

Clinical and functional vulnerability of elderly people from a day center

Vulnerabilidade clínico-funcional de idosos em um centro de convivência

Vulnerabilidad clínico-funcional de ancianos en un centro de convivencia

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Abstract

Objective: To analyze the clinical and functional vulnerability of elderly people from a day center.

Methods: Cross-sectional study carried out with 216 elderly people of a day center in Teresina, state of Piauí, Brazil. Data collection took place between April and August 2018 by means of a questionnaire for sociodemographic and clinical characterization, the clock drawing test (CDT), the Timed up and Go Test (TUG) and the Clinical and Functional Vulnerability Index (IVCF-20). Linear regression with a forward selection was applied to identify the predictive variables of individual vulnerability.

Results: It was observed that 37% of the elderly people were identified as showing medium risk with regard to clinical and functional vulnerability and 11.1% of them had a high risk. Sociodemographic (individual and family income) and clinical characteristics (self-declared comorbidities, polypharmacy, urinary incontinence, BADL-dependence, falls, hospitalization, frequency of physical activities, health self-perception, frequent sadness and depression, cognition, oblivion of drug therapy and functional mobility) were associated with clinical and functional vulnerability ($p < 0.05$).

Conclusion: The findings of our study enable the operationalization of public policies and strategies for early detection of clinical and functional vulnerability in elderly people and intervention measures aimed at promoting health and preventing illness based on comprehensive care.

Resumo

Objetivo: Analisar a vulnerabilidade clínico-funcional de idosos participantes de um centro de convivência.

Métodos: Estudo com delineamento transversal, com 216 idosos de um centro de convivência em Teresina – PI. A coleta de dados ocorreu no período de abril a agosto de 2018, por meio do uso de um questionário para caracterização sociodemográfica e clínica, teste do desenho do relógio (TDR), “*Timed Up and Go Test*” e índice de vulnerabilidade clínico-funcional (IVCF-20). Utilizou-se o modelo de regressão linear *forward* para identificação das variáveis preditoras de vulnerabilidade individual.

Resultados: Constatou-se que 37,0% dos idosos foram classificados com médio risco para vulnerabilidade clínico-funcional e 11,1% com alto risco para vulnerabilidade. As características sociodemográficas (renda individual e renda familiar) e as características clínicas (comorbidades autodeclaradas, polifarmácia, incontinência urinária, dependência em ABVD, queda, hospitalização, frequência de atividade física, autopercepção de saúde, sentimento de tristeza e depressão frequente, cognição, esquecimento da terapia medicamentosa e mobilidade funcional associaram-se a vulnerabilidade clínico-funcional ($p < 0,05$).

Conclusão: Os achados desse estudo possibilitam a operacionalização de políticas públicas e estratégias para a identificação precoce de idosos em condição de vulnerabilidade clínico funcional e medidas de intervenção direcionadas para a promoção da saúde e prevenção de doenças e agravos com base em um cuidado integral.

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Conflicts of interest: none to declare.

Resumen

Objetivo: Analizar la vulnerabilidad clínico-funcional de ancianos que participan en un centro de convivencia.

Métodos: Estudio con diseño transversal, con 216 ancianos de un centro de convivencia en Teresina, estado de Piauí. La recolección de datos se realizó de abril a agosto de 2018, por medio de un cuestionario de caracterización sociodemográfica y clínica, del test del dibujo del reloj (TDR), del "Timed Up and Go Test" y del índice de vulnerabilidad clínico-funcional (IVCF-20). Se utilizó el modelo de regresión lineal *forward* para identificar las variables predictoras de vulnerabilidad individual.

Resultados: Se constató que el 37,0% de los ancianos fue clasificado con riesgo medio de vulnerabilidad clínico-funcional y el 11,1% con riesgo alto de vulnerabilidad. Las características sociodemográficas (ingresos individuales e ingresos familiares) y las características clínicas (comorbilidades autodeclaradas, polifarmacia, incontinencia urinaria, dependencia en ABVD, caídas, internación, frecuencia de actividad física, autopercepción de la salud, sentimientos de tristeza y depresión frecuente, cognición, olvido de tratamiento medicamentosos y movilidad funcional) se relacionan con la vulnerabilidad clínico-funcional ($p < 0,05$).

Conclusión: Los descubrimientos de este estudio permiten la preparación de políticas públicas y estrategias para la identificación precoz de ancianos en condición de vulnerabilidad clínico-funcional y medidas de intervención orientadas a la promoción de la salud y prevención de enfermedades y empeoramiento basadas en el cuidado integral.

Introduction

The aging process is related to biological, psychological and social changes that have a direct impact on social security and health systems. Although it does not necessarily result in illness, physiological and pathological changes that result from aging make homeostasis difficult when elderly people are under stress, thus resulting in greater vulnerability^(1,2)

The vulnerability construct originated in the beginning of the 17th century, from the Latin word *vulnerabilis*, from the verb *vulnerare*, which means "to hurt", and is defined as "subject to attacks or emotional or physical damage". In gerontology, it is approached as a state in which individuals or groups see their self-determination reduced by deterioration of cognition, power, education, resources, and strength, among others.^(3,4)

Health vulnerability has three different aspects: individual, content, and social. Individual vulnerability takes into account comorbidities, signs and symptoms, functional disability, perceived social support, and perceived health. Content vulnerability considers the degree of dependence in terms of health and access to health services. Finally, social vulnerability is the combination of how individuals can access information and material resources and how they deal with cultural barriers.^(2,5,6)

A national population-based study found that out of the 701 participating elderly people, 15.7% had high/very high social vulnerability, and frailty reached 31.8%. Age group, gender, education, years of study and income contributed to the incidence

of vulnerability in elderly people and maximized negative outcomes, therefore having a direct effect on quality of life (QoL) of those people.⁽⁶⁾

Our study addresses clinical and functional vulnerability, which concerns individual vulnerability in health, and it is a frailty condition as the result of a decrease in homeostatic supplies and insufficient response to endogenous and exogenous stressful factors. When this condition is associated with senility, it leads to a self-perpetuating vicious circle related to increased disability, which maximizes the risk of developing a frailty syndrome, with frequent hospitalizations, falls and exacerbation of chronic conditions.^(2,7,8)

This study emerges as a product of the Study Group on Multidimensionality of Aging, Health and Nursing (GEMESE, as per its acronym in Portuguese) from the Federal University of Piauí (UFPI) and is justified by the scarce amount of material available on vulnerability of elderly people in Brazil, especially regarding the use of specific instruments for vulnerability assessment. In addition, predictive studies enable the creation of important data that help guide care services provided to elderly people, with the acknowledgment of risk conditions. In that perspective, this study can have a direct impact on cost reduction in the public health system with regard to hospitalizations and rehabilitation, as well as encourage effective measures and strategies of identification and monitoring of elderly people who are under vulnerability risk.^(1,9) To do so, we analyzed the clinical and functional vulnerability of elderly people from a day center.

Methods

This is a cross-sectional study carried out in a day center for elderly people in the city of Teresina, state of Piauí, which is associated with the Promotion Center for the Elderly (NPTI, as per its acronym in Portuguese). Currently, it provides services to 450 elderly people coming from all the city's urban areas, as well as workshops and actions aimed at health promotion and prevention in the mornings and in the afternoons.

For sample selection, a simple random calculation was made, with a confidence level of 95%, sample error of 5%, and a non-probability convenience sampling. The inclusion criteria were: elderly people of all ages, enrolled in the day center for at least six months, and with preserved cognitive ability, according to the parameters of the Mini-mental State Examination (MMSE).⁽¹⁰⁾

The 'outcome' variable (dependent) consisted of the clinical and functional vulnerability in elderly people. Among the independent variables, we can mention: age, gender, race, marital status, household composition, head of household, literacy, completed years of study, income, sources of income, individual and family monthly incomes, comorbidities, regular use of five or more prescribed drugs, weight loss, urinary incontinence, dependence on basic activities of daily living (BADL), walking or visual aid, falls over the past year, hospitalization over the past year, physical activity, weekly frequency of physical activity, alcoholism, smoking, health self-perception, frequent sadness and depression, cognition, drug therapy, and mobility.

Data collection took place between April and August 2018 by means of a questionnaire for sociodemographic and clinical characterization, the clock drawing test (CDT), the Timed up and Go Test (TUG) and the Clinical and Functional Vulnerability Index (IVCF-20). Data were collected by previously trained researchers while the elderly people waited for the center's activities or afterward.

The questionnaire for sociodemographic and clinical characterization was based on an instrument created and validated for studies with elderly people who have fallen, and it was validated for

elderly people who lived in deprived areas during the pilot phase.⁽¹¹⁾ The cognitive function was assessed by means of the clock drawing test (CDT), which assesses cognitive impairment and analyzes visual and spatial skills, constructive and performance abilities, which are subsequently classified as approved, disapproved with minor errors, and disapproved with major errors.⁽¹²⁾ As for mobility, it was assessed by means of the Timed Up and Go Test (TUG), which observes functional mobility and risk of falls in elderly people, for which the shorter the time spent, the better the performance.⁽¹³⁾

To assess individual vulnerability, the Clinical and Functional Vulnerability Index (IVCF-20) was used, and it was developed and validated for the assessment of eight aspects considered to be predictors of functional decline and/or death. Each section has a specific score according to the individual's performance, and the maximum total score of all sections is 40 points. In this way, individuals can be classified with regard to their clinical and functional vulnerability: low risk (0 to 6 points), moderate risk (7 to 14 points), and high risk (equal to or over 15 points).⁽²⁾

For statistical analysis, variables were coded and entered twice into an Excel spreadsheet, and the analysis was performed by means of IBM's software SPSS version 21.0 (SPSS Inc. Chicago, IL, USA). For sociodemographic and clinical characterization, descriptive analyses were performed by means of measures of central tendency and dispersion. Normality distribution of variables was assessed using the Kolmogorov-Smirnov test. To analyze the association between independent quantitative variables and the dependent variable, a Spearman's rank correlation coefficient was used. To interpret correlations (p-values), the following classification was used: very low correlation for values between 0.00 and 0.20; low correlation for values between 0.21 and 0.39; moderate correlation for values between 0.40 and 0.69; high correlation for values between 0.70 and 0.89; very high correlation for values between 0.90 and 1.00; and perfect correlation for a p-value = 1. To compare mean values, the Mann-Whitney test was used.⁽¹⁴⁾

Independent variables were included in the linear regression model of forward selection approach,

allowing for the choice of variables that were most associated with the outcome (clinical and functional vulnerability) to be included in the final model. The variables preferably chosen were those that had a higher correlation with the dependent variable. The autocorrelation in the residuals was assessed by means of the Durbin-Watson test, in which values below 2 indicated a possible correlation. All statistical tests were performed considering a significance level of 5%.

The development of the study complied with national and international rules of ethics in human research, according to what is laid out in resolution n° 466/2012, under ruling n° 3.131.094/ 2019, CAAE: 05913319.3.0000.5214, from UFPI's Research Ethics Committee.

Results

The final sample was made up of 216 elderly people, with an average age of 70.54 (± 5.87) years. It was also observed that 86.6% (n=187) were women, 59.7% (n=129) were brown, 44.4% (n=96) were married or in a stable relationship, 78.7% (n=170) lived with relatives and 73.6% (n=159) declared themselves as head of household. As for education, 83.3% (n=180) reported that they could read and write, and 45.9% (n=99) had studied up to four years. With regard to economic aspects, 93.5% (n=202) stated that they had their own income, 82.9% (n=179) of which were from retirement allowances. The average individual income was R\$ 1537.37 (± 1188.04) and the average family income was R\$ 2799.78 (± 2542.14).

The clinical conditions of the elderly are shown in table 1. It is worth mentioning that 84.3% (n=182) reported some comorbidity, and cardiovascular and musculoskeletal diseases were reported by 90.8% and 34.3% of participants, respectively. The use of some aid was mentioned by 87.5% (n=189) of participants, and eyeglasses were mentioned by 85.2%. Of the 216 participating elderly people, the average score in the IVCF-20 was 7.79 (± 5.73), in which 51.9% of them had a low risk for clinical and functional vulnerability, 37.0% had a moderate

risk, and 11.1% had a high risk of developing that condition.

Table 1. Distribution of elder participants from a day center, according to clinical characteristics

Variables	n(%)
Comorbidities (self-declared)	
Presence	182(84.3)
Absence	34(15.7)
Regular use of five or more prescribed drugs	
Yes	64(29.6)
No	152(70.4)
Non-intentional weight loss (3 kg over the last month)	
Yes	34(15.7)
No	182(84.3)
Urinary incontinence (self-reported)	
Yes	52(24.1)
No	164(75.9)
Dependence on Basic Activities of Daily Life (BADL)	
Up to 1 activity	197(91.2)
More than 2 activities	19(8.8)
Walking or visual aid	
Yes	189(87.5)
No	27(12.5)
Falls over the past year	
Yes	76(35.2)
No	140(64.8)
Hospitalization over the past year	
Yes	23(10.6)
No	193(89.4)
Physical activity (at least once a week)	
Yes	215(99.5)
No	1(0.5)
Physical activity frequency	
Up to twice a week	24(11.1)
More than twice a week	192(88.9)
Alcoholism	
Yes	23(10.6)
No	193(89.4)
Smoking	
Yes	3(1.4)
No	213(98.6)
Health self-perception	
Excellent, very good, good	144(66.7)
Fair, poor	72(33.3)
Frequent sadness and depression over the last month	
Yes	56(25.9)
No	160(74.1)
Clock drawing test (CDT)	
Approved	44(20.4)
Disapproved with minor errors	49(22.7)
Disapproved with major errors	123(56.9)
Oblivion of drug therapy 3 times a week	
Yes	82(38.0)
No	134(62.0)
Timed Up and Go Test (TUG) time	
0 – 10 seconds	35(16.2)
11 - 20 seconds	154(71.3)
Above 20 seconds	27(12.5)
TOTAL	216(100.0)

The analyses of the correlation between clinical and functional vulnerability and sociodemographic and clinical conditions are shown in table 2.

Table 2. Correlation between clinical and functional vulnerability and sociodemographic and clinical conditions of elderly people

Variables	Statistics	p-value
Gender	2710.500 ¹	0.997
With a partner	5487.000 ¹	0.548
Literacy	2665.000 ¹	0.092
Individual income	-0.145 ²	0.033*
Family income	-0.219 ²	0.001**
Comorbidities (self-declared)	2345.000 ¹	0.025*
Regular use of five or more prescribed drugs	1741.000 ¹	0.000*
Weight loss	2467.500 ¹	0.060
Urinary incontinence	2684.500 ¹	0.000*
BADL-dependence	613.000 ¹	0.000*
Walking or visual aid	2227.000 ¹	0.284
Falls	3381.000 ¹	0.000*
Hospitalization	1208.000 ¹	0.000*
Physical activity (at least once a week)	55.500 ¹	0.519
Physical activity frequency	1611.500 ¹	0.016*
Alcoholism	1993.000 ¹	0.422
Smoking	309.000 ¹	0.922
Health self-perception	3283.500 ¹	0.000*
Frequent sadness and depression (at least 3x/week)	1734.000 ¹	0.000*
Clock drawing test	2605.000 ¹	0.001*
Oblivion of drug therapy 2 times a week	3591.500 ¹	0.000*
Timed Up and Go Test (TUG) time	2143.000 ¹	0.002*

1=Mann-Whitney; 2=Spearman's rank correlation coefficient; *IC= 95% α =0.005; ** IC=99% α = 0.001

The final linear regression model of predictive factors of clinical and functional vulnerability is shown in Table 3.

The multiple linear regression analysis showed, by means of $R^2= 0.824$, that the variables that were most frequently associated with clinical and functional vulnerability were: falls over the last year, hospitalization over the last year, health self-perception, memory loss perceived by close people,

memory loss prevents the performance of a daily activity, loss of interest or satisfaction in pleasant activities, presence of physical weakness criteria, polypharmacy, frequent sadness and depression, urinary incontinence, and BADL-dependence, as presented in table 3. The linear regression model was adapted after an analysis of the independence of residuals by means of the Durbin-Watson test, with a value of 1.865. After this process, the model was considered adequate, with a constant value equal to 44.173 (± 3.437), with a significance level of 0.001 and $R^2=0.824$.

Discussion

The prevalence of elderly women was similar to other studies with elderly people from day-centers and it is related to the feminization of old-age and lower exposure to mortality factors, such as lower consumption of tobacco and alcohol^(5,15). The average age (70.54) is associated with greater functional independence and a lower rate of labor market integration, which results in more free time and autonomy for recreational activities.⁽¹⁶⁾ The prevalence of married elderly people or who were in a stable relationship reaffirms the importance of affective bonds to prevent isolation and to ensure a sound aging.⁽¹⁷⁾

Low educational attainment can be explained by the inequalities observed in Brazil and by bad educational policies in the 30's and 40's, when access to schools was limited by household chores or early insertion in the labor market.⁽⁵⁾ With regard to occupation, most elderly people are retired and

Table 3. Final linear regression model of predictive factors of clinical and functional vulnerability

Variables	β coefficient	Standard error	t	p-value
Falls over the past year	-1.391	0.509	-2.736	0.007
Hospitalization over the past year	-2.040	0.762	-2.678	0.008
Health self-perception	1.568	0.506	3.096	0.002
Memory loss perceived by close people	-1.624	0.529	-3.068	0.002
Memory loss prevents the performance of a daily activity	-5.557	0.985	-5.642	0.000
Loss of interest of pleasure in pleasant activities	-3.469	0.881	-3.936	0.000
Presence of physical weakness criteria (non-intentional weight loss, BMI below 22 kg/m ² , calf circumference below 31 cm, time spent in the walking speed test (4m) > 5 seconds	-2.940	0.873	-3.366	0.001
Polypharmacy	-3.577	0.521	-6.864	0.000
Frequent sadness and depression (3x/week)	-1.707	0.629	-2.713	0.007
Urinary incontinence	-2.254	0.569	-3.959	0.000
BADL-dependence	3.482	0.862	4.039	0.000

their main income sources are retirement pensions and other government allowances.⁽¹⁷⁾

Regarding individual income, the average was higher than the per capita income for the state of Piauí in 2018 (R\$ 817.00). Financial resources, education and access to health services are determining factors for social vulnerability, and when they are associated with complications resulting from aging, they can trigger a weakening process in elderly people. In this context, these elderly people have greater probability of negative outcomes, with the need for greater commitment to actions for disease prevention and health promotion.⁽⁵⁾

As for clinical history, there was a prevalence of elderly people who declared the presence of comorbidities, which are related to anatomical, physiological, and functional changes due to aging.^(15,18,19) With regard to polypharmacy, a positive clinical profile was observed, since the regular use of five or more drugs can alter their pharmacodynamic and pharmacokinetic properties and increase the risk of functional loss. In addition, these conditions are significantly associated with individual vulnerability, resulting in a risk factor for functional and cognitive decline over the years.^(16,19)

As for criteria associated with physical fragility, few complaints of weight loss were found, as well as urinary incontinence, and functional dependence, which reveals a prevalence of sound elderly people. Weight loss contributes to an increase in the number of falls and fractures, and it interferes in a negative way in their independence.⁽²⁰⁾ In addition, urinary incontinence brings about negative effects on the individual's social life and results in restrictions and embarrassment in front of other people.⁽²¹⁾

The correlation between vulnerability and dependence of elderly people in the performance of BADL confirms that an active life helps elderly people to maintain good levels of autonomy, as well as to improve and maintain the performance of daily activities. It is worth mentioning that a small number of elderly people reported hospitalization and falls over the past year, and these events have a direct impact on the individual's functional capacity.⁽²²⁾

The performance of physical activities is a positive finding, since it is beneficial to the prevention

of non-communicable chronic diseases (NCDs), to an increase in muscle mass, and to a better cardio-respiratory capacity, with enhanced performance of BADL, thus maximizing the individual's independence and autonomy.⁽²³⁾ In addition, it maximizes the control and the reduction of mood change symptoms by favoring social interaction and the development of autonomy and independence.⁽²⁴⁾ In that sense, most elderly people stated that they do not consume alcohol or tobacco. This fact has a positive impact on the individual's health, since the combination of alcohol and tobacco with the frequent use of drugs can worsen clinical manifestations and hamper rehabilitation and reintegration of elderly people to society.⁽¹⁸⁾

Health self-perception is an important indicator of general health conditions, and in our study most elderly people had a positive perception of their health, which is associated with functional independence, strengthening of interpersonal relationships with the participation in peer groups, performance of physical, cognitive, and social activities, and avoiding risky behaviors.⁽²³⁾

As for the cognitive aspect, semi-fragile elderly people with a cognitive impairment can switch to a state of fragility in a short period, of about 12 months, which can highlight their individual vulnerability. The preservation of reasoning and memory capabilities is associated with a lower risk of fragility and functional dependence, thus confirming the importance of tracking and assessment of vulnerability in elderly people with cognitive impairment.⁽²⁵⁾

Walking speed measured in the Timed Up and Go test (TUG) is related to the physical fragility in elderly people and the negative effects of aging, such as disabilities, a sedentary lifestyle, falls, muscle weakness, cognitive impairment and poor quality of life. These findings reinforce the need to measure walking speed in gerontological examinations, as well as changes that interfere in that speed, among which postural instability, loss of muscle mass and sarcopenia.⁽²⁶⁾

With regard to the classification of elderly people according to IVCF-20, there was a prevalence of individuals with low to moderate risk of clinical and functional vulnerability. However, it is necessary to

implement interdisciplinary actions in health for comprehensive, cross-sectional, and intersectional care of elderly people, in order to prevent functional decline and negative outcomes, such as institutionalization and death.^(27,28)

Based on the linear regression model, predictive and determining factors were identified when individual vulnerability was associated with socio-demographic and clinical variables of individuals. Among these factors, we can mention falls and hospitalization over the past year, health self-perception, memory, anhedonia, presence of fragility criteria, frequent sadness and depression, urinary incontinence and BADL-dependence.

In elderly people with a risk of weakening, it is important to take intervention measures aimed at an early diagnosis and preventive actions to avoid worsening the individuals' health conditions. With regard to fragile elderly people, a detailed geriatric approach is a priority, with the participation of a multiprofessional team, aiming at keeping or recovering the individual's functionality and autonomy.^(29,30)

In that context, day-centers appear as adequate settings for the promotion of a sound and active aging, with the development of new cognitive and physical skills. In addition, they favor the strengthening of family and community ties, prevent isolation and foster social interaction.⁽³¹⁻³³⁾ However, at state and city levels, policies lack coordination with basic care services and health promotion, and this affects reference and counter-reference systems and tends to fragment care provided to elderly people, making it difficult to track and make an early assessment of elderly people with a risk of vulnerability and to implement early interventions.

Conclusion

This study showed that 88.9% of participating elderly people from the day-center had a low or moderate risk of developing clinical and functional vulnerability. There were correlations with variables such as individual income, family income, and significant association with falls and hospitalization over the past year, health self-perception, memory, anhedonia, presence

of fragility criteria, frequent sadness and depression, urinary incontinence and BADL-dependence. The predictive model of individual vulnerability was composed of the following variables: falls and hospitalization over the past year, health self-perception, memory, anhedonia, presence of fragility criteria, frequent sadness and depression, urinary incontinence and BADL-dependence. As limitations to our study, we can mention its cross-sectional design, non-probability sampling, and the performance of the study in only one day-center, which prevented us from establishing a causal relationship between the studied variables. In addition, it is important to highlight their low educational attainment, which makes cognitive assessment and inclusion difficult. Nevertheless, the results of our study reinforce the need for early identification of elderly people in vulnerability conditions and provide a theoretical contribution to managers, researchers and health professionals so they can plan and implement measures of health promotion and prevention based on comprehensive care.

Collaborations

Oliveira CES, Felipe SGB, Silva CRDT, Carvalho DB, Silva-Júnior F, Figueiredo MLF, Santos AMR and Gouveia MTO contributed to project conception, data analysis and interpretation, article writing, relevant critical review of intellectual content and final approval of the version to be published.

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