Clinical-functional vulnerability in older adults: prevalence and associated factors in a population-based study

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Abstract

Objective: To analyze the prevalence of and factors associated with clinical-functional vulnerability among community-dwelling older adults receiving care from Family Health Strategy (FHS) teams. *Method:* This cross-sectional study included a random, representative sample of community-dwelling older adults from an urban area in northern Minas Gerais, Brazil. Sample representativeness and randomization were ensured by the municipality's full FHS coverage and the random selection of teams as the primary sampling units in cluster sampling. Data were collected during home interviews by a trained team using the Clinical-Functional Vulnerability Index-20 (IVCF-20). Bivariate analyses were performed, followed by hierarchical binary logistic regression. A significance level of 5% was adopted for the final model, with the calculation of odds ratios (ORs) and their respective 95% confidence intervals (95% CIs). *Results:* A total of 1,260 individuals aged 60–105 years participated in the study, most of whom were women (63.8%). The prevalence of clinical-functional vulnerability was 24.7% (n = 311 older adults). The variables associated with greater vulnerability were age ≥80 years (OR = 1.56; 95% CI: 1.09–2.22), ≤4 years of schooling (OR = 1.38; 95% CI: 1.01–1.86), family income ≤2 minimum wages (OR = 1.91; 95% CI: 1.42–2.57), negative self-rated health (OR = 1.96; 95% CI: 1.44–2.65), insomnia (OR = 1.53; 95% CI: 1.13–2.06), polypharmacy (OR = 2.42; 95% CI: 1.81–3.24), diabetes (OR = 1.47; 95% CI: 1.08–1.99), urinary incontinence (OR = 1.47; 95% CI: 1.03–2.09), and spinal problems (OR = 1.37; 95% CI: 1.02–1.85). *Conclusion:* The prevalence of clinical-functional vulnerability was high in the study population. The associated variables reinforce the interaction among biological, clinical, functional, and social factors.

Keywords: Frail Elderly. Health Vulnerability. Prevalence.

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INTRODUCTION

Frailty in older adults is a complex and dynamic process involving multiple aspects and contexts of an individual's personal, family, and social life[1]. In addition to being a health marker, it dynamically reflects the interaction between individuals and their environment, with implications for risk prediction and health interventions[2]. The complexity surrounding this concept extends to the various instruments used to assess the construct, which are based on different theoretical models[3-6].

Although frailty and vulnerability are often used synonymously, they are distinct constructs. Frailty is a clinical syndrome characterized by reduced physiological reserve and increased susceptibility to adverse outcomes when individuals are exposed to various stressors; it has traditionally been linked to the biological phenotype of weight loss and reduced muscle strength[3,4]. Clinical-functional vulnerability, although intrinsically associated with frailty, represents a broader condition that incorporates the assessment of other dimensions, such as multiple comorbidities, polypharmacy, and impairment in activities of daily living[7]. Regardless of the approach used, frailty indicates the degree of clinical vulnerability and functional decline experienced by older adults and reflects a reduction in homeostatic reserve or in the ability to adapt to biopsychosocial stressors[7]. In this regard, the use of screening instruments capable of stratifying this vulnerability may be particularly useful in guiding more specific, timely, and effective care plans. This is especially relevant in the context of Primary Health Care (PHC), which, in Brazil, is primarily delivered through Family Health Strategy (FHS) teams[8].

The Clinical-Functional Vulnerability Index-20 (IVCF-20, acronym derived from the Portuguese name), a rapid and easily administered screening instrument developed and validated in Brazil, has been proposed for use in PHC[7]. The questionnaire assesses eight dimensions associated with clinical-functional impairment. The items assessed include age, self-rated health, activities of daily living (ADLs), cognition, mood/behavior, mobility, communication, and the presence of multiple comorbidities, polypharmacy, and/or recent hospitalization[7]. Rapid screening is important for ensuring appropriate and timely referrals to other levels of care, as well as for preventing unnecessary referrals that burden specialized services. Similarly, identifying variables associated with higher vulnerability scores may help alert health professionals to the risk of frailty and the need for more thorough assessments and better-targeted care[8].

Although the IVCF-20 is a validated and promising instrument for PHC, population-based studies remain scarce[9,10], particularly in settings similar to the one addressed herein. This gap limits the ability of FHS teams to assess the magnitude of the problem within their territories and identify groups requiring priority care. Addressing this gap is therefore essential for guiding more equitable and effective policies and practices within PHC.

For the region evaluated, which has poor socioeconomic indicators[11], the authors hypothesized that clinical-functional vulnerability would be highly prevalent among older adults, with comorbidities playing an important role among the associated factors. Therefore, this study aimed to analyze the prevalence of and factors associated with clinical-functional vulnerability among community-dwelling older adults receiving care from FHS teams.

METHODS

This population-based, descriptive, and analytical cross-sectional study represents the first phase of a randomized community trial conducted in a regional hub city in northern Minas Gerais, Brazil, between February 2024 and July 2025. The municipality has approximately 415,000 inhabitants, approximately 9% of whom are older adults[12].

Individuals aged ≥60 years who were monitored by Family Health Strategy (FHS) teams were eligible for the study. FHS units were used as the primary sampling units (clusters) in the population-based study because the city has full FHS coverage, with more than 170 teams providing care to the municipality's entire population. The inclusion

criteria were residence in the selected area and registration with the respective health care teams. Older adults with severe clinical, functional, or cognitive limitations that prevented them from answering the questionnaires, as reported by family members, were excluded if no caregiver or responsible family member was available during the visits to assist with the interviews. These limitations included being bedridden, receiving palliative care, or having advanced dementia. Individuals who were unavailable to complete the instruments after at least three visits conducted on different days and at different times were considered nonrespondents.

Multistage cluster sampling was performed, with the health care team serving as the sampling unit. First, the health regions were randomly selected. Subsequently, FHS teams were selected by simple random sampling. Finally, the micro-areas covered by these teams were randomly selected, and all households with older adults were visited and their residents invited to participate in the study. This selection process sought to ensure that older adults from different parts of the municipality and different socioeconomic contexts had the same probability of being selected for the study, thereby providing the desired sample representativeness. The participation of the health care teams, particularly the community health workers, was essential for identifying households with older adults and facilitating access to their homes.

The sample size calculation considered a population of approximately 6,000 older adults receiving care in the selected regions, a 95% confidence level, a 4% margin of error, and an expected event frequency of 50%. This estimate was used because this proportion yields the largest required sample size and because the study also assessed other outcomes related to the health of older adults. To account for the cluster sampling process, the calculated value was multiplied by a design effect of 2 and increased by 15% to allow for potential losses, resulting in a minimum required sample of 1,256 individuals.

The data collection team comprised nurses and health sciences students who were undergraduate research scholarship recipients and had received prior training. The local health care teams helped inform and engage the population in the selected areas. Families and older adults were notified in advance by their respective community health workers. The interviews were conducted in the older adults' homes.

The outcome variable was clinical-functional vulnerability, measured using the 20-item IVCF-20. The instrument has an overall score ranging from 0 to 40 points. Older adults with scores ≤6 are classified as robust, scores of 7–14 indicate individuals at risk of becoming frail, and scores ≥15 indicate high clinical-functional vulnerability and, therefore, potentially frail older adults. For the present study, the values were dichotomized using a cutoff score of ≥15 to identify factors associated with high clinical-functional vulnerability[7].

The independent variables included demographic, socioeconomic, and clinical characteristics, which were dichotomized as follows: sex (male vs female); age (60–79 years vs ≥80 years); skin color (Black or Brown [*preta* or *parda*, according to the Brazilian Institute of Geography and Statistics (IBGE) classification] vs other); marital status (married/stable union vs other); educational attainment (≤4 years vs >4 years); family income (≤2 minimum wages vs >2 minimum wages); smoking status (current/former smoker vs never smoked); regular physical activity at least three times per week (yes vs no); self-rated health (positive vs negative); polypharmacy, defined as the daily use of at least five medications (yes vs no); and self-reported morbidities, including hypertension, diabetes, insomnia, rheumatic disease, asthma/bronchitis, urinary incontinence, constipation, and spinal problems (yes vs no for each condition).

Although these variables were reported by the participants themselves or their caregivers, they were selected based on the Brazilian Older Americans Resources and Services Multi-Dimensional Function Assessment Questionnaire (BOMFAQ), the Brazilian version of the Older Americans Resources and Services (OARS) questionnaire, a multidimensional assessment instrument for older adults. The instrument includes assessments of basic activities of daily living (BADLs) and instrumental

activities of daily living (IADLs). The BOMFAQ is easy to administer and has been validated for the Brazilian population[13].

Descriptive and bivariate analyses were performed using Pearson's chi-square test. Variables with $p \leq 0.20$ in the bivariate analyses were selected for the multivariable analysis. Two-block hierarchical binary logistic regression was performed to identify factors associated with higher scores on the clinical-functional vulnerability scale. The first block included sociodemographic and economic variables, whereas clinical variables were added in the second block. The analyses accounted for the cluster sampling design, with the FHS team considered the primary sampling unit. Standard errors and confidence intervals were adjusted for the design effect.

Model fit was assessed using the Hosmer–Lemeshow test, and Nagelkerke's pseudo-R^2 was used to report the proportion of variance explained by the models. The significance level was set at 5%, and odds ratios (ORs) and their respective 95% confidence intervals (95% CIs) were reported for the associated variables.

All ethical principles were observed in accordance with Resolutions No. 466/2012 and No. 510/2016 of the Brazilian National Health Council. The study protocol was reviewed and approved by a research ethics committee duly registered with the Brazilian National Research Ethics Commission (CONEP; Opinion No. 5,519,672), and all participants or their responsible caregivers provided written informed consent.

USE OF ARTIFICIAL INTELLIGENCE

The authors declare that they did not use artificial intelligence (AI) tools at any stage of this study.

DATA AVAILABILITY

The complete dataset supporting the findings of this study is available from the corresponding author upon reasonable request.

RESULTS

A total of 1,260 individuals participated in the study. The nonresponse rate was below 4% of the households visited and was primarily due to the unavailability of the older adult and/or their caregiver, even after prior scheduling (n = 47). Participants ranged in age from 60 to 105 years, with a predominance of older adults aged 60–69 years (n = 786; 62.4%). Most participants were women (n = 804; 63.8%), self-identified as Brown (n = 761; 60.4%), and reported up to four years of schooling (n = 725; 55.5%) (Table 1).

Regarding the clinical characteristics of the group, hypertension was the most frequently reported morbidity, followed by insomnia and spinal problems. Continence was the most frequently impaired basic activity of daily living, whereas shopping was the most frequently impaired instrumental activity of daily living, followed by remembering appointments (Table 2).

The IVCF-20 scores showed that 311 older adults (24.7%) had high clinical-functional vulnerability, 448 (35.5%) were at risk of becoming frail, and 501 (39.8%) were classified as robust. Table 3 presents the results of the bivariate analyses examining the associations between high clinical-functional vulnerability and the demographic, socioeconomic, and behavioral characteristics of the group evaluated. The variables meeting the screening criterion of $p \leq 0.20$ were sex, age, marital status, educational attainment, and family income.

Table 1. Demographic, socioeconomic, and behavioral characteristics of older adults registered with Family Health Strategy teams (N = 1,260). Montes Claros, Minas Gerais, Brazil, 2024–2025.

Variables	n (%)
Sex	
Female	804 (63.8)
Male	456 (36.2)
Age group (years)	
≥ 80	255 (20.2)
70–79	499 (39.6)
60–69	506 (40.2)
Skin color	
Brown	761 (60.4)
Black	171 (13.6)
White	320 (25.4)
Other/Missing data	8 (0.6)
Marital status	
Single	121 (9.6)
Married/stable union	653 (51.8)
Widowed/divorced/separated	486 (38.6)
Educational attainment (years of schooling)	
None	212 (16.8)
1–4	513 (40.7)
5–8	196 (15.6)
>8	339 (26.9)
Living arrangement	
Lives alone and/or with a caregiver	176 (14.0)
Lives with a spouse and/or children	809 (64.2)
Lives with other older adults	140 (11.1)
Other living arrangements	135 (10.7)
Family income (in minimum wages)*	
≤1.0	42 (3.3)
1.1–2.0	529 (42.0)
2.1–3.0	545 (43.3)
>3.0	88 (7.0)
Missing data	56 (4.4)
Smoking status	
Never smoked	729 (57.9)
Former smoker	459 (36.4)
Current smoker	72 (5.7)
Regular physical activity	
Yes	429 (34.0)
No	825 (65.5)
Missing data	6 (0.5)

*The monthly minimum wage was R$1,412.00 in 2024 and R$1,518.00 in 2025. **Source:** The authors.

Table 2. Clinical characteristics of older adults registered with Family Health Strategy teams (N = 1,260). Montes Claros, Minas Gerais, Brazil, 2024–2025.

Variables	n (%)
Self-rated health	
Excellent	155 (12.3)
Good	735 (58.3)
Poor	292 (23.2)
Very poor	67 (5.3)
Missing data	11 (0.9)
Polypharmacy	
Yes	400 (31.7)
No	860 (68.3)
Self-reported morbidities*	
Hypertension	929 (73.7)
Diabetes	375 (29.8)
Rheumatic disease	173 (13.8)
Asthma/bronchitis	96 (7.6)
Urinary incontinence	253 (20.1)
Constipation	199 (15.8)
Spinal problems	606 (48.1)
Insomnia	665 (52.8)
Impaired basic activities of daily living (BADLs)	
Bathing	66 (5.2)
Eating	31 (2.5)
Dressing	69 (5.5)
Personal hygiene	55 (4.3)
Transferring	66 (5.2)
Continence	172 (13.6)
Impaired instrumental activities of daily living (IADLs)	
Preparing one's own meals	151 (12.0)
Managing one's own finances	181 (14.4)
Managing one's own medications	145 (11.5)
Shopping for household necessities	199 (15.8)
Making coffee or tea	133 (10.6)
Keeping up with current events	141 (11.2)
Paying attention, understanding, and discussing	121 (9.6)
Remembering appointments	193 (15.3)
Going out and returning home	134 (10.6)
Staying home alone	148 (11.7)

*Some participants reported more than one morbidity. **Source:** The authors.

Table 3. Associations of demographic, socioeconomic, and behavioral characteristics with clinical-functional vulnerability, as assessed using the Clinical-Functional Vulnerability Index-20 (IVCF-20), among older adults registered with Family Health Strategy teams (N = 1,260). Montes Claros, Minas Gerais, Brazil, 2024–2025. Bivariate analyses.

Variables	IVCF-20		*p*-value	OR (95% CI)
	≥ 15	< 15		
	n (%)	n (%)		
Sex			0.005	
Female	219 (27.2)	585 (72.9)		1.33 (1.12,1.95)
Male	92 (20.2)	364 (79.8)		
Age (years)			0.001	
≥80	84 (32.9)	171 (67.1)		1.68 (1.25,2.27)
<80	227 (22.6)	778 (77.4)		
Skin color			0.294	
Black and Brown	223 (23.9)	709 (76.1)		0.86 (0.64,1.14)
Other	88 (26.8)	240 (73.2)		
Marital status			<0.001	
Without a partner	177 (29.2)	429 (70.8)		1.60 (1.24,2.07)
With a partner	134 (20.5)	520 (79.5)		
Educational attainment (years)			<0.001	
≤4	215 (29.7)	510 (70.3)		1.93 (1.47,2.53)
>4	96 (17.9)	439 (82.1)		
Family income (minimum wages)			<0.001	
≤ 2	170 (29.8)	401 (70.2)		1.81 (1.39,2.37)
> 2	120 (19.0)	513 (81.0)		
Smoking status			0.503	
Current/former smoker	126 (23.7)	405 (76.3)		0.95 (0.71,1.19)
Never smoked	185 (25.4)	544 (74.6)		
Regular physical activity			0.465	
No	198 (24.0)	627 (76.0)		0.90 (0.69,1.18)
Yes	111 (25.9)	318 (74.1)		

Source: The authors.

The associations between clinical variables and high clinical-functional vulnerability are presented in Table 4. All variables evaluated were significantly associated with high IVCF-20 scores.

In the hierarchical logistic regression analysis, the initial model, which included only sociodemographic variables, explained 5.8% of the variation (Nagelkerke's pseudo-$R^2 = 0.058$), and the Hosmer–Lemeshow test indicated that the model had a good fit ($\chi^2 = 8.422$; $p = 0.393$). After the clinical variables were added, the final model showed increased explanatory power, accounting for 17.0% of the variation (Nagelkerke's pseudo-$R^2 = 0.170$). The Hosmer–Lemeshow test likewise indicated that the final model had a good fit ($\chi^2 = 8.284$; $p = 0.406$).

Table 5 presents the results of the final model, including the variables that remained significantly associated with clinical-functional vulnerability at the 5% level ($p < 0.05$): age ≥80 years (OR = 1.56), ≤4 years of schooling (OR = 1.38), family income ≤2 minimum wages (OR = 1.91), negative self-rated health (OR = 1.96), insomnia (OR = 1.53), polypharmacy (OR = 2.42), diabetes (OR = 1.47), urinary incontinence (OR = 1.47), and spinal problems (OR = 1.37).

Table 4. Associations between clinical characteristics and clinical-functional vulnerability, as assessed using the Clinical-Functional Vulnerability Index-20 (IVCF-20), among older adults registered with Family Health Strategy teams (N = 1,260). Montes Claros, Minas Gerais, Brazil, 2024–2025. Bivariate analyses.

Variables	IVCF-20		*p*-value	OR (95% CI)
	≥ 15	< 15		
	(n)	(n)		
Self-rated health			<0.001	
Negative	130 (36.2)	229 (63.8)		2.30 (1.76, 3.02)
Positive	176 (19.8)	714 (80.2)		
Polypharmacy			<0.001	
Yes	144 (36.0)	256 (64.0)		2.33 (1.79, 3.04)
No	167 (19.4)	693 (80.6)		
Hypertension			0.009	
Yes	247 (26.6)	682 (73.4)		1.51 (1.11, 2.06)
No	64 (19.3)	267 (80.7)		
Insomnia			<0.001	
Yes	193 (29.0)	472 (71.0)		1.65 (1.27, 2.15)
No	118 (19.8)	477 (80.2)		
Rheumatic disease			0.001	
Yes	60 (34.7)	113 (65.3)		1.77 (1.26, 2.50)
No	251 (23.1)	836 (76.9)		
Asthma/bronchitis			0.005	
Yes	35 (36.5)	61 (63.5)		1.85 (1.19, 2.86)
No	276 (23.7)	888 (76.3)		
Diabetes			<0.001	
Yes	119 (31.7)	256 (68.3)		1.68 (1.28, 2.20)
No	192 (21.7)	693 (78.3)		
Urinary incontinence			<0.001	
Yes	88 (34.8)	165 (65.2)		1.88 (1.39, 2.53)
No	223 (22.1)	784 (77.9)		
Constipation			0.001	
Yes	68 (34.2)	131 (65.8)		1.75 (1.26, 2.42)
No	243 (22.9)	818 (77.1)		
Spinal problems			<0.001	
Yes	185 (30.5)	421 (69.5)		1.84 (1.42, 2.39)
No	126 (19.3)	528 (80.7)		

Source: The authors.

Table 5. Variables associated with clinical-functional vulnerability among older adults receiving care from Family Health Strategy teams (N = 1,260), after multivariable binary logistic regression analysis. Montes Claros, Minas Gerais, Brazil, 2024–2025.

Variables	β	OR (95% CI)	*p*-value
Sociodemographic variables			
Age ≥80 years	0.441	1.56 (1.09, 2.22)	0.015
≤4 years of schooling	0.323	1.38 (1.01, 1.86)	0.004
Family income <2 minimum wages	0.645	1.91 (1.42, 2.57)	<0.001
Clinical variables			
Negative self-rated health	0.671	1.96 (1.44, 2.65)	<0.001
Insomnia	0.424	1.53 (1.13, 2.06)	0.005
Polypharmacy	0.883	2.42 (1.81, 3.24)	<0.001
Diabetes	0.386	1.47 (1.08, 1.99)	0.013
Urinary incontinence	0.385	1.47 (1.03, 2.09)	0.032
Spinal problems	0.317	1.37 (1.02, 1.85)	0.038

Source: The authors.

DISCUSSION

The analysis of clinical-functional vulnerability among older adults receiving care from Family Health Strategy (FHS) teams identified a high prevalence of this condition. As discussed below, the associated factors underscore the complexity and multifactorial nature of the outcome investigated, involving both sociodemographic and clinical variables. The characteristics of older adults receiving care from FHS teams reveal a population whose profile already suggests substantial social vulnerability. Most participants were women, and the sample included large proportions of individuals with low educational attainment and low family incomes, as well as those who self-identified as Brown or Black—characteristics suggestive of health inequities[14].

Similar proportions of older adults classified as having high clinical-functional vulnerability and as potentially frail (24.7%) have been reported in other studies using the same instrument[15,16]. In an assessment of 492 older adults receiving care from FHS teams in a city in the state of Mato Grosso do Sul, this proportion was approximately 20%[15]. In a similar study conducted in northeastern Brazil involving 356 older adults receiving PHC, the proportion was 22.5%[16]. A higher percentage (30.6%) was reported in a study conducted in Uberlândia, Minas Gerais[17]. However, that study used a secondary database and primarily examined the spatial distribution of vulnerability among the municipality's older population.

From a practical perspective, these findings highlight the importance of systematically incorporating clinical-functional vulnerability assessment into the routine practices of FHS teams. The instrument used, which is quick and easy to administer, enabled the identification, within PHC, of older adults at greater risk. This makes it possible to prioritize those most likely to benefit from early interventions, timely referrals to higher levels of care, individualized care plans, and closer longitudinal follow-up. Early identification is particularly relevant because clinical-functional vulnerability is a dynamic and potentially reversible condition, especially when addressed before more severe disabilities develop[18].

The analysis of associated variables in the multivariable model demonstrates that clinical-functional vulnerability among older adults is shaped by an interconnected set of sociodemographic, economic, clinical, and even subjective factors. Greater vulnerability was observed among long-lived older adults, those with lower educational attainment and income, and those who had negative self-rated health, regularly used five or more medications, or

reported specific clinical conditions such as diabetes, urinary incontinence, spinal problems, and insomnia. These conditions may directly or indirectly affect functional capacity, autonomy, and the ability to adapt to stressors associated with aging[1].

The association between advanced age (≥80 years) and greater clinical-functional vulnerability observed in this study is consistent with the Brazilian and international literature and aligns with the findings of other studies on frailty[1,16,19]. Advanced age is associated with the accumulation of chronic conditions, progressive decline in functional capacity, sensory and cognitive changes, greater exposure to adverse events such as falls and hospitalizations, and limitations in activities of daily living[20].

Having four or fewer years of schooling and a lower family income remained in the final model as social variables strongly associated with clinical-functional vulnerability. This finding reinforces the role of socioeconomic conditions as structural determinants of health in aging[21]. Other studies have reported an association between vulnerability and low educational attainment among older adults and have emphasized that limited education reduces access to health information, creates greater barriers to self-care, and impairs the ability to manage chronic diseases, thereby contributing to poorer functional outcomes[22,23]. Similarly, the literature indicates that insufficient income limits access to health care resources, self-care resources, and adequate housing conditions, thereby increasing the risk of vulnerability[24].

Negative self-rated health also emerged as one of the variables most strongly associated with clinical-functional vulnerability. This subjective indicator reflects an individual's integrated perception of their health, encompassing biological, psychosocial, and social dimensions[25]. Other studies have also reported a statistically significant association between negative self-rated health and frailty[19,26]. In the context of vulnerability and frailty among older adults, negative self-rated health may reflect the presence of chronic diseases or persistent symptoms, functional limitations, and psychosocial distress. It may also result from weak family and social relationships and lower engagement in self-care activities. However, this study did not assess the availability or quality of the participants' support networks. Because this variable is easy to assess, this finding reinforces the importance of attentive, person-centered listening and consideration of older adults' own assessments of their health by FHS teams.

Among the clinical conditions associated with clinical-functional vulnerability, polypharmacy, diabetes mellitus, urinary incontinence, spinal problems, and insomnia were particularly noteworthy. Polypharmacy, defined as the regular use of five or more medications, was significantly associated with vulnerability among the older adults evaluated, consistent with previous studies[27,28]. Polypharmacy often reflects the presence of multimorbidity and therefore indicates greater clinical vulnerability. Moreover, polypharmacy increases the risk of drug interactions, adverse events, falls, and cognitive impairment, all of which directly affect functional capacity in older adults[27]. This finding, which has also been reported in the literature, reinforces the need for periodic medication reviews and the rational use of medications among older adults[28].

Diabetes remained independently associated with clinical-functional vulnerability, which is consistent with other studies[29,30]. This association may be attributable to the chronic complications of diabetes. The finding may therefore indicate a bidirectional relationship, because frailty tends to accelerate diabetes progression, compromise glycemic control, and affect treatment selection, resulting in the coexistence of conditions associated with poorer outcomes[30]. Thus, early recognition of this association may help reduce disability among older adults. Nevertheless, it is important to emphasize that these possibilities are interpretative hypotheses supported by the literature rather than causal relationships demonstrated by the present study.

Urinary incontinence was also significantly associated with clinical-functional vulnerability. This relationship is also likely to be bidirectional. On the one hand, vulnerability among older adults involves a loss of functional reserve across multiple systems, including the urinary system. On the other hand, urinary incontinence may lead to social isolation, negatively affect self-esteem, and exacerbate vulnerability among older adults[31]. A meta-analysis

examining this association found that urinary incontinence was twice as prevalent among frail older adults as among those without frailty. The authors recommended systematic screening for urinary incontinence as an indicator of frailty, together with appropriate management of both conditions[32].

Spinal problems and insomnia were also associated with greater vulnerability in the group evaluated. Both conditions are common among older adults and may directly affect functional capacity. Self-reported spinal problems likely reflect the presence of chronic pain resulting from poor posture or musculoskeletal disorders that limit mobility, reduce social participation, and contribute to physical inactivity, thereby increasing vulnerability among older adults[33]. Insomnia has direct effects on the daily lives of older adults because it impairs memory consolidation and may exacerbate cognitive decline. Indirectly, it may cause daytime fatigue, contribute to postural instability, and increase the risk of falls. Negative effects on quality of life and increased stress, anxiety, and social isolation have also been reported[34]. Together, these associated conditions impair physical recovery, cognition, and emotional balance, ultimately reducing functional capacity among older adults[35].

Several limitations of the present study should be considered when interpreting and generalizing the findings. First, there is a lack of standardization across studies regarding the assessment of clinical-functional vulnerability and frailty among older adults, which limits the comparability of findings across studies. Because this was a cross-sectional study, causal relationships cannot be established for the associations observed, thereby limiting the ability to guide preventive measures based on temporal relationships. The absence of variables related to the older adults' family context and social environment should also be considered. Finally, although the morbidities evaluated were identified using validated instruments, they were self-reported and may therefore be subject to social desirability bias. In the group evaluated, self-reported information may also have been affected by memory limitations.

Some of the observed associations may also reflect correlations resulting from overlap between components of the instruments. This is the case for self-rated health and polypharmacy, both of which are included in the IVCF-20 and the BOMFAQ. Therefore, these associations may not necessarily represent independent factors associated with vulnerability. However, the contribution of these two variables to the overall IVCF-20 score is small, two points out of a possible 40, because the instrument comprises 20 items and its total score summarizes the contributions of all items. To assess the possibility of circularity or overlap between exposures and the outcome, a sensitivity analysis was performed after excluding these variables from the calculation of the overall score. This analysis did not change the magnitude of the associations. Therefore, the observed overlap does not appear to invalidate the inclusion of these variables in the final analysis. Despite these limitations, the findings are relevant and were obtained from a large, representative sample of older adults registered with FHS teams.

CONCLUSION

Approximately one-quarter of the older adults receiving care from Family Health Strategy teams had high clinical-functional vulnerability. This prevalence is concerning, particularly given the observed multifactorial nature of this condition, involving sociodemographic, clinical, and social factors. The main contribution of this study is to demonstrate that, among the population receiving care from FHS teams, the management of clinical-functional vulnerability cannot be limited to addressing complaints reported by patients or their family members. Accordingly, when caring for older adults, FHS teams should consider not only the management of chronic diseases but also the socioeconomic and family context, polypharmacy, and self-rated health, with the aim of promoting aging with greater autonomy and quality of life. Early and intersectoral interventions should be planned and implemented, thereby strengthening geriatric and gerontological care within PHC.

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