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ORIGINAL ARTICLE

Frailty as a strategy for organizing Health Services for Older Adults

Fragilidade como estratégia de organização dos serviços de saúde para pessoas idosas

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Abstract

Introduction: The aging process increases clinical conditions associated with age, such as urinary incontinence, systemic arterial hypertension, diabetes mellitus, risk of falls, depression, and cognitive decline. There is no consensus on the definition of frailty due to the scope of different physical and biopsychosocial dimensions of the term. Nevertheless, this condition is associated with vulnerability, increasing the chances of falls, functional decline, hospitalization, institutionalization, and death. *Objective*: Describe and identify clinical/functional dimensions associated with different frailty levels in older people. *Methods*: A retrospective cross-sectional study was conducted with older adults in Amazonas, Brazil. Variables extracted from the Clinical-Functional Vulnerability Index. The Chi-square test determines the association between the outcome variable and the independent variables. To assess the variables associated with vulnerability, the Poisson model was used. *Results*: The results show that a total of 497 older people aged 60 to 101 years 216 were classified as robust, 161 pre-frail, and 120 frails. It was concluded that a large part of the older adults in the analyzed community was already in the process of frailty or was fragile. The domains that contributed most to the frailty in each stratum were mood alterations, gait alterations, and deficiency in Activities of

Daily Living (basic and instrumental). *Conclusion*: A large part of the older adults in the analyzed community was already in the process of frailty or was fragile. The domains that most contribute to the frailty in each stratum were mood alterations, gait alterations, and deficiency in activity daily life (basic and instrumental).
Keywords: Aging; Health Services for the Aged; Health of the Elderly; Frailty.

Resumo

Introdução: O processo de envelhecimento aumenta as condições clínicas associadas à idade, como incontinência urinária, hipertensão arterial sistêmica, diabetes mellitus, risco de quedas, depressão e declínio cognitivo. Não há consenso quanto à definição de fragilidade, devido à abrangência das diferentes dimensões físicas e biopsicossociais do termo. No entanto, essa condição está associada à vulnerabilidade, o que aumenta as chances de quedas, declínio funcional, hospitalização, institucionalização e morte. *Objetivo*: Descrever e identificar as dimensões clínico-funcionais associadas a diferentes níveis de fragilidade em idosos. *Métodos*: Foi realizado um estudo transversal retrospectivo com idosos no Amazonas, Brasil. As variáveis foram extraídas do Índice de Vulnerabilidade Clínico-Funcional. O teste do qui-quadrado avaliou a associação entre a variável dependente e as variáveis independentes. Para avaliar as variáveis associadas à vulnerabilidade, utilizou-se o modelo de Poisson. *Resultados*: Os resultados mostram que, de um total de 497 idosos com idades entre 60 e 101 anos, 216 foram classificados como robustos, 161 como pré-frágeis e 120 como frágeis. Concluiu-se que grande parte dos idosos na comunidade analisada já se encontrava em processo de fragilidade ou era frágil. Os domínios que mais contribuíram para a fragilidade em cada estrato foram alterações de humor, alterações da marcha e deficiência nas Atividades da Vida Diária (básicas e instrumentais). *Conclusão*: Grande parte dos idosos na comunidade analisada já se encontrava em processo de fragilidade ou já era frágil. Os domínios que mais contribuíram para a fragilidade em cada estrato foram alterações de humor, alterações da marcha e deficiência nas atividades da vida diária (básicas e instrumentais).
Palavras-chave: Envelhecimento; Serviços de Saúde para Idosos; Saúde do Idoso; Fragilidade.

Introduction

The world population is aging including Brazil. Seniors aged 65 and over represent 10.49% of the Brazilian population, with a forecast of an increase to 25.17% in 2060 [1]. Aging is a continuous and dynamic process, characterized by chemical and morphological changes. These modifications lead to a loss of harmonic interaction between multiple domains, decreasing the ability to adapt to the environment, and can compromise the health status, increasing the chances of vulnerability [2-4]. This process increases clinical conditions associated with age, such as urinary incontinence, systemic arterial hypertension, diabetes mellitus, risk of falls, depression, and cognitive decline. These health conditions contribute to a greater state of frailty in older people [5,6] requiring the creation of public policies aimed at this population [7].

There is no consensus on the definition of frailty due to the scope of different physical and biopsychosocial dimensions of the term. Nevertheless, this condition is associated with vulnerability, increasing the chances of falls, functional decline, hospitalization, institutionalization, and death [2,3,4,7]. The possibility of intervention addressed to prevent or minimize frailty must be the focus of Health Services addressed for older adults. Some studies demonstrate the possibility of regression of this frailty condition through a multicomponent exercise program, focusing on endurance, strength, coordination, balance, and flexibility improving functional performance [8-10].

Among models traditionally used in geriatric medicine to define this condition, the multidimensional model should be considered a novel approach to including genetic, biological, functional, cognitive, psychological, and socioeconomic dimensions [11]. Several scales assess older adults in a multidimensional way, such as the Clinical-Functional Vulnerability Index-20 (IVCF-20) [2], Edmonton Frail Scale (EFS) [8], and Vulnerable Elders Survey-13 (VES-13) [12]. Different studies use these scales to assess the factors associated with frailty [13,14] or its prevalence in different communities [15], however, it wasn't found studies that use these scales to elaborate care plans aimed at the needs demonstrated by each level of frailty.

The first step in planning strategies to control and prevent vulnerability in older adults is to carry out a correct functional assessment, allowing for detect risk situations, monitoring functional decline, and identifying areas with greater impairment within the individual assessment of each one and, consequently, identify the need use of specialized services. Knowing the vulnerability of population groups allows us to mobilize personal and physical resources for social transformations, based on intersectoral relationships. Thus, the greater the degree of commitment, resources, scientific quality, monitoring, and management of national, regional, and local social programs for the prevention and care of older people, the greater the chances of directing and optimizing social resources, strengthening the older people in the face of diseases long-term and its consequences.

Therefore, it is necessary to assess the factors that most contribute to frailty among the older community to the elaboration of care plans for each of these strata, aiming to reduce the process of frailty and prevent the evolution of frailty. The understanding of which dimensions greater contribute to each stratum helps health services for the aged to be prepared to create more efficient strategies to help the older people in the community to achieve successful aging. So, the objective of this study was to describe and identify clinical/functional dimensions associated with different frailty levels in older people to help health services deal with frailty.

Methods

Ethical aspects

This project was approved by the Ethics and Research Committee of the Federal University of Amazonas (3,781,478).

Design, place, and period of the study

This is a retrospective cross-sectional study carried out at the Gerontological Polyclinic of the Fundação Universidade Aberta da Terceira Idade (FUnATI) in Manaus, Amazonas/Brazil.

The manuscript was written according to The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE).

Population, inclusion, and exclusion criteria

It was a convenience sample of patients aged 60 years or older who presented to the Polyclinic for their first visit for assistance from January 2017 to December 2019. Medical records with incorrect completion were excluded. Initially, 744 medical records were collected; after filtering, the final sample comprised 497 participants.

Study protocol

Data collection took place from June to August 2019, through an active search of medical records. Socioeconomic data and the Clinical-functional vulnerability-20 (IVCF-20) were collected by the research team. Double-typing was performed on overlapping spreadsheets in Microsoft Excel® to check for inconsistencies. In the presence of inconsistency, the medical record number indicated was revised so that the correction could be made. All data were reviewed, tabulated, and coded.

The variables analyzed by the study were based on the dimensions evaluated by the IVCF-20. The instrument is a screening questionnaire composed of 20 questions that assess the older population in the dimensions of age, self-perception of health, activities of daily living (ADL), cognition, mood, mobility, communication, and multiple comorbidities. Based on the score achieved, older people are classified as robust when the score is from 0 to 6; at risk of frailty when the score is between 7 and 14, and frail when it is greater than or equal to 15 [6] (Figure 1).

The purpose of applying the IVCF-20 to the elderly is to identify the specific dimension that contributes to increased vulnerability. The identification of this dimension leads to an individual treatment plan that includes different professionals. Figure 2 demonstrates a proposal of how the dimensions are connected to health areas. For example, an elderly person with impaired mobility, hypertension, and overweight (BMI > 27kg/cm2) should be referred to a physical therapy/occupational therapist, general practitioner/geriatrics, nurse, and nutritionist. If blood pressure is showing acceptable values, the patient can be referred to physical education.

Analysis of results and statistics

Data were grouped and statistically analyzed using the Stata program (version 14.0). A descriptive statistical analysis of the variables studied was performed. The chi-square test was used to assess the association between the outcome variable (vulnerability) and the independent variables. The significance level adopted was 5% ($p < 0.05$).

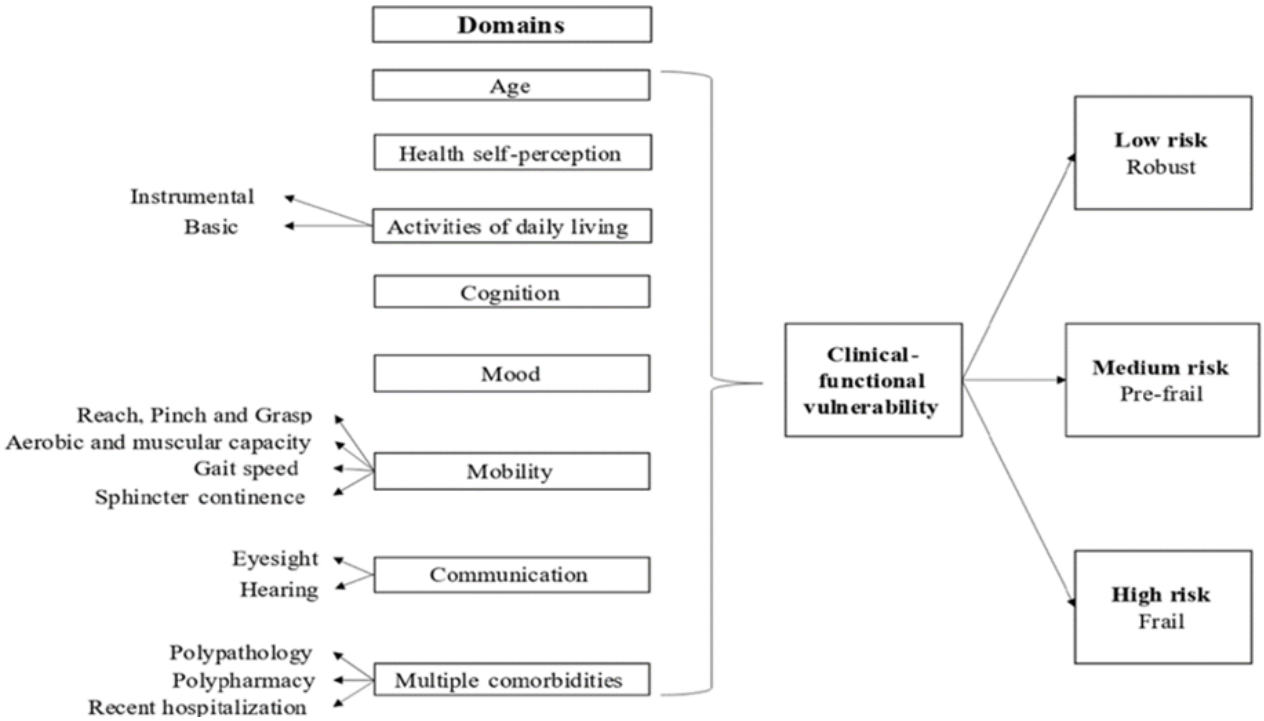

Figure 1 – *Multidimensional model components from IVCF-20.*

Source: https://www.ivcf20.org/

To assess the variables associated with clinical-functional vulnerability, crude Prevalence Ratios (PRs) were first calculated with 95% confidence intervals (CIs) for each variable using the Poisson model. Then, to evaluate the associations of interest, a Poisson multiple regression model with robust variance was used to estimate the adjusted PR. For this, variables with p-values < 0.20 in the univariate analysis were included, and those that remained statistically significant (p<0.05) after adjustment for the other variables were retained in the final model.

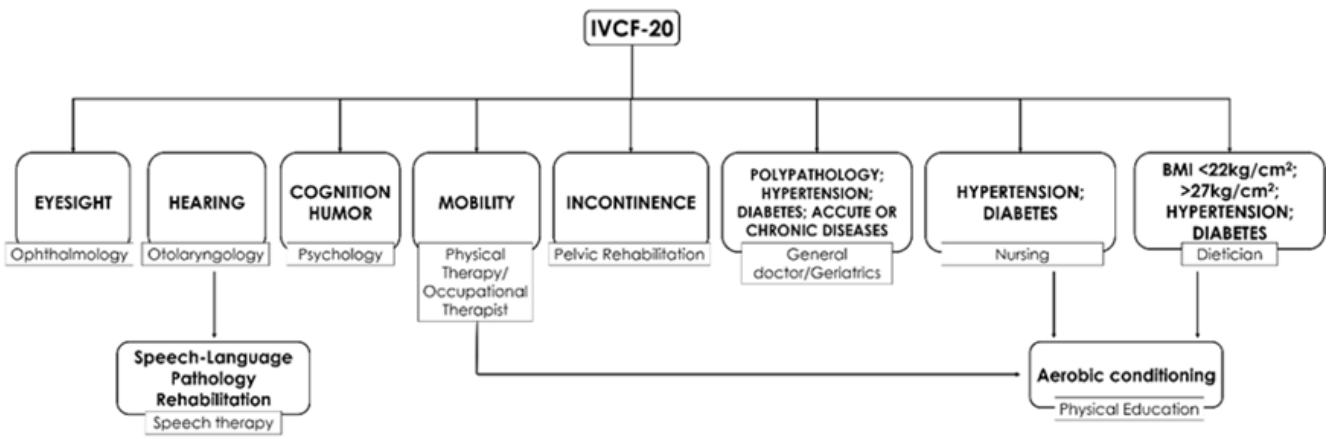

Figure 2 – *Proposal flow model based on IVCF-20.*

Source: Leon e cols, 2023.

Results

The study included 497 older adults, 69.4% female (n = 345), aged 60 to 101 years (average 69.082 ± 7.77 years). Frailty analysis showed that 43.5% (n = 216) of the older people were classified as robust, 32.4% (n = 161) as pre-frails, and 24.1% (n = 120) were evaluated as frails. Overall, bad/regular health self-perception was assumed by 60.4% (n = 300) of the participants. The majority didn't report ADL disabilities (the ability to take a shower by themselves). Cognition and mood issues were reported by 48.3% (n = 240) and 59.2%, (n = 294) respectively. A greater number of participants didn't report mobility alterations, communications difficulties, or the presence of multiple comorbidities (Table 1).

Frail people were older (>85year) and reported bad health self-perception mostly. Also, they presented a major frequency of disabilities and/or difficulties in all other dimensions evaluated: instrumental ADL, basic ADL, cognition alteration, mood alteration, alteration in reach, pinch, and grasp, alteration in aerobic and muscular capacity, gait difficulty, two or more falls in the last month, communication difficulty, and major presence of multiple comorbidities. The older people at risk of frailty showed a worse self-perception of health compared to the robust ones. Both cognition alteration and mood alteration were more present among the frail and at risk of frailty.

Table 1 – *Association of IVCF -20* domains with the risk of vulnerability older people treated at the Gerontological Polyclinic. Manaus/AM, from 2017 to 2019 (n = 497).*

Domain (n; %)	Total (497, 100%)	Robust (216; 43.5%)	Pre-frail (161; 32.4%)	Frail (120; 24.1%)	p-value
Sex					
Male	152 (30.6%)	63 (29.2%)	49 (30.4%)	40 (33.3%)	0.70
Female	345 (69.4%)	153 (70.8%)	112 (69.6%)	80 (66.7%)	
Age group					
60-74	389 (78.3%)	196 (90.7%)	129 (80.1%)	64 (53.3%)	<0.0001
75-84	83 (16.7%)	18 (8.3%)	27 (16.8%)	38 (31.7%)	
≥85	25 (5%)	2 (0.9%)	5 (3.1%)	18 (15%)	
Student					
Yes	254 (51.1%)	142 (65.8%)	86 (53.4%)	26 (21.7%)	<0.0001
No	241 (48.5%)	73 (33.8%)	75 (46.6%)	93 (77.5%)	
Did not inform	2 (0.40%)	1 (0.46%)	0 (0%)	1 (0.83%)	

Health self-perception					
Great, good	193 (38.8%)	129 (59.7%)	47 (29.2%)	17 (14.2%)	<0.0001
Bad, regular	300 (60.4%)	85 (39.4%)	114 (70.8)	101 (84.2%)	
Did not inform	4 (0.80%)	2 (0.9%)	0 (0%)	2 (1.6%)	
Activities of daily living					
Deficiency in instrumental ADL†					
Yes	140 (28.2%)	0 (0%)	30 (18.6%)	110 (91.7%)	<0.0001
No	357 (71.8%)	216 (100%)	131 (81.4%)	10 (8.3%)	
Deficiency in basic ADL†					
Yes	44 (8.9%)	0 (0%)	0 (0%)	44 (36.7%)	<0.0001
No	453 (91.1%)	216 (100%)	161(100%)	76 (63.3%)	
Cognition alteration					
Yes	240 (48.3%)	58 (26.9%)	97 (60.3%)	85 (70.8%)	<0.0001
No	257 (51.7%)	158 (73.1%)	64 (39.7%)	35 (29.2%)	
Mood alteration					
Yes	294 (59.2%)	66 (30.6%)	124 (77%)	104 (86,7%)	<0.0001
No	203 (40.8%)	150 (69.4%)	37 (23%)	16 (13.3%)	
Mobility					
Alteration in Reach, Pinch, and Grasp					
Yes	47 (9.5%)	4 (1.9%)	12 (7.5%)	31 (25.8%)	<0.0001
No	450 (90.5%)	212 (98.1%)	149 (92.5%)	89 (74.2%)	
Alteration in aerobic and muscular capacity					
Yes	153 (30.8%)	26 (12%)	55 (34.2%)	72 (60%)	<0.0001
No	344 (69.2%)	190 (88%)	106 (65.8%)	48 (40%)	
Gait difficulty					
Yes	184 (37%)	15 (6.9%)	70 (43.5%)	99 (82.5%)	<0.0001
No	313 (63%)	201 (93.1%)	91 (56.5%)	21 (17.5%)	
Two or more falls in the last month					
Yes	78 (15.7%)	12 (5.6%)	30 (18.6%)	36 (30%)	**<0.0001**
No	413 (83.1%)	203 (94%)	128 (79.5%)	82 (68.3%)	
Did not inform	6 (1.2%)	1 (0.46%)	3 (1.9%)	2 (1.7%)	
Sphincter incontinence					
Yes	152 (30.6%)	33 (15.3%)	68 (42.2%)	51 (42.5%)	<0.**0001**
No	345 (69.4%)	183 (84.7%)	93 (57.8%)	69 (57.5%)	

Communication difficulty					
Yes	183 (36.8%)	40 (18.5%)	68 (42.2%)	75 (62.5%)	**<0.0001**
No	314 (63.2%)	176 (81.5%)	93 (57.8%)	45 (37.5%)	
Presence of multiple comorbidities					
Yes	134 (27%)	17 (7.9%)	45 (28%)	72 (60%)	**<0.0001**
No	363 (73%)	199 (92.1%)	116 (72%)	48 (40%)	

Note:
* IVCF-20- Clinical Functional Vulnerability Index 20
† ADL – Activities of daily living
Source: Primary data obtained through IVCF-20.

By the adjusted multivariate analysis, the variables associated with robustness were mood alteration and gait difficulty. The variable most associated with those at risk of frailty was a deficiency in basic ADLs and mood changes. The variable most associated with the frail was the deficiency in instrumental ADLs (Table 2). Regardless of the frailty stratum, most dimensions in this sample were mobility/daily living and cognition/mood.

Table 2 – *Poisson multiple regression model: variables associated with clinical-functional vulnerability in community-dwelling elderly. Manaus/AM, from 2017 to 2019.*

Variable (N = 497)	Crude PR*	CI† (95%)	Adjusted PR	CI (95%)
Robust				
Student	1.18	(1.02 – 1.36)	1.00	(0.86 – 1.17)
Age	1.21	(1.03 – 1.42)	1.03	(0.86 – 1.23)
Health self-perception	1.28	(1.11 – 1.49)	1.08	(0.92 – 1.27)
Activities of daily living				
Instrumental	1.43	(1.24 – 1.66)	1.18	(0.96 – 1.41)
Basic	1.31	(1.05 – 1.64)	0.96	(0.75 – 1.23)
Cognition	1.27	(1.10 – 1.46)	1.10	(0.95 – 1.28)
Mood	1.41	(1.21 – 1.64)	**1.32**	**(1.13 – 1.54)**

Mobility				
Reach, Pinch and Grasp	1.25	(1.01 – 1.56)	1.00	(0.79 – 1.27)
Aerobic and muscular capacity	1.26	(1.09 – 1.46)	1.11	(0.95 – 1.28)
Gait	1.43	(1.24 – 1.64)	**1.35**	**(1.17 – 1.56)**
Sphincter continence	1.21	(1.05 – 1.41)	1.10	(0.94 – 1.28)
Communication	1.24	(1.07 – 1.43)	1.08	(0.93 – 1.26)
Multiple comorbidities	1.29	(1.11 – 1.50)	1.14	(0.97 – 1.34)
Pre-frail				
Student	1.02	(0.89 – 1.16)	-	-
Age	1.02	(0.87 – 1.20)	-	-
Health self-perception	0.92	(0.80 – 1.06)	-	-
Activities of daily living				
Instrumental	1.09	(0.94 – 1.27)	-	-
Basic	1.22	(0.98 – 1.52)	**1.30**	**(1.03 – 1.63)**
Cognition	0.91	(0.76 – 1.04)	0.94	(0.81 – 1.08)
Mood	0.87	(0.76 – 1.00)	**0.84**	**(0.73 – 0.97)**
Mobility				
Reach, Pinch, and Grasp	1.05	(0.83 – 1.31)	-	-
Aerobic and muscular capacity	0.97	(0.84 – 1.12)	-	-
Gait	0.92	(0.80 – 1.05)	-	-
Sphincter continence	0.90	(0.77 – 1.04)	0.92	(0.79 – 1.07)
Communication	0.96	(0.83 – 1.10)	-	-
Multiple comorbidities	0.99	(0.85 – 1.15)	-	-
Frail				
Student	0.85	(0.74 – 0.97)	0.96	(0.83 – 1.11)
Age	0.81	(0.68 – 0.96)	0.95	(0.80 – 1.15)
Health self-perception	0.87	(0.76 – 1.00)	0.98	(0.85 – 1.12)
Activities of daily living			0.96	(0.81 – 1.14)
Instrumental	0.62	(0.52 – 0.73)	**0.62**	**(0.52 – 0.73)**
Basic	0.55	(0.40 – 0.74)	0.77	(0.54 – 1.08)
Cognition	0.88	(0.77 – 1.01)	0.95	(0.83 – 1.09)
Mood	0.86	(0.75 – 0.98)	0.97	(0.84 – 1.11)

Mobility				
Reach, Pinch, and Grasp	0.74	(0.58 – 0.96)	0.94	(0.72 – 1.22)
Aerobic and muscular capacity	0.82	(0.71 – 0.95)	0.96	(0.82 – 1.13)
Gait	0.78	(0.68 – 0.90)	0.95	(0.81 – 1.10)
Sphincter continence	0.92	(0.80 – 1.07)	-	-
Communication	0.86	(0.74 – 0.99)	0.93	(0.80 – 1.07)
Multiple comorbidities	0.78	(0.69 – 0.92)	0.90	(0.76 – 1.07)

Note:
* PR - Prevalence Ratios
† CI - Confidence Intervals
Source: Primary data obtained through IVCF-20.

Discussion

Mood/cognition and physical disabilities were the dimensions most associated with frailty in the older people community. Briefly, mood and gait alterations were associated with a low risk of frailty; deficiency in basic ADLs and mood alteration were associated with a medium risk; and deficiency in instrumental ADLs was associated with a higher risk of frailty. The presence of these two dimensions highlights the importance of Cognitive-Behavioral Rehabilitation (Psychology) and Physical Rehabilitation. These health areas must be fully integrated and organized into services that assist older people.

Depression is associated with a higher risk of morbidity and mortality [16]. Patients with depressive symptoms demonstrate symptoms of anxiety, suicidal thoughts, decreased cognitive function, and functional capacity [4,10]. In depressed older subjects, frailty is associated with psychological factors such as the intensity of depressive symptoms [17]. Healthy habits of living, such as engaging in physical activity and maintaining a balanced diet, are associated with fewer depressive symptoms among older adults [11,12]. Another factor that can influence these symptoms is continued work, as it fosters a sense of autonomy and independence [1] and enables social interaction [18]. In addition, cognition is linked to learning and to the functions of memory, thinking, planning, and reasoning [19].

Several studies have linked the impairment of ADLs to frailty [3,7,20,21,22,14], increasing the risk of functional disability in an individual and thus preventing him from living independently and autonomously [5,23]. This corroborates the findings of this study, in which impairment in basic and instrumental ADLs was the dimension associated with groups at risk of frailty and frailness, respectively. Gait speed is a potential indicator of frailty among older adults, enabling assessment of functional and

health status [2,24]. A change in this variable can predict falls and subsequent decline in the functionality of the aged [25], progressing to hospital admissions and death [6,24,26].

As the population profile has already been identified, it is possible to propose strategies that best accommodate the public in each stratum. As an example of mood alteration, which was more prevalent in the robust and pre-frail groups, it is necessary to create a psychological service for this public, in a way that does not interfere with the individual needs of those who attend the polyclinic. The moment the older adult is classified as robust or pre-frail on the IVCF-20, they should be referred to a psychology professional. Even if they don't demonstrate signs of mood alteration, they are inserted in the groups that have been demonstrated to have an association with this variable. Another way to address this would be walking sessions, so they should be referred to professionals in physical education as well. There is a correlation between 30-minute walks and positive changes in the mood of active older adults [9].

Therefore, not only should the psychology service be activated, but other areas of care can also influence the patient's mood, demonstrating that care for the frail should take a multidimensional approach. That can also be seen with cognition and ADLs, as alterations in cognition affect the ability to perform these ADLs, and it would be primarily assessed by psychology. But as seen in the literature, combined cognitive and physical exercise training for cognitive function has shown positive effects in older adults [14], so it would be beneficial for these people if there were an approach that combines the services of psychology and physiotherapy/physical education.

The convenience sample at a community center for older adults limits generalizability; however, the sample size allows statistical inferences to be made about this population. Despite the limitations of the research, it contributes to the development of public policies for each analyzed stratum, reducing the progression of the frailty process, preventing progression to more advanced strata, and regressing the frailty condition. Also, this study provides data to help health services improve their structural capacity to better serve the aging population.

Conclusion

A large proportion of older adults in the analyzed community were already in the process of becoming frail or were already frail. The domains that most contribute to the frailty in each stratum were mood alterations, gait alterations, and deficiency in ADLs (basic and instrumental). For health services to be prepared to deal with frailty, services related to cognitive and physical rehabilitation must be widely available.

Conflicts of Interest

The authors declare no conflict of interest.

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Authors' contribution

Research conception and design: Ataíde DS, Leon EB, Brito E, Santos MM ; Data acquisition: Ataíde DS, Queiroz RCR; Data analysis and interpretation: Tavares BM, Queiroz RCR, Ataíde DS, Santos MM; Manuscript writing: Queiroz RCR; Manuscript revision for important intellectual content: Campos HLM, Leon EB, Brito E, Ribeiro EE, Ataíde DS.

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