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RESEARCH

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SYNDROME OF FRAILTY AND THE USE OF ASSISTIVE TECHNOLOGIES IN ELDERLY

Síndrome da fragilidade e o uso de tecnologias assistivas em idosos

Síndrome de la fragilidad y el uso de tecnologías asistas en idosos

Clóris Regina Blanski Grden[1], Jacy Aurélia Vieira de Sousa[2], Luciane Patrícia Andreani Cabral[3], Péricles Martim Reche[4], Danielle Bordin[5], Pollyanna Kássia de Oliveira Borges[6]

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ABSTRACT

Objective: To analyze the association between the fragility syndrome and the use of assistive technologies in the elderly in an outpatient clinic. **Method:** Cross-sectional research with 374 elderly individuals, between February 2016 and February 2017. Data collection included structured instrument and Edmonton Fragility Scale. Stata®12 was used for analysis, the association was verified through Fisher's F test and Student's t test (p≤0.05). **Results:** Predominance of women (67.4%), mean age of 67.9 years, married (56.4%), low educational level (55.1%). Of the participants, 4.5% used bengal, 1.3% crutch and 0.3% walker, 29.4% used corrective lenses, 40.1% of the elderly presented some degree of fragility. The bivariate and multivariate analysis showed a positive association between fragility and bengal (p=0.001). **Conclusion:** Important for the health professional, perform the early screening of the fragility, highlighting the elderly using assistive technologies, as they may indicate impairment and functional loss.

Descriptors: Elderly; Frailty elderly; Nursing; Geriatric nursing; Ambulatory care.

RESUMO

Objetivo: Analisar a associação entre a síndrome da fragilidade e o uso de tecnologias assistivas em idosos de um ambulatório. **Método:** Pesquisa transversal, com 374 idosos, entre fevereiro de 2016 a fevereiro de 2017. A coleta de dados contemplou instrumento estruturado e Escala de Fragilidade de Edmonton. Para análise utilizou-se o *Stata*®12, verificou-se a associação por meio dos testes F de Fisher e t de Student (p≤0,05). **Resultados:** Predomínio de mulheres (67,4%), média de idade de 67,9 anos, casados (56,4%), baixa escolaridade (55,1%). Dos participantes, 4,5% utilizavam bengala, 1,3% muleta e 0,3% andador, 29,4% faziam uso de lentes corretivas, 40,1% dos idosos apresentaram algum grau de fragilidade. As análises bivariada e multivariada apontaram associação positiva entre a fragilidade e bengala (p=0,001). **Conclusão:** Importante do profissional de saúde, realize o rastreio precoce da fragilidade com destaque para os idosos em

1 Nurse, PhD, Adjunct Professor of the State University of Ponta Grossa, Ponta Grossa-Paraná-Brazil.

2 Nurse, PhD, Adjunct Professor of the State University of Ponta Grossa, Ponta Grossa-Paraná-Brazil.

3 Nurse, Master, Collaborating Professor of the Ponta Grossa State University, Ponta Grossa-Paraná-Brazil.

4 Pharmacist, Ph.D., Adjunct Professor of Ponta Grossa State University, Ponta Grossa-Paraná-Brazil.

5 Dentist, PhD, Associate Professor at the Ponta Grossa State University, Ponta Grossa-Paraná-Brazil.

6 Dentist, PhD, Adjunct Professor of the Ponta Grossa State University, Ponta Grossa-Paraná-Brazil.

uso de tecnologias assistivas, pois podem indicar o comprometimento e perda funcional.

Descritores: Idoso; Idoso fragilizado; Enfermagem; Enfermagem geriátrica; Assistência ambulatorial.

RESUMEN

Objetivo: Analizar la asociación entre el síndrome de fragilidad y el uso de tecnologías asistivas en ancianos de un ambulatorio. **Método:** Investigación transversal, con 374 ancianos, entre febrero de 2016 a febrero de 2017. La recolección de datos contempló instrumento estructurado y Escala de Fragilidad de Edmonton. Para el análisis se utilizó el Stata®12, se verificó la asociación por medio de las pruebas F de Fisher y t de Student (p≤0,05). **Resultados:** Predominio de mujeres (67,4%), promedio de edad de 67,9 años, casados (56,4%), baja escolaridad (55,1%). De los participantes, el 4,5% utilizaba bengala, el 1,3% muleta y el 0,3% andador, el 29,4% hacía uso de lentes correctivas, el 40,1% de los ancianos presentaron algún grado de fragilidad. Los análisis bivariados y multivariados apuntaron una asociación positiva entre la fragilidad y el bengala (p=0,001). **Conclusión:** Importante del profesional de salud, realice el rastreo precoz de la fragilidad con destaque para los ancianos en uso de tecnologías asistivas, pues pueden indicar el compromiso y pérdida funcional.

Descriptores: Ancianos; Ancianos fragilizados; Enfermería; Enfermería geriátrica; Asistencia ambulatoria.

INTRODUCTION

The process of human aging entails numerous organic modifications that lead to significant and disabling functional and cognitive decline in the elderly. Throughout life, activities of daily living, such as mobility and self-care, may be restricted by several events, but the impact of this limitation on the elderly is considered extremely negative.

In the context of reducing or rehabilitating such limitations in elderly patients, the use of Assistive Technologies (AT) is a common practice, encompassing ancillary devices and related services, with the focus of maintaining or improving the individual's functionality, as well as promoting overall well-being, autonomy and quality of life[1]. Examples of AT include devices used by older people with physical or cognitive deficits from lenses and canes to new technologies with artificial intelligence elements such as autonomous vehicles.[2,3]

Negative clinical outcomes to the health of the elderly, such as functional dependence, falls and hospitalizations, can foster the demand for AT.[4] In this regard, the Fragility Syndrome is a medical syndrome characterized by decreased strength, endurance and decline in function closely related to the occurrence of adverse health events.[5]

As one of the central elements in the fragility cycle, sarcopenia comprises the progressive and widespread loss of muscle mass and function, with a negative influence on energy expenditure and effort tolerance.[6] Concerning this, international studies point to the benefits of AT in improving strength and balance.[7,8]

Still regarding fragile elderly, national and international authors have reported the improvement in functional condition and autonomy, delayed referral to long-term care institutions and reduction in health care costs.[9,10] Despite the benefits, the use of AT should be accompanied by a health professional who monitors the appropriate and continuous use of the proposed equipment and services.[2,11]

Research on the relationship between frailty syndrome and assistive technologies is scarce, however, it is important to guide the multidisciplinary team in the early screening of the syndrome and in planning care to promote the functionality of the elderly. Thus, in view of the above, the present study sought to analyze the association between frailty syndrome and the use of assistive technologies in the elderly attended at a specialized outpatient clinic.

METHODS

Cross-sectional study conducted at a specialized outpatient clinic of a teaching hospital in the Campos Gerais region, from February 2016 to February 2017. The institution is public and specialized outpatient clinic that serves thirty medical specialties for users referred by the Basic Health Units and Family Health Strategy, as well as by the Center of Specialties of the city and region.

The group evaluated was selected through convenience sampling, unintentional, according to the demand met. The sample included 390 elderly individuals who were interviewed individually while waiting for care in the waiting room of the specialized outpatient clinic. A total of 374 individuals were included in the analysis after excluding 16 (4.1%) subjects who did not meet the selection criteria.

The criteria used to select the sample were: a) aged 60 or over; b) a score higher than the cutoff point in the Mini Mental State Examination (MMSE); c) waiting for medical attention on the day of the interview.[12] The elderly with previous diagnoses of diseases or severe mental deficits that prevented participation in the study were excluded.

In the initial phase of data collection, cognitive screening was performed using the Mini Mental State Examination (MMSE).[13] The instrument has 11 items grouped into seven categories, represented by specific cognitive function groups: temporal orientation, spatial orientation, memory, attention span, calculus, recall memory, language and visual constructive capacity. The score ranges from zero to thirty, with the following cutoff points for evaluation: 13 points for illiterate people; 18 points for low and medium education, and 26 points for higher education.[12]

To evaluate frailty, we used the Edmonton Fragility Scale (EFS), validated and adapted to Brazil by researchers.[14,15] This instrument assesses nine categories: cognition, health status, functional independence, social support, medication use, nutrition, mood, urinary continence and functional performance, distributed in 11 items with a maximum score of 17 points. The scores for frailty analysis are: 0-4, no frailty; 5-6, apparently vulnerable; 7-8, mild fragility; 9-10, moderate frailty; 11 or more, severe frailty.[15]

In order to classify and characterize the sample, a sociodemographic and clinical questionnaire was elaborated specifically for the study. The variables investigated were: gender, age, marital status, education, home arrangement, illness, medication use, cane use, crutch, walker, falls and hospitalizations in the last 12 months. In association analysis,

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we considered independent and dependent variables, respectively, assistive technologies and frailty.

Data were tabulated and analyzed using Stata® software version 12 (StataCorp LP, CollegeStation, TX, USA). Initially, they were submitted to exploratory analysis and described by absolute frequency and percentage. Data normality was verified by the Kolmogorov-Smirnov test. The results obtained by said test met the assumption that the data had normal distribution. Also considering the assumptions, residual analyzes were performed, the results revealed no evidence that the assumption of homoscedasticity was violated or that a transformation of the response or explanatory variable is necessary. Subsequently, the association between the variables was verified by simple linear regression with Fisher's F and Student's t tests, significance level of $p<0.05$. In multivariate analysis, we started with a saturated model and removed variables that were not statistically relevant, as long as their exclusion did not modify the results of the independent variables that remained in the model ($p<0.05$).

The project was approved by the Ethics Committee of the Ponta Grossa State University with Opinion No. 792.978 and by CAAE No. 34905214.0.0000.0105. The ethical precepts of voluntary and consented participation of each subject were respected, according to the resolution in force at the time of the research.

RESULTS AND DISCUSSION

There was a predominance of elderly aged 60-69 years (n = 247; 66%), with a mean age of 67.9 years (SD = 6.0), married (n = 211; 56.4). %), with low education (n = 206; 55.1%) and living with relatives (n = 172; 46%). Most participants were women (n = 252; 67.4%) (Table 1).

Of the respondents, 363 (97.1%) said they had some type of disease and 345 (92.2%) were taking medication. Regarding assistive technologies, the use of corrective lenses was indicated by 110 (29.4%) participants, 17 (4.5%) of the elderly used a cane, five (1.3%) crutch and one (0.3%) a walker. Regarding falls and hospitalizations in the last year, 128 (34.2%) and 114 (30.2%) elderly, respectively, reported positively for this condition (Table 1).

Table 1 - Distribution of sociodemographic and clinical characteristics of the elderly attended at the specialty outpatient clinic. Ponta Grossa, PR, Brazil, 2017

Variables	Classification	Total (%)
Gender	Female	252(67,4)
	Male	122(32,6)
Age	60 - 69 years	247(66)
	≥70 - 79 years	108(28,9)
	>80 years	19(5,1)
Marital status	Married	211(56,4)
	Single	48(12,8)
	Widowed	115(30,8)
Schooling	High	31(8,3)
	Average	84(22,5)
	Low	206(55,1)
	Analfabet	53(14,2)
Living arrangements	Sozinho	65(17,4)
	Family	172(46)
	Spouse	135(36,1)
	Caretaker	2(0,5)
Illness	Yes	363(97,1)
	No	11(2,9)
Medication	Yes	345(92,3)
	No	29(7,8)
Corrective lenses	Yes	110(29,4)
	No	253(70,6)
Cane	Yes	17(4,6)
	No	357(95,5)
Crutch	Yes	5(1,4)
	No	369(98,7)
Walker	Yes	1(0,3)
	No	373(99,7)
Falls (last 12 months)	Yes	128(34,2)
	No	246(65,8)
Hospitalization (last 12 months)	Yes	113(30,2)
	No	261(69,8)

* Schooling: high (≥8 years of schooling); average (4-8 incomplete years); low (1-4 incomplete years).

Regarding frailty syndrome, 114 (30.5%) elderly were classified as non-fragile; 110 (29.4%) apparently vulnerable to frailty; 96 (25.7%) had mild fragility; 43 (11.5%) moderate and 11 (2.9%) severe. The average score of the EFS assessment was 5.91 points (SD = 2.4), with a minimum score of 0 and a maximum of 13 points.

Regarding the average performance on the frailty scale, the elderly wearing lenses scored 5.97 points; use of crutches 8.0 points, canes 8.35 points and walker 7.00 points. Individuals using assistive technologies obtained higher mean values on the frailty scale when compared to those who did not. The mean frailty score among the elderly who used canes was significantly higher compared to those who did not ($\overline{X}$ = 8.35 vs 5.80) (Table 2).

In bivariate analysis, it was observed that assistive technologies were associated with increased fragility scale. However, when confidence intervals and p-statistic values were evaluated, only "cane" technology remained associated with the frailty scale. Thus, when the elderly used the cane, the frailty was 2.5 times higher compared to the participant who did not use it ($p = 0.000$) (Table 2).

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Table 2 - Mean fragility scale and beta coefficients of the simple linear regression analysis and multiple linear regression, according to the use of assistive technologies by the elderly. Ponta Grossa, PR, Brazil, 2017

Assistive technology		n	$\overline{X}$	Bivariate analysis		Multiple model	
				β (IC 95%)*	*p* **	β (IC 95%)*	*p* **
Lenses	Y	110(29,4)	5,97	0,19 (-0,36;0,74)	0,496	0,20 (-0,34;0,74)	0,459
	N	264(70,6)	5,78				
Crutches	Y	5(1,3)	8,00	2,11 (-0,07;4,29)	0,058	1,75 (-0,40;3,89)	0,111
	N	369(98,7)	5,89				
Cane	Y	17(4,5)	8,35	2,55 (1,37; 3,73)	0,000	2,47 (1,28;3,65)	0,000
	N	357(95,5)	5,80				
Walker	Y	1(0,27)	7,00	1,08 (-3.79;5,96)	0,662	-	-
	N	373(99,7)	5,91				

* Expresses average increase in fragility scale given 1 (one) unit increase in assistive technology

** Regarding the test performed to test the difference of means

In multivariate analysis, the effect of the four assistive technologies (lenses, crutches, canes and walker) on frailty was evaluated, and only the cane was explanatory of the increased frailty (Table 3). When the "walker" technology was removed, the canes remained as the explanatory variable of the association with frailty syndrome, while the use of lenses or crutches was not associated with increased frailty (Table 3).

Table 3 - Initial multiple regression models between frailty scale and assistive technologies in use by the elderly. Ponta Grossa, PR, Brazil, 2017

Assistive technology	Initial model		Final model	
	β (IC 95%)*	p **	β (IC 95%)*	p **
Lenses	0,20 (-0,34-0,74)	0,469	0,20 (-0,34;0,74)	0,459
Crutches	1,75 (-0,40-3,90)	0,111	1,75 (-0,40;3,89)	0,111
Canes	2,47 (1,29;3,66)	0,000	2,47 (1,28;3,65)	0,000
Walker	1,16 (-3,60;5,93)	0,632	-	-

Regarding the general characterization of the sample, the findings are similar to the results of research on the theme of frailty syndrome in the elderly, in the community or in outpatient care.[16,17,18]

Overall, the use of cane, crutch and walker assistive technologies was poorly referenced by respondents. Similar results were presented in the cross-sectional investigation conducted with 203 elderly users of basic health units which found that 5.4% of participants made use of these devices.[19] A possible explanation for the low referenced use of mobility aids can be attributed to the fact that the elderly associate the image of disability with such technologies.

Of the assistive technologies investigated, we found that the use of corrective lenses was more frequent. However, with a lower percentage than the results presented in the cross-sectional survey conducted with older elderly residents at home, in Ribeirão Preto / SP, which identified that of 114 participants, 45.6% were wearing corrective lenses (45.6%).[20]

In general, studies investigating assistive technologies and / or mobility aids tend to combine the use of a cane, walker and crutches into one category, which makes individual comparison by technology difficult.

The assessment of frailty by the EFS found that the prevalence values identified were close to those reported in the cross-sectional study conducted with 511 elderly non-institutionalized subjects, which found that 41.3% of the elderly had some degree of frailty, according to EFS[21]; and cross-sectional survey of 360 elderly assisted at a referral center in Minas Gerais that found the syndrome in 47.2% of participants.[22]

The prevalence variability of the syndrome can be attributed to the different theoretical models, screening criteria, size and geographical characteristics of the researched samples. For example, the international systematic review on the topic reported prevalence rates of frailty ranging from 7.7% to 42.6% in elderly residents of Latin America and the Caribbean.[23] In Brazil, experts who drafted the Brazilian Consensus on Elderly Fragility found range between 6.7 and 74.1%.[24]

Regarding assistive technologies, it was found that the elderly using assistive technologies presented higher mean values in the frailty scale, especially the use of a cane that was associated with the syndrome in the bivariate and multivariate analysis. A similar result was found in a cross-sectional survey conducted at home with 339 elderly people from Minas Gerais, where the fragility assessed through the SAI was associated with difficulty walking (adjusted PR = 4.27; 95% CI 1.74–10.52), and need for mobility aids (adjusted PR = 9.42; 95% CI 2.06–43.16).[17]

In the cross-sectional study conducted with 144 community-dwelling elderly in Ribeirão Preto, the use of wheelchair (p = 0.0014), cane (p = 0.0026) and walker (p = 0, 0386) were significantly associated with frailty.[20]

The use of assistive technologies is understood as a factor directly related to the physical dimension of the syndrome.

The triad of frailty may be explained by neuromuscular changes, neuroendocrine dysregulation and immune system dysfunction. The description of the cycle proposed by the authors is a spiral with decreasing tendency in the energy reserve of several systems, which may explain the process of loss of muscle mass and strength, decrease of metabolic rate, decline of energy expenditure and mobility, justifying the high risk for adverse outcomes such as decreased functional capacity, dependence, fall, hospitalization, and death.[25] Thus, it is expected that fragile individuals may have the need to use such technologies, especially those related to mobility aids.

CONCLUSIONS

A limitation of the study is the convenience sample, composed of elderly people who were able to go to the hospital, which may have contributed to the non-inclusion of fragile individuals using assistive technologies. In addition, sampling is representative of a local community, so it does not allow generalizing the results to other territories. Longitudinal studies are recommended to evaluate frailty syndrome and its relationship with associated factors in elderly in outpatient care.

The study made it possible to identify that almost half of the sample had some condition of frailty and that the use of assistive technologies by the elderly was little mentioned. Assistive technologies were associated with increased frailty scale, especially the use of a cane.

The importance of the health professional is notable in reference to early screening of the elderly in fragile condition with emphasis on the elderly who use assistive technologies, as they may indicate impairment and functional loss, which in turn may contribute to the aggravation of the syndrome.

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Corresponding author
Clóris Regina Blanski Grden
Address: Rua Teodoro Sampaio, 88, Oficinas
Ponta Grossa/PR, Brazil
Zip code: 84036-070
E-mail address: reginablanski@hotmail.com

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