



ASSOCIATION BETWEEN PHYSICAL FRAILTY, COGNITION, AND SYMPTOMS OF ANXIETY AND DEPRESSION IN OLDER ADULTS: A POPULATION-BASED STUDY IN AN INTERIOR REGION OF BRAZIL

ASSOCIAÇÃO ENTRE FRAGILIDADE FÍSICA, COGNIÇÃO E SINTOMAS DE ANSIEDADE E DEPRESSÃO EM PESSOAS IDOSAS: ESTUDO DE BASE POPULACIONAL NO INTERIOR DO BRASIL

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ABSTRACT: The objective of this study was to investigate the association between physical frailty and symptoms of anxiety in community-dwelling older adults, also considering cognition and depressive symptoms as associated variables. This was a cross-sectional study conducted with 604 older adults living in the community in the city of Patos de Minas, Minas Gerais, Brazil, in which depressive and anxiety symptoms were assessed using the Geriatric Depression Scale and the Geriatric Anxiety Inventory, cognition was measured using the Mini-Mental State Examination, and frailty was evaluated through a self-reported scale. Associations between frailty, cognition, depression, anxiety, and sociodemographic variables were analyzed using chi-square tests for categorical variables and the Kruskal-Wallis test for continuous variables. Among the 604 participants, 348 were women, with a mean age of 69.3 years (± 7.3), 57.9% presented low levels of physical activity, 56.0% were classified as frail, and 33.8% as pre-frail, with Region 3 showing lower physical activity levels and higher frailty. Among frail individuals, 31.1% exhibited cognitive decline, and frail older adults presented more symptoms of depression and anxiety, lower educational levels, and more advanced age compared to non-frail individuals. It is concluded that physical frailty in older adults is significantly associated with symptoms of anxiety and depression, cognitive decline, and sociodemographic factors, and although the findings are based on bivariate analyses, which limit control of potential confounders, they reinforce the need for multidimensional strategies that integrate mental health into the prevention of physical frailty in aging.

KEYWORDS: Aged. Frailty. Anxiety. Depression. Cognition.

RESUMO: O objetivo foi investigar a associação entre fragilidade física e sintomas de ansiedade em pessoas idosas da comunidade, considerando também a cognição e os sintomas depressivos como variáveis associadas. Estudo transversal realizado com 604 pessoas idosas residentes na comunidade da cidade de Patos de Minas, Minas Gerais, Brasil. Os sintomas depressivos e de ansiedade foram avaliados por meio da Escala de Depressão Geriátrica e do Inventário Geriátrico de Ansiedade. A cognição foi mensurada pelo Minixame do Estado Mental, e a fragilidade foi avaliada por meio de uma escala autorreferida. Para analisar as associações entre fragilidade, cognição, depressão, ansiedade e variáveis sociodemográficas, foram empregados testes de qui-quadrado para variáveis categóricas e Kruskal-Wallis para variáveis contínuas. Entre os 604 participantes, 348 eram mulheres, com média de idade de 69.3 anos ($\pm 7,3$). No total, 57,9% apresentaram baixos níveis de atividade física, 56,0% foram classificados como frágeis e 33,8% como pré-frágeis. A Região 3 apresentou níveis mais baixos de atividade física e maior nível de fragilidade. Entre os classificados como frágeis, 31,1% apresentaram declínio cognitivo. As pessoas idosas frágeis apresentaram mais sintomas de depressão e ansiedade, menor escolaridade e idade mais avançada do que aquelas não frágeis. Conclui-se que a fragilidade física em pessoas idosas está significativamente associada a sintomas de ansiedade, depressão, declínio cognitivo e fatores sociodemográficos. Embora os achados revelem padrões relevantes, eles derivam de análises bivariadas, o que limita o controle de possíveis confundidores. Ainda assim, reforçam a necessidade de estratégias multidimensionais que integrem a saúde mental na prevenção da fragilidade física no envelhecimento.

PALAVRAS-CHAVE: Idoso. Fragilidade. Cognição. Ansiedade. Depressão.

INTRODUCTION

Physical frailty is a common geriatric syndrome marked by diminished physiological reserves and a reduced capacity to maintain homeostasis under stress¹. It is linked to an increased risk of adverse health outcomes, including hospitalization, functional decline, falls, institutionalization, and mortality². Although frailty and multimorbidity are distinct clinical entities³, they often coexist and are both associated with disability related to chronic noncommunicable diseases⁴, thereby contributing to increased dependency in older adults.

In older adults, it is associated with adverse health outcomes such as hospitalization, institutionalization, and premature mortality, with prevalence rates ranging from 7% to 12%² in developed countries. Emerging evidence also suggests a significant association between frailty and symptoms of anxiety and depression, particularly in low-income settings or contexts with limited social support⁵. However, most existing studies have been conducted in large urban centers or among institutionalized populations, with limited population-based research in medium-sized cities or rural areas, whether in middle- or high-income countries.

In this context, various sociodemographic and clinical factors have been identified as influencing the prevalence and progression of frailty². In Brazil, the estimated prevalence of frailty among older adults is approximately 24%⁶, notably higher than the 12% reported in other countries². Given its elevated prevalence and associated risks, frailty is increasingly recognized as a growing public health priority⁷.

In addition to sociodemographic factors and clinical variables, lifestyle aspects such as physical inactivity, dietary problems, and physical-biological conditions, including neurodegenerative diseases, may be associated with frailty. Understanding these determinants can guide policymakers in developing preventive strategies aimed at improving public health^{3,7}. Mental health conditions, including cognitive impairment⁸ and depression⁹, also have a significant impact on older adults, as they contribute to increased disability, diminished quality of life, and a higher risk of adverse health outcomes.

The co-occurrence of frailty with disabling conditions such as cognitive impairment and/or major depression can increase the risk of institutionalization, the development of physical disabilities, and a decline in quality of life among older adults⁹. For instance, in a systematic review, Pothier et al.¹⁰ found that in advanced age, depression and frailty frequently overlap, complicating the clinical diagnosis of both syndromes. In a Brazilian study, Nascimento et al.¹¹ identified specific depressive symptoms among frail older adults, such as altered somatic perception and diminished interest and pleasure in daily activities, while pre-frail individuals commonly exhibited reduced positive affect, somatic complaints, and interpersonal sensitivity.

Individuals with cognitive impairment and physical frailty are six times more likely to develop dementia than those without either condition¹². In addition, frail individuals are four times more likely to experience depression compared to non-frail individuals⁹. In a study involving 4 103 older adults in China, depression and anxiety were also associated with a high prevalence of both pre-frailty and frailty⁵. These findings suggest a bidirectional relationship between depression and frailty, with their co-occurrence predicting adverse outcomes more strongly than either condition alone.

Although the associations between frailty, cognitive deficits, and depressive symptoms are well established in the literature, few population-based studies in small Brazilian urban centers have examined physical frailty and anxiety symptoms in an integrated manner. The use of self-reported scales has proven to be a feasible strategy for screening in low-complexity healthcare settings, enabling more accessible preventive interventions. This approach can play a key role in promoting health and preventing functional decline among community-dwelling older adults, particularly in rural-urban areas

with limited access to specialized services. The hypothesis of this study is that anxiety symptoms are associated with physical frailty in older adults living in the community.

Given this context, the present article had three main objectives: (a) to describe the methodology of the Protective Factors in Aging (FAPRE) study — a descriptive, comparative, and cross-sectional investigation based on a non-probabilistic sample of older adults residing in Patos de Minas, Brazil; (b) to characterize the sample in terms of demographic and socioeconomic variables, frailty indicators, cognitive status, and symptoms of depression and anxiety; and (c) to examine the association between physical frailty and anxiety symptoms in community-dwelling older adults, while also considering cognitive status and depressive symptoms as associated variables.

METHODS

FAPRE is the acronym for *Fatores de Proteção no Envelhecimento* (Protective Factors in Aging) and was designed as a population-based study aimed at examining conditions of well-being and health among community-dwelling older adults aged 60 years and over, residing in urban areas of the municipality of Patos de Minas. More specifically, the FAPRE study aimed to investigate the relationships between indicators of frailty and psychological functioning with demographic and socioeconomic variables, as well as with selected aspects of physical health, cognition, and psychological well-being.

The study was conducted in the municipality of Patos de Minas, located in the interior of the state of Minas Gerais, within the Alto Paranaíba micro-region. The city is considered a regional economic hub and stands out among the 10 surrounding municipalities in its immediate geographic region. It ranks among the 20 largest municipalities in the state in terms of total tax revenue. In 2024, its population was estimated at 167 870. The municipal Human Development Index (HDI) is 0.765, slightly above the national HDI of 0.759. According to the 2010 census conducted by the Brazilian Institute of Geography and Statistics (IBGE), older adults aged 60 and over accounted for 10.7% of the population, totaling 16 511 individuals.

SAMPLING AND PARTICIPANTS

The minimum sample size was estimated at 604 older adults, based on a 4% margin of sampling error. A non-probabilistic, region-based sampling strategy was adopted, as there was no random selection of census tracts. This approach aimed to ensure broader coverage and greater diversity of urban areas surveyed in the municipality. Neighborhoods were grouped into 10 regions according to average household income (in Brazilian reais), as reported in the 2010 IBGE census (see Table 1). The 2010 census was used because it was the most recent official data available during the study's planning and implementation phases. The number of older adults recruited in each region was proportional to the census-based distribution by gender (male/female) and age group. As such, regions with larger older populations contributed proportionally more participants.

Given the number of regions and the target sample, the Brazilian Economic Classification Criterion (Critério de Classificação Econômica Brasil – CCEB, 2019) was used* to group the 10 regions into four broader categories: Region 1 (Socioeconomic Level A); Region 2 (Socioeconomic Level B); Region 3

* Economic classification system based on points coded according to the amount of equipment in the home, level of education, and access to public services. The classification is based on levels (A, B, C, D, and E). Level A corresponds to the highest economic standard, and level E to the lowest.

(Socioeconomic Level C); and Region 4 (Socioeconomic Levels D and E). This sampling strategy allowed for the inclusion of participants from diverse socioeconomic strata within the municipality.

It is important to note that, because the study used a non-probabilistic regional sampling approach, the findings cannot be generalized to the broader population. However, stratification by gender, age group, and income was employed to ensure internal representativeness of the sample.

Table 1. Distribution of the sample of older adults by region, sex, and age group.

Regions/Neighborhoods	Total Sample	Male				Female			
		60-64	65-69	70-74	75+	60-64	65-69	70-74	75+
Region 1: Barreiro Residential Area + Sorriso Residential Area + Coração Eucarístico + Nossa Senhora de Fátima + Jardim Itamarati + Alvorada + Caramuru	46	7	6	4	4	8	6	5	6
Region 2: Padre Eustáquio + Nossa Senhora das Graças + Cerrado + Lagoinha + Rosário + São Francisco	67	9	6	5	7	12	9	7	12
Region 3: Alto dos Caiçaras + Caiçaras + Aurélio Caixeta + Jardim América + Guanabara + Copacabana + Sobradinho	50	9	6	4	4	9	7	5	6
Region 4: Centro + Jardim Centro + Jardim Califórnia + Jardim Floresta + Valparaíso + Cidade Jardim + Jardim Paraíso	108	13	9	8	13	17	12	13	23
Region 5: Morada do Sol + Alto da Colina + Jardim Aquários + Jardim Esperança + Residencial Monjolo	29	5	4	2	2	6	4	3	3
Region 6: Nova Floresta + Novo Horizonte + Vila Garcia + Abner Afonso + Bela Vista	77	13	8	6	7	13	10	8	12
Region 7: Planalto + Residencial Gramado + Cidade Nova + Ipanema + Jardim Céu Azul + Jardim dos Andrades	27	5	3	3	2	4	4	3	3
Region 8: Antônio Caixeta + Eldorado + Boa Vista + Jardim Recanto + Jardim Panorâmico + Sebastião Amorim	47	8	5	4	4	9	6	5	6
Region 9: Brazil + Brasília + Jardim Paulistano + Nossa Senhora Aparecida + São José Operário + Santo Antônio + Várzea + Vila Rosa + Santa Luzia	71	10	7	7	7	12	9	8	11
Region 10: Cônego Getúlio + Lagoa Grande + Cristo Redentor + Santa Terezinha	82	10	9	8	8	14	12	9	12

Note: Neighborhood names are presented in Portuguese to preserve the original geographic identifiers used in the study. Source: survey data.

RECRUITMENT

Local radio and television stations, higher education institutions (HEI), and the municipal departments of social development and health were contacted to publicize the study and explain its objectives, eligibility criteria, and ethical procedures. Partnerships with these institutions were established to facilitate access to both suitable spaces and potential participants.

Interested individuals could contact the research team directly through the partner HEI. In addition, older adults were approached by the technical teams of the Social Assistance Reference Centers (CRAS), Basic Family Health Units (UBS), social groups, and the University for Older Adults. Once interest was expressed, participants were contacted to schedule an interview, which could be conducted either at their residence or in one of the aforementioned institutions. Recruiters were instructed to meet the

stipulated number of participants for each neighborhood region, ensuring adherence to the census-based distribution of genders and age groups, as shown in Table 1.

Participants met the following inclusion criteria: being aged 60 years or older, able to understand the study instructions, residing in the designated neighborhood region, and fitting the age and gender quotas established for sample composition. Older adults were excluded if, during the screening interview, they presented cognitive impairment suggestive of dementia syndrome; aphasia resulting from stroke or neurodegenerative causes; other neurological or psychiatric disorders; severe visual or hearing impairment that hindered communication; or if they were in a terminal stage of illness. All information was provided directly by the older adults themselves.

PROCEDURES

Data were collected in a single session by undergraduate health students from a partner HEI, all of whom had received 16 hours of training in the study procedures. Each evaluator was provided with a standardized data collection manual. The evaluation sessions lasted between 40 and 120 minutes. At the start of each session, participants were informed about the study objectives, the voluntary nature of their participation, their right to withdraw at any time, the confidentiality of their data, and the absence of physical or psychological risks. Those who agreed to participate signed an Informed Consent Form (ICF) approved by the Research Ethics Committee of the Faculty of Medical Sciences at the University of Campinas (Unicamp) and the University Center of Patos de Minas, under approval numbers 1 641 152 and 1 686 473 respectively.

The evaluation protocol comprised nine blocks of variables. The first block included sociodemographic information and cognitive assessment. At the end of the cognitive assessment, the interviewer scored the Mini-Mental State Examination (MMSE)¹³. Participants whose MMSE scores were above the established dementia cut-off proceeded to the second part of the protocol, which covered health-related data, including previous diagnoses, self-rated health, social support, mood, psychological well-being, personality, and religiosity. Participants scoring below the cut-off were discharged before completing the second part of the protocol. At the conclusion of data collection, all participants received information and guidance on mental health and on follow-up programs available in the public healthcare system.

INSTRUMENTS AND MEASURES

SOCIODEMOGRAPHIC VARIABLES

The following sociodemographic characteristics were assessed: age (categorized as 60–69, 70–79, or ≥80 years), gender (female or male), employment status (active or retired), marital status (married, widowed, single, or separated), household arrangement (living alone or with others), head of household status (whether the respondent was the head of the household), education (years of schooling: none, 1–4 years, or ≥5 years), individual and household monthly income (categorized by minimum wage ranges), and perceived income adequacy (sufficient or insufficient to meet basic needs).

COGNITIVE FUNCTION

Cognitive function was assessed using the MMSE, with education-adjusted cut-off scores: 17 for illiterate participants; 22 for those with 1–4 years of schooling; 24 for those with 5–8 years; and 26 for those with ≥9 years of schooling.

These cut-off points were based on the MMSE means reported by Brucki et al.¹³, defined as one standard deviation below the mean for each educational level. This criterion was also adopted by Neri et al.¹⁴, considering that cognitive changes may affect the reliability of self-reported data. In the present sample, the MMSE demonstrated satisfactory internal consistency (Cronbach's $\alpha = 0.777$).

FRAILTY

Frailty was assessed using the Self-Reported Frailty Scale developed by Nunes et al.¹⁵, a practical instrument designed to identify frailty based on self-reported information. The scale includes five components: unintentional weight loss, reduced strength, slower walking speed, decreased physical activity in the past year, and fatigue. It enables older adults to self-assess their frailty status, making it suitable for use in population-based studies and in settings with limited resources.

In the present sample, the scale demonstrated a Cronbach's α of 0.649. Cut-off points were defined as follows: 0–1 = no frailty; 2–3 = pre-frailty; and 4–5 = frailty. Previous studies have confirmed the validity of this instrument, demonstrating its sensitivity in identifying older adults at risk for adverse health outcomes. Nunes et al.¹⁵ validated the instrument in the Brazilian context, and its use has since expanded to other countries, where it has demonstrated effectiveness in detecting frailty in an accessible manner.

PSYCHIATRIC SYMPTOMS

Depressive symptoms were assessed using the 5-item Geriatric Depression Scale (GDS-5), based on the studies by Almeida & Almeida¹⁶ and Yesavage et al.¹⁷. In the present sample, internal consistency was acceptable (Cronbach's $\alpha = 0.580$), a value consistent with short screening scales¹⁸. The GDS-5 is a shortened version of the original instrument and classifies symptoms according to the following cut-off points: 0–1 = no depression; 2–3 = mild symptoms; and 4–5 = moderate to severe symptoms.

Anxiety symptoms were assessed using the 5-item Geriatric Anxiety Inventory (GAI-5), validated by Pachana et al.¹⁹. In the present sample, the instrument showed good internal consistency (Cronbach's $\alpha = 0.806$). The GAI-5 uses the following cut-off points: 0–1 = no significant anxiety; 2–3 = mild symptoms; and 4–5 = moderate to severe symptoms.

DATA ANALYSIS

Before data entry into the electronic database, all protocols were independently checked by two reviewers. Data entry was subsequently verified by two trained evaluators. Participant characteristics were summarized using absolute and relative frequencies (percentages) for categorical variables and means with standard deviations (SD) for continuous variables. The normality of continuous variables was assessed using the Kolmogorov–Smirnov test. Group comparisons were conducted using the chi-square test for categorical variables and the Kruskal–Wallis test for continuous variables. All analyses were performed using SPSS, version 20.0 (SPSS Inc., Chicago, IL, USA), with statistical significance set at $p \leq 0.05$.

RESULTS

The study sample comprised 604 older adults, including 348 women and 256 men. The most common age group was 60–69 years ($n = 335$), and 375 participants self-identified as white. Regarding

marital status, 55.5% were married, and 81.6% reported not living alone. Demographic and socioeconomic characteristics varied significantly across regions, as shown in Table 2. Region 1 had a higher proportion of self-identified white individuals (73.9% vs. 41.2% in Region 4; $p = 0.04$) and a higher socioeconomic status. This was reflected in greater educational attainment (mean of 8.5 years in Region 1 vs. 3.2 years in Region 4; $p < 0.001$) and higher personal income (54.7% earning ≥ 3.1 minimum wages in Region 1 vs. 2.7% in Region 4; $p < 0.001$) compared with the other regions.

Table 2. Distribution of older adults across the four regions according to demographic indicators.

	Total ($n=604$)	Region 1 ($n=111$)	Region 2 ($n=124$)	Region 3 ($n=301$)	Region 4 ($n=68$)	p
Sex, n (%)						
Female	348 (57.6)	65 (18.7)	70 (20.1)	172 (49.4)	41 (11.8)	0.95
Male	256 (42.4)	46 (18.0)	54 (21.1)	129 (50.4)	27 (10.5)	
Age group, (mean $\pm$ SD)	69.3 (7.3)	70.0 (7.8)	69.9 (7.9)	69.1 (7.1)	68.2 (6.6)	0.50*
60 - 69 years	335 (55.5)	57 (17.0)	68 (20.3)	168 (50.1)	42 (12.5)	0.25
70 - 79 years	208 (34.4)	41 (19.7)	37 (17.8)	109 (52.4)	21 (10.1)	
≥ 80 years	61 (10.1)	13 (21.3)	19 (31.1)	24 (39.3)	5 (8.2)	
Race/ethnicity, n (%)						
Non-White	229 (37.9)	29 (26.1)	52 (41.9)	120 (39.9)	28 (41.2)	0.04
White	375 (62.1)	82 (73.9)	72 (58.1)	181 (60.1)	40 (58.8)	
Marital status, n (%)						
Married	334 (55.5)	69 (62.2)	77 (62.1)	157 (52.2)	31 (45.6)	0.10
Single	47 (7.8)	11 (23.4)	6 (12.8)	27 (9.0)	3 (4.4)	
Separated	56 (9.3)	8 (7.2)	12 (9.7)	29 (9.6)	7 (10.3)	
Widowed	167 (27.6)	23 (20.7)	29 (23.4)	88 (29.2)	27 (39.7)	
Living alone, n (%)						
No	493 (81.6)	91 (82.0)	102 (82.3)	244 (81.1)	56 (82.4)	0.98
Yes	111 (18.4)	20 (18.0)	22 (17.7)	57 (18.9)	12 (17.6)	

Note: * Kruskal-Wallis test; Chi-square test, $p \leq 0.05$. Region 1 $\neq$ Region 2, Region 3, and Region 4. Source: survey data.

Regarding socioeconomic indicators, Table 3 shows that most participants (52.6%) had between 1 and 4 years of schooling. Region 1 had the highest proportion of older adults with more than 5 years of schooling (60.4%); a statistically significant difference compared with the other regions ($p < 0.001$). In terms of personal income, Region 3 had the highest proportion of individuals earning below the minimum wage (59.2%), in contrast to Region 1 (10.6%) and Region 4 (3.5%).

For family income, Regions 2 (34.1%) and 3 (59.1%) had the highest proportions of households with total income below one minimum wage, compared with 4.5% in Region 1 and 2.3% in Region 4. Perceived income sufficiency was more common in Region 1 (63.1%), while in Regions 2 (46.0%), 3 (45.2%), and 4 (44.1%) the perception of financial insufficiency prevailed, although the difference was not statistically significant ($p = 0.45$). Regarding occupational status, 80.0% of participants were not working, 80.1% were retired, and 31.5% were receiving a pension.

Table 4 presents the indicators of frailty and cognitive impairment among older adults. The most frequent frailty criteria were low grip strength (68.0%), weight loss (40.9%), and fatigue (30.6%). Statistically significant differences between regions were found for physical inactivity ($p = 0.002$) and low walking speed ($p = 0.041$).

Region 1 showed a higher proportion of physically active participants (57.7%) and a lower prevalence of reduced walking speed (49.5%) compared with the other regions. Overall, 56.0% of participants were classified as frail, with higher prevalence in Regions 3 (60.1%) and 4 (58.8%), a difference that was statistically significant ($p = 0.031$). Cognitive impairment was present in 26.2% of individuals, being more prevalent in Region 4 (42.6%) compared with Regions 1 (18.9%) and 3 (23.9%), also with statistical significance ($p = 0.003$).

Table 3. Distribution of older adults across the four regions according to socioeconomic indicators.

	Total (n=604)	Region 1 (n=111)	Region 2 (n=124)	Region 3 (n=301)	Region 4 (n=68)	P
Education (md ± SD)	4.8 (4.2)	8.5 (5.3)	5.0 (4.1)	3.9 (3.2)	3.2 (2.6)	<0.001 ^{a,b,c,d,e**}
No formal education	65 (10.8)	3 (2.7) ^a	14 (11.3) ^{b,c}	36 (12.0) ^b	12 (17.6) ^{a,c}	
1–4 years, n (%)	318 (52.6)	41 (36.9) ^a	60 (48.4) ^{b,c}	173 (57.5) ^b	44 (64.7) ^{a,c}	<0.001*
≥ 5 years	221 (36.6)	67 (60.4) ^a	50 (40.3) ^{b,c}	92 (30.6) ^b	12 (17.6) ^{a,c}	
Personal income						
< 1 minimum wage	142 (23.5)	15 (10.6) ^{d,e,a}	38 (26.8) ^{d,b,c}	84 (59.2) ^{e,b,f}	5 (3.5) ^{a,c,f}	
1.1–3 minimum wages	387 (64.1)	55 (14.2) ^{d,e,a}	72 (18.6) ^{d,b,c}	199 (51.4) ^{e,b,f}	61 (15.8) ^{a,c,f}	<0.001*
≥3.1 minimum wages	75 (12.4)	41 (54.7) ^{d,e,a}	14 (18.7) ^{d,b,c}	18 (24.0) ^{e,b,f}	2 (2.7) ^{a,c,f}	
Family income						
< 1 minimum wage	44 (7.3)	2 (4.5) ^{d,e,a}	15 (34.1) ^{d,b,c}	26 (59.1) ^{e,b,f}	1 (2.3) ^{a,c,f}	
1.1–3 minimum wages	360 (59.6)	45 (12.5) ^{d,e,a}	66 (18.3) ^{d,b,c}	194 (53.9) ^{e,b,f}	55 (15.3) ^{a,c,f}	<0.001*
≥3.1 minimum wages	200 (33.1)	64 (32.0) ^{d,e,a}	43 (21.5) ^{d,b,c}	81 (40.5) ^{e,b,f}	12 (6.0) ^{a,c,f}	
Sufficient income						
No	264 (43.7)	41 (36.9)	57 (46.0)	136 (45.2)	30 (44.1)	
Yes	340 (56.3)	70 (63.1)	67 (54.0)	165 (54.8)	38 (55.9)	0.45
Work						
No	493 (80.0)	82 (73.9) ^{e,a}	91 (73.4) ^{b,c}	249 (82.7) ^{e,a,b}	61 (89.7) ^c	
Yes	121 (20.0)	29 (26.1) ^{e,a}	33 (26.6) ^{b,c}	52 (17.3) ^{e,a,b}	7 (10.3) ^c	0.01*
Retired						
No	120 (19.9)	16 (14.4)	20 (16.1)	73 (24.3)	11 (16.2)	
Yes	484 (80.1)	95 (85.6)	104 (83.9)	228 (75.7)	57 (83.8)	0.06
Receiving a pension						
No	414 (68.5)	79 (71.2)	92 (74.2)	202 (67.1)	41 (60.3)	
Yes	190 (31.5)	32 (28.8)	32 (25.8)	99 (32.9)	27 (39.7)	0.20

Note: * Chi-square test, ** Kruskal-Wallis test, $p \leq 0.05$. a Region 1 ≠ Region 4. b Region 2 ≠ Region 3. c Region 2 ≠ Region 4. d Region 1 ≠ Region 2. e Region 1 ≠ Region 3. f Region 3 ≠ Region 4. Source: survey data.

Table 4. Distribution of older adults across the four regions according to frailty indicators and cognitive impairment.

	Total (n=604)	Region 1 (n=111)	Region 2 (n=124)	Region 3 (n=301)	Region 4 (n=68)	P
Weight loss						
No	357 (59.1)	74 (66.7)	77 (62.1)	166 (55.1)	40 (58.8)	
Yes	247 (40.9)	37 (33.3)	47 (37.9)	135 (44.9)	28 (41.2)	0.169
Low grip strength						
No	193 (32.0)	41 (36.9)	45 (36.3)	89 (29.6)	18 (26.5)	
Yes	441 (68.0)	70 (63.1)	79 (63.7)	212 (70.4)	50 (73.5)	0.254
Physical inactivity						
No	254 (42.1)	64 (57.7) ^{d,e}	50 (40.3) ^d	111 (36.9) ^e	29 (42.6)	
Yes	350 (57.9)	47 (42.3) ^{d,e}	74 (59.7) ^d	190 (63.1) ^e	39 (57.4)	0.002*
Fatigue						
No	419 (69.4)	75 (67.6)	88 (71.0)	210 (69.8)	46 (67.6)	
Yes	185 (30.6)	36 (32.4)	36 (29.0)	91 (30.2)	22 (32.4)	0.933
Low walking speed						
No	243 (40.2)	56 (50.5) ^{e,a}	54 (43.5)	110 (36.5) ^{e,a}	23 (33.8)	
Yes	361 (59.8)	55 (49.5) ^{e,a}	70 (56.5)	191 (63.5) ^{e,a}	45 (66.2)	0.041*
Frailty status						
Non-frail	62 (10.3)	17 (15.3) ^e	18 (14.5)	22 (7.3) ^e	5 (7.4)	
Prefrail	204 (33.8)	45 (40.5) ^e	38 (30.6)	98 (32.6) ^e	23 (33.8)	
Frail	338 (56.0)	49 (44.1) ^e	68 (54.8)	181 (60.1) ^e	40 (58.8)	0.031*
Cognitive deficit						
No	446 (73.8)	90 (20.2) ^{d,a}	88 (71.0) ^{d,c}	229 (76.1) ^{e,f}	39 (57.4) ^{a,c,f}	
Yes	158 (26.2)	21 (18.9) ^{d,a}	36 (29.0) ^{d,c}	72 (23.9) ^{e,f}	29 (42.6) ^{a,c,f}	0.003*
Dysphoric mood						
Anxiety	423 (70.0)	66 (15.6) ^{e,a}	82 (19.4)	222 (52.5) ^e	53 (12.5) ^a	
Depression	444 (73.5)	74 (16.4)	96 (21.6)	223 (50.2)	51 (11.5)	0.013*

Note: * Chi-square test, $p \leq 0.05$. a Region 1 ≠ Region 4. b Region 2 ≠ Region 3. c Region 2 ≠ Region 4. d Region 1 ≠ Region 2. e Region 1 ≠ Region 3 f Region 3 ≠ Region 4. Source: survey data.

Regarding mood and cognitive outcomes, frailty was associated with a higher frequency of depressive symptoms and, in particular, anxiety among older adults, as shown in Table 5. Frail participants had significantly higher anxiety symptom scores compared with pre-frail and non-frail individuals ($p < 0.001$). The mean anxiety score was 3.29 (SD $\pm$ 1.78) in frail individuals, 2.37 (SD $\pm$ 1.78) in pre-frail individuals, and 1.62 (SD $\pm$ 1.76) in non-frail individuals. This association was consistent across all regions; notably, in Region 3, more than 60% of frail participants reported moderate to severe anxiety. A significant association was also observed between frailty and depressive symptoms ($p < 0.001$).

Table 5. Distribution of frail, pre-frail, and non-frail older adults according to sociodemographic variables, cognitive impairment, and mood.

	Non-Frail (n=62)	Prefrail (n=204)	Frail (n=338)	<i>P</i>
Sex				
Female	32 (51,6) ^a	96 (47,1) ^b	128 (37,9) ^{a,b}	0.033*
Male	30 (48,4)	108 (52,9)	210 (62,1)	
Age group, (mean $\pm$ SD)	67,7 (6,8)	68,6 (7,2)	70,1 (7,6)	0.02
60 - 69 years	37 (59,7)	124 (60,8)	174 (51,5)	0.206
70 - 79 years	21 (33,9)	63 (30,9)	124 (36,7)	
≥ 80 years	4 (6,5)	17 (8,3)	40 (11,8)	
Marital status				
Married	34 (54,8)	122 (59,8)	178 (52,7)	0.700
Single	6 (9,7)	16 (7,4)	25 (7,4)	
Separated	6 (9,7)	15 (7,4)	35 (10,4)	
Widowed	16 (25,8)	51 (25,0)	100 (29,6)	
Education (md $\pm$ sd)	7.3 (4,4)	5.5 (4,5)	4.0 (3,7)	<0.001**
No formal education	2 (3,2) ^{b,a}	14 (6,9) ^{b,c}	49 (14,5) ^{a,c}	<0.001*
1 to 4 years	21 (33,9) ^{b,a}	104 (51,0) ^{b,c}	193 (57,1) ^{a,c}	
≥ 5 years	39 (62,9) ^{b,a}	86 (42,2) ^{b,c}	96 (28,4) ^{a,c}	
Head of household				
No	14 (22,6)	54 (26,5)	111 (32,8)	0.127
Yes	48 (77,4)	150 (73,5)	227 (67,2)	
Perceived income adequacy				
No	22 (35,5)	83 (40,7)	159 (47,0)	0.136
Yes	40 (64,5)	121 (59,3)	179 (53,0)	
Cognitive impairment				
No	57 (91,9) ^{b,a}	156 (76,5) ^{b,c}	233 (68,9) ^{a,c}	<0.001*
Yes	5 (8,1) ^{b,a}	48 (23,5) ^{b,c}	105 (31,1) ^{a,c}	
Dysphoric mood (md $\pm$ sd)	1,71 (1,76)	2,38 (1,76)	3,21 (1,77)	< 0.001**
Anxiety	1,62 (1,76)	2,37 (1,78)	3,29 (1,78)	<0.001**
Depression	1,64 (0,86)	1,97 (0,93)	2,46 (1,12)	

Note: * Chi-square test, $p \leq 0.05$. ** Kruskal Wallis test, $p \leq 0.05$. a Fragile $\neq$ Not fragile. b Pre-fragile $\neq$ Not fragile. c Pre-fragile $\neq$ Fragile. Source: survey data.

DISCUSSION

This study examined sociodemographic, physical, and mental health indicators among community-dwelling older adults in Brazil. The findings revealed marked disparities between the regions analyzed, particularly in sociodemographic characteristics such as race, income, and occupational status. In terms of physical health, the population was characterized by low levels of physical activity and reduced walking speed, while mental health indicators showed high frequencies of anxiety and depressive symptoms. Notably, frailty was associated with older age, lower educational attainment, and a higher prevalence of cognitive impairment, anxiety, and depressive symptoms.

Although depression has been widely associated with frailty in both national and international studies, the findings of this cross-sectional study reinforce the importance of anxiety as a factor associated with frailty syndrome. Acknowledging the causal limitations inherent to the study design, we observed a higher prevalence of anxiety among frail older adults, consistent with the limited number of studies that have examined this relationship.¹² Although less frequently investigated, anxiety may contribute to functional and social decline in older adults, suggesting that it could serve as a relevant early marker.^{19, 20} However, it is often underestimated in population-based research.²¹

The composition of the sample in terms of self-reported color or race, individual and family income, employment, and retirement status was similar to that reported in the 2013 PNAD and in Brazilian epidemiological studies^{14, 22}. This correspondence suggests that the sociodemographic profile of the participants aligns with national patterns previously described, which supports the contextualization of the results and contributes to their external validity. However, this similarity does not imply statistical representativeness of the Brazilian population.

Socioeconomic differences in frailty are recognized as important indicators of health inequalities, particularly in aging societies²³. The cross-sectional data from this study indicate an association between frailty and socioeconomic status among community-dwelling older Brazilians. Specifically, a higher prevalence of frailty was observed among individuals with lower educational attainment and income, corroborating previous findings in the literature.

The socioeconomic status of participants influenced indicators such as walking speed, physical activity level, and frailty status. Furthermore, the discussion on frailty includes the underlying mechanisms of aging and their progression.³ Both international and national literature acknowledge that these mechanisms involve complex interactions between genetic and environmental factors, which, over time, lead to cumulative molecular and cellular damage across physiological systems.²⁴ In this study, individuals with lower socioeconomic status, particularly those in Region 3, showed a higher prevalence of reduced walking speed, physical inactivity, and frailty^{15, 25}.

This observation is consistent with previous studies. Huang et al.²⁶ reported that older adults with lower educational levels or living in areas with lower economic status had higher frailty scores. Similarly, dos Santos Alves et al.²⁷, in a study of Brazilian older adults, found that those with low socioeconomic status were more frequently classified as frail or pre-frail. However, discussions on the contribution of socioeconomic inequalities to frailty remain ongoing²⁶.

This study identified a higher frequency of low income and frailty among individuals aged 60 to 69 years compared with older age groups. This finding may be explained by the “healthy survivor effect,” whereby individuals with poorer health and lower socioeconomic status are more likely to die at a younger age²⁶. A recent systematic review concluded that, in the studies analyzed, income was often considered a mediator of the association between frailty and other indicators of low socioeconomic status²³. These factors were grouped into five categories — behavioral, health, social, material, and psychological, which act in an interconnected manner to increase the risk of frailty among older adults experiencing socioeconomic vulnerability.

The study revealed that older adults with cognitive impairment and elevated symptoms of depression and anxiety were associated with a higher prevalence of frailty. Current scientific literature supports these findings, demonstrating the relationship between frailty, cognition, and psychiatric disorders. Data from the SABE study, for instance, indicated that 13.8% of frail participants exhibited significant depressive symptoms and 38.9% had cognitive decline, results consistent with those of the present investigation²⁸. In the FIBRA study, Venturini et al.²⁹ found that the prevalence of depressive symptoms and feelings of sadness increased

with advancing levels of frailty, with mean depressive symptom scores significantly higher among pre-frail and frail individuals compared to their non-frail counterparts.

Although frailty and depression are positively associated constructs, their relationship is bidirectional⁹, suggesting that similar pathophysiological mechanisms may be involved, including low-grade chronic inflammation (inflammaging), immunometabolic dysregulation, and dopaminergic and mitochondrial alterations²⁰. With respect to anxiety, frail and pre-frail older adults exhibited a higher number of symptoms. However, the evidence establishing this relationship remains inconclusive, largely due to conceptual and methodological inconsistencies, despite the fact that anxiety is a highly prevalent clinical condition in later life, with rates ranging from 1.2% to 15.0% in community-based samples²¹. Although the cross-sectional design of the present study precludes causal inference, both anxiety and depression may be associated with increased risks of developing frailty syndrome, as suggested by our findings.

Particularly regarding cognition in later life, Fabrício et al.³⁰ emphasized the need to assess this domain, given its association with multiple clinical conditions, including frailty. In a systematic review and meta-analysis, Robinson, Gogniat, and Miller³¹ identified a negative impact of frailty on cognitive performance, both in global cognitive assessments and in specific cognitive domains. The present study found that the proportion of older adults with cognitive decline was higher in regions with lower average income, as well as among pre-frail and frail individuals. Similar results have been reported in Brazilian studies, where economic, environmental, and cultural conditions²⁷ were linked to worsening cognition³² and identified as risk factors for the development of frailty syndrome.

In this study, frailty was assessed through self-report. In a recent proposal for a multidimensional model of frailty, Venturini et al.²⁹ underscored the need for further discussion on the physical and functional criteria used for frailty classification. Although self-reported measures across the physical, social, and psychological dimensions demonstrated a significant association with the frailty classifications proposed by Fried et al.¹ (as observed in a subsample of 2,441 older adults from the FIBRA study), and our findings align with this observation, it is important to note that such measures may overestimate the prevalence of frailty, particularly in populations with lower educational levels. Despite this limitation, self-reported instruments remain valuable as a screening approach, facilitating the early identification of potentially frail individuals in community settings.

This study presents several limitations. First, the assessment of frailty, depression, and anxiety relied on self-reported measures, which may be subject to reporting bias. Second, the sample was obtained through non-probabilistic sampling based on neighborhood regions. While this approach enabled coverage of diverse geographic areas and social strata, it does not permit probabilistic statistical inference for the municipality's overall population, and its representativeness should therefore be interpreted with caution. Finally, the absence of statistical control for potential confounding variables limits the ability to draw direct causal inferences from the associations observed.

However, it also has notable strengths. First, it included a sample of community-dwelling older adults from a city in the interior of Minas Gerais, whose socioeconomic characteristics, marked by a higher proportion of individuals with low income and lower educational attainment in Patos de Minas, differ from those of more frequently studied capital city populations, offering valuable insight into regional specificities. Second, to our knowledge, this is the first investigation to examine the association between self-reported frailty, cognition, anxiety, depression, and socioeconomic status in a population of Brazilian community-dwelling older adults, thereby addressing an existing gap in the literature.

The findings of this study have important practical implications for public health and gerontological practice. The identification of regional differences in sociodemographic profiles, as well as in physical and mental health indicators among community-dwelling older adults, underscores the need

for public policies and health programs that are more precisely targeted and adapted to local contexts. The observed association between frailty, cognitive impairment, and symptoms of anxiety and depression reinforces the importance of screening and early intervention for these conditions within primary health care settings, with the aim of fostering active and healthy aging.

In addition, the relevance of anxiety as a factor associated with frailty, often underestimated in clinical practice, suggests that health professionals should give greater attention to this aspect when assessing older adults. Finally, the findings regarding the influence of socioeconomic status on frailty underscore the need to account for social disparities when planning strategies for the prevention and management of frailty, with the goal of reducing health inequalities among the older population.

CONCLUSION

The results of this study indicate that most of the older adults assessed were classified as frail, based on self-reported measures, and that the presence of frailty was associated with socioeconomic status, cognitive impairment, and symptoms of depression and anxiety. These findings underscore the value of simple and accessible tools for screening frailty in community settings.

Notably, anxiety symptoms were associated with physical frailty even when analyzed alongside sociodemographic and cognitive variables. This suggests that anxiety should be incorporated into screening and prevention protocols as a potentially modifiable clinical marker, since it can be identified and treated through psychological or pharmacological interventions, potentially helping to mitigate or delay the onset of frailty. Further research is warranted to deepen the understanding of interactions between frailty and psychological and social factors, with the aim of informing preventive strategies in the care of older adults.

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