nutritional status. J Nutr Health Aging. 2009;13(9):782-8. Available from: https://doi.org/10.1007/s12603-009-0214-7.

24. Miller MD, Paradis CF, Houck PR, Mazumdar S, Stack JA, Rifai AH, et al. Rating chronic medical illness burden in geropsychiatric practice and research: application of the Cumulative Illness Rating Scale. Psychiatry Res. 1992;41(3):237-48. Available from: https://doi.org/10.1016/0165-1781(92)90005-n.

25. Santiago LM, Luz LL, Mattos IE, Gobbens RJ. Cross-cultural adaptation of the Tilburg Frailty Indicator (TFI) for use in the Brazilian population. Cad Saúde Pública. 2012;28(9):1795-1801. Available from: https://doi.org/10.1590/S0102-311X2012000900018.

26. Jerez-Roig J, Ferreira LMBM, Araújo JRT, Lima KC. Functional decline in nursing home residents: a prognostic study. PLoS ONE. 2017;12(5):e0177353. Available from https://doi.org/10.1371/journal.pone.0177353.

27. Ferreira DB, Santiago LM, Mattos IE. The role of VES-13 as a predictor of adverse outcomes in elderly assisted by primary care, Brazil. Innov Aging. 2017;1(Supl 1):1-9. Available from: https://dx.doi.org/10.1093%2Fgeroni%2Figx004.4108.

28. Bull FC, Al-Ansari SS, Biddle S, Borodulin K, Buman M, Cardon G, et al. World Health Organization 2020 guidelines on physical activity and sedentary behavior. Br J Sports Med. 2020;54:1451-62. Available from: http://dx.doi.org/10.1136/bjsports-2020-102955.

29. Paterson DH, Warburton DE. Physical activity and functional limitations in older adults: a systematic review related to Canada's Physical Activity Guidelines. Int J Behav Nutr Phys Act. 2010;7(38):1-9. Available from: https://doi.org/10.1186/1479-5868-7-38.

30. Jonkman NH, Del Panta V, Hoekstra T, Colpo M, van Schoor NM, Bandinelli S, et al. Predicting trajectories of functional decline in 60- to 70-year-old people. Gerontology. 2018;64:212-21. Available from: https://doi.org/10.1159/000485135.

31. Boylu AA, Günay G. Life satisfaction and quality of life among the elderly: moderating effect of activities of daily living. Turk J Geriatr. 2017;20(1):61-9. Available from: https://www.researchgate.net/publication/316062736_Life_satisfaction_and_quality_of_life_among_the_elderly_Moderating_effect_of_activities_of_daily_living.

32. Ng ST, Tey NP, Asadullah MN. What matters for life satisfaction among the oldest-old? Evidence from China. PLoS ONE.2017;12(2):e0171799. Available from: https://doi.org/10.1371/journal.pone.0171799.

33. Admi H, Shadmi E, Baruch H, Zisberg A. From Research to Reality: Minimizing the Effects of Hospitalization on Older Adults. Rambam Maimônides Med J. 2015;6(2):e0017. Available from: https://dx.doi.org/10.5041%2FRMMJ.10201.

34. Osuna-Pozo CM, Ortiz-Alonso J, Vidán M, Ferreira G, Serra-Rexach JA. Review of functional impairment associated with acute illness in the elderly. Rev Esp Geriatr Gerontol. 2014;49(2):77-89. Available from: https://doi.org/10.1016/j.regg.2013.08.001.

35. Carvalho TC, Valle AP, Jacinto AF, Mayoral VFS, Boas PJFV. Impact of hospitalization on the functional capacity of the elderly: a cohort study. Rev Bras Geriatr Gerontol. 2018;21(2):134-42. Available from: https://doi.org/10.1590/1981-22562018021.170143.