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Original Article

Correlation between demographic and clinical factors, frailty, and functional capacity of older adults during the COVID-19 pandemic

Correlação entre fatores demográficos, clínicos, fragilidade e capacidade funcional de pessoas idosas na pandemia de COVID-19

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ABSTRACT

Objective: to examine the correlation between demographic and clinical factors, frailty, and functional capacity in older adults during the COVID-19 pandemic. **Methods**: this prospective longitudinal study was conducted in a secondary care unit with 128 participants. Variables included demographic and clinical data, frailty, and basic and instrumental activities of daily living. Descriptive statistics, Student's t-tests, and Pearson's correlation were applied. **Results**: a decline in both basic ($p<0.001$) and instrumental ($p=0.001$) activities of daily living was observed between the first and second assessments. Frailty increased from the first to the second assessment ($p<0.001$). Advancing age was correlated with reduced performance in both basic and instrumental activities of daily living. Instrumental activities decreased with a higher number of comorbidities and greater frailty, while they were positively correlated with educational level. **Conclusion**: a decline in functional capacity and an increase in frailty were observed among older adults between the two assessments. Demographic and clinical factors were correlated with instrumental activities of daily living. **Contributions to practice**: screening for the conditions identified in this study may support post-pandemic strategies such as participation in social groups, engagement in physical activity, and other interventions aimed at restoring and maintaining functional capacity and quality of life.

Descriptors: Activities of Daily Living; Aged; Frailty; COVID-19.

RESUMO

Objetivo: correlacionar fatores demográficos, clínicos, fragilidade e capacidade funcional de pessoas idosas na pandemia de COVID-19. **Métodos:** estudo longitudinal prospectivo, realizado em uma unidade de atenção secundária com 128 participantes. As variáveis compreenderam dados demográficos, clínicos, fragilidade, atividades básicas e instrumentais da vida diária. Foram realizadas estatística descritiva, testes *t student* e correlação de *Pearson.* **Resultados:** ocorreu diminuição das atividades básicas ($p<0,001$) e instrumentais ($p=0,001$) da vida diária entre a primeira e segunda avaliação. Observou-se aumento da fragilidade entre a primeira e segunda avaliação ($p<0,001$). O aumento da idade correlacionou-se com a redução das atividades básicas e instrumentais da vida diária. As atividades instrumentais foram reduzidas com a maior quantidade do total de doenças e da fragilidade e correlacionou-se positivamente com a escolaridade. **Conclusão:** ocorreu a diminuição da capacidade funcional nas pessoas idosas e aumento da fragilidade entre as duas avaliações. Fatores demográficos e clínicos apresentaram correlação com as atividades instrumentais de vida diária. **Contribuições para a prática:** o rastreio das condições identificadas no estudo pode contribuir no período pós-pandêmico, fomentando estratégias como a participação em grupos de convivência, prática de atividades físicas, entre outros para recuperação e/ou manutenção da capacidade funcional e qualidade de vida.

Descritores: Atividades Cotidianas; Idoso; Fragilidade; COVID-19.

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Introduction

Functional capacity and frailty are central concepts for understanding the aging process and its impact on quality of life, health, and autonomy among older adults. Functional capacity is defined as the ability to perform daily activities independently, serving as a marker of autonomy and health. This capacity includes both basic activities of daily living, such as eating, dressing, and personal hygiene, and more complex instrumental activities, such as managing finances, shopping, and administering medications. Its preservation depends on physical factors such as muscle strength and mobility; social factors such as support networks; and behavioral factors such as physical activity and healthy habits. Thus, functional capacity is intrinsically linked to quality of life and to the ability of older adults to remain active and integrated into society[1-4]. However, physical conditions such as frailty may compromise the independence of older adults in performing daily activities.

Frailty is defined as a dynamic and multifactorial state that reflects reduced physiological reserves and greater vulnerability to internal and external stressors. Unlike the isolated presence of chronic diseases or comorbidities, frailty results from complex interactions among physical, psychological, and social factors typical of aging. This state significantly increases the risk of adverse outcomes such as falls, accelerated functional decline, frequent hospitalizations, and premature mortality. Moreover, frailty is a dynamic concept: although in many cases it progresses gradually, early interventions can slow or even reverse this process[5].

Although distinct, functional capacity and frailty are complementary dimensions in the care and assessment of older adults' health. While functional capacity provides a concrete measure of autonomy and independence in daily tasks, frailty indicates imminent risks and the need for preventive approaches. Recognizing and assessing these concepts in an integrated manner is essential for promoting targeted interventions that enhance autonomy and minimize the impact of vulnerabilities on the trajectory of healthy aging[1,3,5].

Several instruments are available for assessing functional capacity. The Barthel Index evaluates Basic Activities of Daily Living (BADL) and is a widely used and validated instrument in Brazil that measures functional independence in personal care, mobility, locomotion, and elimination[1]. To assess Instrumental Activities of Daily Living (IADL), which involve more complex social activities requiring the ability to live independently in the community—such as using the telephone, handling money, preparing meals, and managing medications—the Lawton and Brody Scale is widely used in gerontology and validated in Brazil[2].

The assessment of functional capacity has shown that disability results from multiple factors. One example was the context of 2020, when the pandemic caused by the novel coronavirus (COVID-19) particularly affected the older population worldwide. Social isolation, one of the consequences of the pandemic, brought lifestyle changes and negatively influenced physical, psychological, and social conditions. Although preventive measures were crucial for protecting the health of older adults, social isolation clearly affected their daily activities[6-7].

Therefore, investigating the progression of functional capacity and frailty in older adults, as well as the associated factors during the COVID-19 pandemic, is highly relevant given the significant impact that social isolation had on their daily activities. These findings can guide health professionals and institutions in developing care strategies aimed at maintaining functionality and preventing adverse outcomes. Thus, systematic monitoring of these factors not only contributes to expanding scientific knowledge but also strengthens policies and practices focused on comprehensive care and health promotion for older adults.

Accordingly, this study aims to analyze the correlation between demographic and clinical factors, frailty, and functional capacity of older adults during the COVID-19 pandemic.

Methods

A longitudinal prospective study was conducted in two phases, with an interval of 18 months, as part of the larger project entitled: Self-care and the frailty syndrome of older adults before and during the COVID-19 pandemic. The first assessment, conducted in person, took place from January to March 2020 in a geriatrics outpatient clinic of a secondary health care unit affiliated with a public higher education institution in a municipality in São Paulo State, Brazil. This facility also provides services related to chronic diseases, home care, women's health, therapeutic anticoagulation management, among others. The second assessment occurred from September to December 2021 by telephone due to local recommendations and restrictions on social isolation. During this phase, telephone contact was made using the number provided during the first data collection. If contact was not successful on the first attempt, up to three calls were made at intervals of four to five days. At this stage, participants were asked whether any older adult had contracted COVID-19 during that period, and all responses indicated that none had developed the disease. The study report followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) recommendations.

The study population consisted of older adults registered at the geriatrics outpatient clinic where the research was conducted. Inclusion criteria were: for the first assessment, age ≥ 60 years and both sexes; and for the second assessment, participation in the first phase of the study. Participants were recruited through convenience sampling during the first assessment while waiting for their outpatient consultations. For sample size calculation, the total number of daily appointments was considered, averaging 10 to 12 consultations. The Power Analysis and Sample Size (PASS) software, version 13, was used, with an a priori statistical power of 90%. The minimum sample for the first in-person assessment was 206 participants. Due to the COVID-19 pandemic, the second assessment was conducted by telephone, resulting in an attrition of 93 participants compared with the first assessment. This loss occurred due to participant refusals (n = 43) and failure to establish contact (n = 50), despite three attempts made on alternate days. Consequently, the final sample comprised 128 participants.

Independent variables included in the study were: age (in years), sex (female/male), marital status (single, married, divorced, widowed) and categorized as with or without a partner, education (in years), family income (in minimum wages), total number of diseases, and frailty. To assess frailty, the Tilburg Frailty Indicator, validated for use in Brazil, was applied. This instrument consists of 15 items distributed across three domains: physical, social, and psychological. Scores range from 0 to 15, with a cutoff point of ≥ 5 indicating frailty[8].

Dependent variables were BADL and IADL. BADL were measured using the Barthel Index, validated for use in Brazil, which includes 10 items: feeding, bathing, dressing, personal hygiene, bowel control, bladder control, use of the toilet, chair-to-bed transfer, ambulation, and stair climbing. Scores range from 0 to 100, with higher scores indicating greater independence[1]. IADL were measured using the Lawton and Brody Scale, also validated in Brazil, which assesses more complex social activities. Scores range from seven (highest level of dependence) to twenty-one (complete independence). Older adults are categorized as totally dependent (7 points), partially dependent (8–20 points), or independent (21 points), the latter being able to perform all IADL without assistance[2]. For the second telephone-based assessment, a specific day and time were scheduled in advance with participants who had taken part in the first phase, with procedures explained beforehand.

Data analysis was performed using SPSS version 22.0. For quantitative variables, as they adhered to normality according to the Shapiro-Wilk test, measures of central tendency (mean) and dispersion (range and standard deviation) were calculated, while proportions were used for qualitative variables. In

the bivariate analysis, Student's t-tests and Pearson's correlation were applied. Statistical significance was set at 5% (α=0.05) for all analyses. The data from this study are stored in the Geriatrics and Gerontology Research Center dataset at the Ribeirão Preto School of Nursing, University of São Paulo, and in Mendeley Data[9].

The study was approved by the Research Ethics Committee of the Ribeirão Preto School of Nursing, University of São Paulo (protocol number 5,467,232/2022), in compliance with all ethical standards. Certificate of Ethical Approval no. 32221020.1.0000.5393.

Results

Regarding the study sample, there was a predominance of female participants, aged 60–79 years, with 1 to 4 years of education, living with a partner, and an average family income of two minimum wages (Table 1). The mean age of the older adults was 71.9 years (standard deviation = 7.63), with a minimum of 61 and a maximum of 105 years.

Table 1 – Sociodemographic characteristics of older adults participating in the study (n=128). Ribeirão Preto, SP, Brazil, 2020–2021

Variables	n (%)
Sex	
Female	92 (71.9)
Male	36 (28.1)
Age (years)	
Younger older adult (60–79)	108 (84.4)
Older older adult (>80)	20 (15.6)
Marital status	
With partner	113 (88.3)
Without partner	15 (11.7)
Education (years)	
Illiterate	6 (4.7)
1 to 4	67 (52.3)
5 to 9	34 (26.6)
≥10	21 (16.4)
Family income (Minimum wage)*	
1	31 (24.2)
2	49 (38.3)
3 to 5	41 (32.0)
6 to 9	5 (3.9)
No	2 (1.6)

*Minimum wage in 2022: R$ 1,212.00

A statistically significant reduction was observed in IADL and BADL, along with an increase in frailty, between the first and second assessments (Table 2).

Table 2 – Comparison of measures of central tendency and dispersion of IADL, BADL, and frailty among older adults in the first and second assessments (n=128). Ribeirão Preto, SP, Brazil, 2020–2021

Variables	Mean	Standard deviation	Minimum	Maximum	p-value*
IADL					
First assessment	19.80	2.618	0	7	0.010
Second assessment	19.27	2.875	2	21	
BADL					
First assessment	95.43	11.773	10	100	<0.001
Second assessment	88.95	22.672	0	100	
Frailty					
First assessment	4.48	3.099	0	12	<0.001
Second assessment	8.02	2.168	4	14	

*Paired-samples t-test; IADL: Instrumental Activities of Daily Living; BADL: Basic Activities of Daily Living

Regarding changes in the classification of IADL, there was a decrease in independence (1st assessment – 90; 70.3%; 2nd assessment – 69; 53.9%) and an increase in partial dependence (1st assessment – 36; 28.1%; 2nd assessment – 58; 45.3%).

For the classification of BADL, there was a decrease in independence (1st assessment – 88; 70.3%; 2nd assessment – 69; 53.9%) and mild dependence (1st assessment – 20; 15.6%; 2nd assessment – 17; 13.3%). There was an increase in moderate dependence (1st assessment – 18; 14.1%; 2nd assessment – 27; 21.1%), severe dependence (1st assessment – 1; 0.8%; 2nd assessment – 4; 3.1%), and total dependence (1st assessment – 1; 0.8%; 2nd assessment – 6; 4.7%).

In the second assessment, advancing age was correlated with reduced BADL and IADL. The increase in the number of diseases and the degree of frailty also correlated with the decrease in IADLs. In turn, a positive correlation was observed between higher educational level and IADL (Table 3). It is noteworthy that

the mean total number of diseases was 4.18 (standard deviation = 3.02), ranging from 0 to 14 diseases.

Table 3 – Correlation between BADL and IADL in the second assessment and sociodemographic and clinical variables of older adults (n=128). Ribeirão Preto, SP, Brazil, 2020–2021

Variables	BADL		IADL	
	r*	p-value	r	p-value
Age	-0.188	0.034	-0.413	< 0.001
Education	0.164	0.065	0.263	0.003
Total number of diseases	-0.150	0.092	-0. 223	0.011
Frailty	-0.084	0.344	-0.182	0.040

*r: Pearson's Correlation Coefficient; BADL: Basic Activities of Daily Living; IADL: Instrumental Activities of Daily Living

Discussion

In the correlation between age, education level, total number of diseases, and frailty with Instrumental and Basic Activities of Daily Living in older adults, the results of this study, conducted during the COVID-19 pandemic, showed significant changes in functionality between the first and second assessments. A decline in BADL and IADL was observed, accompanied by a marked increase in frailty, indicating a progressive loss of functional capacity. This progression may reflect both the natural aging process and specific factors from the follow-up period, such as mobility restrictions and social interaction limitations imposed by the COVID-19 pandemic[3,10]. The slight decline observed in BADL is consistent with other studies in the literature and can be explained, in part, by women's greater tendency to seek and receive social support, due to their higher participation in social networks and social activities[7,11-12].

Older adults without a partner showed greater functional impairment. During the pandemic, social isolation profoundly affected this population, particularly those without support from others. Having a partner exerts a significant influence on BADL. The presence of a partner can provide practical and emotional support, as well as increase motivation and encouragement for independently performing basic activities[13].

The correlation analysis showed that age had a negative association with BADL and, more strongly, with IADL, indicating that aging impacts instrumental activities more than basic ones. This pattern suggests that initial losses in functionality tend to occur first in more complex tasks, as observed in previous studies that also used correlation coefficients[14-15]. It is important to note that most participants in this study were younger older adults, which may have moderated the functional decline observed; moreover, the period of social isolation during the COVID-19 pandemic likely contributed to the reduction in daily activity performance due to public health measures.

Education showed a positive correlation with IADL, but not with BADL, indicating that higher educational levels may help maintain instrumental activities. This finding is consistent with investigations demonstrating a correlation between low education and a higher risk of functional dependence in older adults, suggesting that educational capital supports both the understanding and execution of more complex tasks[16].

The negative relationship between the number of diseases and IADL shows that the greater the number of comorbidities, the greater the impairment in performing instrumental activities. This suggests that the presence of multiple diseases negatively affects functionality, increasing the need for assistance with tasks[3,17]. This scenario was exacerbated during the COVID-19 pandemic, when the coexistence of multiple diseases heightened the risks of health complications, physical limitations, and geriatric syndromes such as frailty[18].

Morbidity plays an important role in the analysis of frailty. Inactive older adults, with or without type 2 diabetes, were 13 times more likely to develop frailty, and the risk increased nearly nine times among those aged 75 years or older. In addition, older adults with five or more comorbidities were four times more likely to become frail[19].

Frailty showed a negative correlation with IADL but was not correlated with BADL. This finding suggests that, in the early stages of the syndrome, frailty primarily affects instrumental activities, while basic activities tend to remain preserved until more advanced stages[20]. Longitudinal studies using correlation analysis confirm this pattern, showing that frailty is an earlier predictor of decline in IADL[21-22].

The context of the COVID-19 pandemic likely contributed to the accelerated functional decline observed. Social isolation, mobility restrictions, and fear of contagion limited participation in physical and social activities, worsening conditions of frailty and multimorbidity. Although no confirmed diagnoses of COVID-19 were reported among this group of older adults during follow-up, participants were asked about the occurrence of the disease. In a three-month follow-up study involving 318 patients hospitalized due to COVID-19, the assessment of functional capacity and frailty showed an increase in frailty, defined by a worsening Clinical Frailty Scale score between baseline and three months in 41 patients (26.8%)[20].

Given the results presented, it is noteworthy that no studies similar to this one were found that assessed frailty using the Tilburg scale during the pandemic. Only studies that examined frailty during the pandemic in general were identified[23-25], which makes comparison with previous findings difficult.

International studies conducted in England, Spain, and Japan found that social isolation during lockdowns influenced levels of frailty, with those experiencing less social restriction showing lower functional deterioration[23,26]. These findings reinforce the importance of simultaneously analyzing both the objective and subjective aspects of social relationships so that health professionals, especially nurses, can understand how different dimensions of social interaction impact the functionality and overall health of older adults[27].

Thus, the results of this study highlight the importance of sociodemographic and clinical variables—age, education, comorbidities, frailty, and social support—in the functional performance of older adults. Furthermore, the pandemic underscored the need for adapted care and support strategies, reinforcing the role of the nursing team in preventing functional decline, preserving autonomy, and promoting quality of life.

Study limitations

Conducting the second assessment by telephone, due to the context of the COVID-19 pandemic, resulted in sample loss that may have interfered with the generalizability of the results, in addition to possibly affecting the accuracy of participants' responses. Another limitation was the use of convenience sampling and correlation analysis to interpret the results, as this restricts the ability to establish causal relationships between variables. It should be emphasized, however, that the findings provided important insights for guiding care for the older population in the post-pandemic context.

Contributions to practice

The findings of this study may contribute to advancing scientific knowledge in the fields of health and nursing, particularly in the post-pandemic period, which presents important challenges for the recovery and/or maintenance of functional capacity in older adults. Early identification by health professionals, especially nurses, of factors correlated with increased frailty and impairment of BADL and IADL—such as age, education, and number of diseases—can support strategies such as encouraging participation in social groups, promoting physical activity, reintegration of older adults into formal education programs, among others, to reduce functional decline and loss of autonomy, ensuring healthy aging with dignity and quality of life. Its relevance to clinical practice should also be highlighted, as it identifies indicators for active aging

during the pandemic, emphasizing the role of nursing in recognizing and managing the effects of social isolation in older adults, and acting as a bridge to minimize the impacts of this condition on health and well-being, especially in contexts such as health crises that intensify isolation.

Conclusion

The study demonstrated that the COVID-19 pandemic contributed to decreased functional capacity and increased frailty in older adults. Advancing age was correlated with reduced performance in both basic and instrumental activities of daily living. Instrumental activities decreased as the total number of illnesses and the level of frailty increased, and were positively correlated with education.

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Authors' contribution

Conception and design or analysis and interpretation of data; drafting of the manuscript or critical revision of its intellectual content; final approval of the version to be published; responsibility for all aspects of the text to ensure the accuracy and integrity of any part of the manuscript: Rodrigues RAP, Matiello FB, Alcântara e Silva MP, Santos ME, Bento DYK, Fernandes DS. Conception and design or analysis and interpretation of data; final approval of the version to be published; responsibility for all aspects of the text to ensure the accuracy and integrity of any part of the manuscript: Rodrigues RAP.

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