

Correlation between risk of falls, vulnerability and body composition of the elderly in a comprehensive health care center for the elderly

Correlação entre risco de quedas, vulnerabilidade e composição corporal de idosos de um centro de atenção integral a saúde do idoso

 Miguel Jânio Costa Ferreira¹,  Andréa Santana Carneiro¹,  Alisson Sousa Santos¹,  Elaine Farias Ibiapina¹,  Lisiane Fernanda Simeão¹,  Almir Vieira Dibai Filho²,  Daniela Bassi Dibai¹,  Maria Claudia Gonçalves¹

ABSTRACT

Objective: To investigate the correlation of the risk of falling with the decrease in functional mobility, vulnerability and obesity in the elderly. **Method:** Cross-sectional study. Active elderly people of both sexes, aged between 60-85 years were evaluated, and volunteers who did not undergo the evaluative tests proposed to identify functional mobility and nutritional status were excluded. The Body Mass Index (BMI) tests were applied, which classified the nutritional status of malnutrition BMI ≤ 22 , nutritional risk BMI= 22.1-24.0, ideal weight BMI= 24.1-27.0, overweight BMI 27.1-30 and obesity with BMI > 30.0 , the Timed Up & Go (TUG) to identify functional mobility and functional risks related to falls in the elderly and the classification adopted for this study was ≥ 10 s being risk indicators for falls and the Vulnerable Elders Survey (VES-13) that classified as vulnerable elderly, volunteers with a score > 2 points. Statistical analysis was performed at 95% confidence level and $p < 0.05$. **Results:** 104 elderly people participated, classified as having no risk for falls (67.3%), non-vulnerable (67.3%) and as obese (24%). There was no correlation between obese subjects and the risk of falls in TUG time in seconds [$\rho = -0.115$; $p > 0.05$] and with the TUG classification [$\rho = -0.152$; $p > 0.05$]. However, there was a correlation between vulnerability and the risk of falls in time in seconds of the TUG [$\rho = 0.217$; $p < 0.05$]. **Conclusion:** No correlation was observed between obesity and risk of falls. However, it was found that the more vulnerable the greater the risk for falls.

Keywords: Accidental Falls, Body Composition, Health Vulnerability, Aged

RESUMO

Objetivo: Investigar a correlação do risco de queda com a diminuição da mobilidade funcional, vulnerabilidade e a obesidade em idosos. **Método:** Estudo transversal, foram avaliados idosos ativos de ambos os sexos, idade entre 60-85 anos e excluídos voluntários que não realizaram os testes avaliativos propostos para identificar a mobilidade funcional e o estado nutricional. Foram aplicados os testes Índice de Massa Corporal (IMC) que classificou o estado nutricional desnutrição IMC ≤ 22 , risco nutricional IMC= 22.1-24.0, peso ideal IMC= 24.1-27.0, sobrepeso IMC 27.1-30 e obesidade com IMC > 30.0 , o Timed Up & Go (TUG) para identificar a mobilidade funcional e os riscos funcionais relacionados a quedas em idosos e a classificação adotada para este estudo foi ≥ 10 s sendo indicadores de risco de quedase o Vulnerable Elders Survey(VES-13) que classificou como idoso vulnerável os voluntários com a pontuação > 2 pontos. A análise estatística foi realizada em 95% nível de confiança e $p < 0,05$. **Resultados:** Participaram 104 idosos, classificados com ausência de risco para quedas (67.3%), não vulneráveis (67.3%) e como obesos (24%). Não foi observada correlação entre obesos com o risco de quedas no tempo em segundos do TUG [$\rho = -0.115$; $p > 0.05$] e com a classificação do TUG [$\rho = -0.152$; $p > 0.05$]. Porém, foi observada correlação entre a vulnerabilidade com o risco de quedas no tempo em segundos do TUG [$\rho = 0.217$; $p < 0.05$]. **Conclusão:** Não foi observada correlação entre obesidade e risco para quedas. Contudo, verificou-se que quando mais vulnerável maior é o risco para quedas.

Palavras-chaves: Acidentes por Quedas, Composição Corporal, Vulnerabilidade em Saúde, Idoso

¹ Universidade Ceuma - UniCEUMA

² Universidade Federal do Maranhão - UFMA

Address for correspondence

Miguel Jânio Costa Ferreira

E-mail: mfpersonal2010@hotmail.com

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INTRODUCTION

During aging, individuals develop feelings of attachment to the physical space in which they reside, which may constitute a barrier or act as a stimulus for a healthier and more active life.¹ In Brazil, falls was the third most common cause of deaths due to external causes in older adults in 2007 and the leading cause of hospitalizations in older adults of both sexes in 2008.²

Approximately 30% older adults sustain a fall per year, and this percentage increases to 50% among individuals aged >80 years according to a study indicating an approximate frequency of 30%–50% self-reported cases.³

The risk of falls at home is associated with the health status of older adults,^{4,5} and ergonomic adaptations are necessary to facilitate self-care and prevention of an accident.^{2,6,7} The risk factors for falls at home in older adults include an inadequate bathroom, restricted space for locomotion, and furniture in inappropriate places.^{8,9}

In addition to external factors, the nutritional status of older adults may also be a risk factor for vulnerability, especially when combined with the morphophysiological changes that occur naturally during the aging process. Thus, they are considered indicators of functional decline and contribute to the risk of falls in older adults with obesity.¹⁰

The progression of functional decline in older adults is related to chronic non-communicable diseases (NCDs), falls, depression symptoms, and limitations in instrumental activities of daily living, which characterize the vulnerability of these individuals.¹¹ However, in addition to the risk of falls, obesity in older adults has a large impact on the effect of chronic NCDs and is responsible for >40% deaths in Brazil.¹²

Therefore, we hypothesized that older adults with obesity would be more likely to fall than the older adults with obesity, that older adults with impaired functional mobility would have a greater risk for falls than older adults without impaired functional mobility, and that older adults with vulnerability would have a higher risk of falls than older adults without vulnerability.

OBJECTIVE

This study aimed to investigate the correlation between the risk of falls and a decrease in functional mobility, vulnerability, and obesity in older adults and verify the correlation between the risk of falls and vulnerability in older adults.

METHODS

This analytical cross-sectional study used a convenience sample and followed the procedures, steps, and guidelines of the STROBE statement.

Active volunteers of both sexes aged 60–85 years from the Centro de Atenção Integral à Saúde do Idoso, São Luís, MA, Brazil were included. Participants were recruited from both the morning and afternoon shifts between March 2019 to June 2019 according to the schedules made available by the administrative sector of the investigation center.

Older adults who did not undergo or complete the proposed evaluative tests to identify functional decline and nutritional status were excluded.

A questionnaire was prepared based on the sociodemographic information in the Brazilian elderly

handbook, such as that on age, sex, religion, race/color, schooling, marital status, history of diseases, frequent conditions, falls, and number of falls in the last 12 months.¹³

Then, older adults individuals were classified as vulnerable or not vulnerable according to the Vulnerable Elders Survey–13 (VES-13), consisting of four evaluative components—age (0–3 points), health perception (0–1 point), physical limitations (six questions; 0–2 points), and functional disabilities (five questions; 0–4 points). The questionnaire takes an average of 5 min to complete, and the scores range from 0 to 10 points. Individuals with a score >2 are classified as vulnerable.^{13–16}

Anthropometric assessment was performed to assess the nutritional status of older adults according to their body mass index (BMI), which is calculated as weight/height². Older adults were classified as malnourished (BMI: ≤22 kg/m²), at nutritional risk (BMI: 22–24 kg/m²), normal weight (BMI: 24.1–27 kg/m²), overweight (BMI: 27.1–30 kg/m²), and obese (BMI: >30 kg/m²).^{17,18} Measurements were taken in a standing position, with older adults wearing minimum clothing and distributing their weight on both legs. The weight and height were measured using a mechanical scale with a maximum capacity of 150 kg and a stadiometer of the scale with a ruler, respectively. The number of ionized steel with a maximum range of 2 m of the brand Wellms®.

Finally, the timed up and go (TUG) test was performed to identify mobility and functional risks related to falls in older adults.¹⁹ The dynamic balance of the individuals was tested while they performed a task, in an environment that could lead to a fall. An alternative to this is: The dynamic balance in the elderly was tested while performing a task in situations that could lead to a fall.²⁰ The TUG test measures the time (in seconds) taken by an individual to get up from a chair with armrests at a height of approximately 44 cm, walk a distance of 3 m, turn around, walk back to the chair and sit down. This test has been widely used in clinical practice to assess functional mobility, the risk of falls, and dynamic balance in adults, and its normal values are established for this population. Completing the TUG test in >10 s was considered an indicator for the risk of falls.²¹

Data were organized and tabulated in Microsoft Excel for Windows, version 2010, and statistical analysis was performed using the IBM software Statistical Package of Social Sciences (SPSS 20.0) for Windows. The sample size was organized for convenience. Scalar descriptive variables are presented as means and standard deviations, and categorical variables are presented as frequencies. The associations between the variables were verified using the chi-square test of independence (χ^2) and analyzed using the Spearman correlation test (ρ) because normality was not observed in the distribution according to the Kolmogorov–Smirnov test. Statistical analysis was performed at a 95% confidence level (α), and $p < 0.05$ was considered significant.

Older adults were evaluated at the investigation center and were informed of the objectives and methodology of the research when they were invited to participate in the study. All the participants signed the informed consent form (ICF). This study met the requirements proposed by Resolution No. 466 of December 12, 2012 of the National Health Council and was approved by the ethics committee of Ceuma University (process No. 2,851,570 /2018).

RESULTS

Among the 180 older adults registered at the comprehensive health care center for older adults, 123 were initially considered eligible to participate in the study. However, after evaluations, only 104 older adults were included. Most patients were women, self-declared brown race/color, educated (≥ 8 years of schooling), catholics, and single or married (Table 1).

Table 1. Sociodemographic characteristics of the 104 elderly people, São Luís (MA)

Variables	N	%
Sex		
Female	94	90.4
Male	10	9.6
Race/Color		
Black	37	35.6
White	18	17.3
Brown	43	41.3
Yellow	1	1.0
Indigenous	4	3.8
Not Declared	1	1.0
Education		
None	17	16.3
01-03 Years	16	15.4
04-07 Years	29	27.9
08 Years or more	42	40.4
Religion		
Catholic	87	83.7
Protestant	13	12.5
Other	4	3.8
Marital Status		
Single	28	26.9
Married	28	26.9
Divorced	22	21.2
Widower	26	25.0
Total	104	100.0

Table 2 shows a comparison of 33 (31.7%) older adults with a history of falls and 71 (68.3%) older adults without a history of falls. The chi-square test of independence showed no significant association between elderly people without a history of falls with the TUG classification [$\chi^2(1) = 1.568$; $p > 0.05$], VES-13 classification [$\chi^2(1) = 2.296$; $p > 0.05$] and BMI classification [$\chi^2(4) = 5.309$; $p > 0.05$].

The Spearman correlation test did not reveal significant correlations between the variables selected to answer the main study objective. Older adults with obesity did not present a significant correlation with the time of the TUG test [$\rho = -0.115$; $p > 0.05$] and the TUG classification [$\rho = -0.152$; $p > 0.05$]. In addition, there was no correlation between the risk of falls classified by the TUG test and history of falls in the previous year [$\rho = -0.160$; $p > 0.05$]. However, a weak positive correlation was observed between the VES-13 score and the time of the TUG test [$\rho = 0.217$; $p < 0.05$], shown in Table 3.

DISCUSSION

This study aimed to investigate the correlation between the risk of falls, indicated by a decrease in functional mobility and obesity, in older adults; however, no correlation was observed. These results could be related to the mean BMI (27.38 ± 4.57 kg/m²) and the total number of older adults with obesity (n=

25; 24%), showing fewer older adults with obesity and a history of falls than older adults with obesity and no history of falls. This can also be explained by the result of the mean time in the TUG test (9.52 ± 3.87 s), classifying a large number of older adults without a risk for falls (approximately 70% of the total sample). Further, older adults with a history of falls showed a greater absence of risk of falls than the older adults without a history of falls.

These results of the time taken to complete the TUG test among older adults with and without a history of falls are different from the findings of a study that investigated the comparison between functional mobility in older adults with and without a history of falls. The average time in seconds in older adults without a history of falls was lower than that in older adults with a history of falls.²²

The TUG test is used to identify the risk of falls and functional decline through dynamic balance. In this study, few older adults were at risk of functional decline and falls, similar to the findings of another study that showed that only 39.4% older adults had a TUG task execution time of > 10 s.¹² However, in a previous study, the risk was accentuated by the dynamics of the habitual gait of older adults and by the existence of patterns of acceleration when performing some physical activities in relation to their physical abilities.²³

In the study mentioned above, older adults with no risk of falls according to the TUG test were more likely to be obese than those without the risk of falls. The average time taken to complete the TUG test was within the average safe range reported for the Brazilian elderly population. However, in a national study conducted to identify it as a predictor of functional decline for risk of falls, the cutoff point for the TUG test was 12.47 s²⁴ (average) higher than the cutoff point used in this study.

A significant, positive, and weak correlation was observed between the time of the TUG test and VES-13 score, indicating that the vulnerability score increased with the increasing time to perform the test. Therefore, this correlation indicates that elderly people with functional decline and a risk of falls may also be more vulnerable, which according to the literature, may signal a decrease in life expectancy and quality of life, with a greater risk of death.²⁵

The results of the VES-13 test, which identifies vulnerable older adults, indicated that approximately 70% older adults were not vulnerable, corroborating the findings of other studies reporting that 79% older adults were not vulnerable¹⁵ and 38% older adults were vulnerable.²⁶ However, a similar proportion of older adults with and without vulnerability has been reported in the literature 57.8% and 42.2%, respectively.²⁷

However, the study findings indicate the need to implement increasingly effective and prophylactic interventions to reduce injuries related to the risk of falls and vulnerability in older adults.²⁸ Regular physical activity is a main strategy used as a protective and preventive measure for humans, described in the literature as a way of minimizing the functional decline and maintaining muscle tissue during the aging process as it preserves the magnitude of physical fitness.²⁹

Furthermore, physical activity can be included as a recreational activity as it reduces the risk to health and improves the quality of life of older adults.²⁸

Table 2. Descriptive distribution of the investigated volunteers and the association between the TUG, VES-13 and BMI classifications of the 104 elderly people, São Luís (MA)

Variables	Total n= 104 (100%)		WHOF n= 33 (31.7%)		NHOF n= 71 (68.3%)		χ^2	p-value
	n (%)	average±dp	n (%)	average±dp	n (%)	average±dp		
TUG rating								
No risk of falls	70 (67.3)	9.52±3.87	25 (75.8)	8.86±2.76	45 (63.4)	9.83±4.28	1,568	0,210
Presence of risk for falls	34 (32.7)		08 (24.2)		26 (36.6)			
VES-13 rating								
Not vulnerable	70 (67.3)	2.35±2.62	21 (63.6)	2.79±2.87	49 (69.0)	2.14±2.49	2,296	0,586
Vulnerable	34 (32.7)		12 (36.4)		22 (31.0)			
BMI rating								
Malnourished	10 (9.6)	27.38±4.57	06 (18.2)	26.44±4.38	04 (5.6)	27.82±4.62	5,309	0,257
Nutritional risk	10 (9.6)		02 (6.1)		08 (11.3)			
Eutrophic	34 (32.7)		10 (30.3)		24 (33.8)			
Overweight	25 (24.0)		09 (27.3)		16 (22.5)			
Obese	25 (24.0)		06 (18.2)		19 (26.8)			

0 cell (0.0%) has an expected count less than 5. Minimum expected count is 17.00; (χ^2) Independence Chi-square; Significance value $p < 0.05$; (WHOF) With a history of falls; (NHOF) No history of falls; (TUG) Timed Up & Go; (VES-13) the Vulnerable Elders Survey-13; (BMI) Body Mass Index

Table 3. Spearman correlation (ρ) between the variables evaluated in the elderly, São Luís (MA)

Variables	ρ	p-value
BMI rating vs TUG time in seconds	0.140	0.157
BMI Rating vs TUG rating	0.110	0.266
Obese vs Time in TUG seconds	-0.115	0.245
Obese vs TUG classification	-0.152	0.123
Obese vs VES-13 rating	-0.104	0.292
Obese vs VES-13 score	-0.063	0.527
Obese vs Total falls in the last year	-0.022	0.828
Obese vs Classification of falls history	0.45	0.649
Classification of falls history vs TUG times in seconds	0.021	0.834
Total falls in the last year vs TUG times in seconds	-0.160	0.106
Falls history rating vs TUG rating	0.123	0.214
Total falls in the last year vs TUG ranking	-0.142	0.151
VES-13 Score vs TUG time in seconds	0.217	0.027

(BMI) Body Mass Index; (TUG) Timed Up & Go; (VES-13) Vulnerable Elders Survey-13; ρ Correlation of Spearman

The study "Association between physical fitness and successful aging in older adults in Taiwan" found that regular physical exercise for a minimum of 20 min for >2 days per week improved the rate of successful aging among physically active Canadian older adults, which was double that reported in other nations.³⁰

This study has some limitations, such as the small sample size due to the conflict of schedules between specialized care and the time available for collection, which was decisive for the exclusion criteria, and the cross-sectional study design, which had limitations in the investigation due to the lack of studies on the causal effects and risk factors, thus requiring evaluations using other protocols to verify the results.

CONCLUSION

Although the correlation observed was weak, it was positive and significant between important parameters such as functional decline, risk of falls, and vulnerability, indicating the

importance of assessing functional decline in older adults to prevent the advent of vulnerability, thus reflecting the general state of health of the individual. Future studies are needed to address the risks of falls, obesity, and vulnerability in older adults, as these are relevant issues for public policy.

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