Factors associated with frailty in older users of Primary Health Care services from a city in the Brazilian Amazon

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Abstract

Objective: To estimate the prevalence of frailty syndrome and its association with socioeconomic, demographic and health variables, in elderly people treated at two Health Units in the city of Rio Branco, Acre, from October 2016 to June 2017. *Method:* The prevalence of frailty was measured using the *Edmonton Frail Scale (EFS)*, and associations were tested with selected variables. Poisson regression, with robust variance and 95% confidence intervals, was used to estimate the prevalence ratios and define the adjusted model. All analyzes took into account the sample weights and were performed using SPSS version 20. *Results*: It was found that 35.1% of the sample showed fragility. The prevalence of frailty was associated with being 75 years old or more, physical inactivity, nutritional risk, cognitive deficit, negative health perception, using 5 or more medications and having/history of cancer, falls in past year, living alone, unsatisfactory neighborhood safety and being of ethnicity/non-white color. *Conclusion*: The alert profile for screening for frailty was verified, which may assist in the clinical practice of FHS professionals in the study population, and also considers the need to implement and strengthen eldely's health care programs and performance of the Family Health Support Centers.

Keywords: Frailty. Aged. Primary health care. Prevalence.

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INTRODUCTION

In recent years, the number of studies investigating the factors that influence healthy longevity has grown. The link between genetic traits and environmental insults that promote a series of adaptive responses by the body is recognized, but in some cases these lead to diseases and faster aging[1]. The clinical syndrome of frailty is characterized by loss of body weight and muscle mass, decrease in bone mass and in strength, fatigue, slow gait, postural instability, reduced grip strength and diminished capacity of the body to maintain homeostasis. This syndrome increases the likelihood of an unfavorable prognosis when faced with external stressors and acute disease, representing a major risk factor for morbidity and mortality in older individuals[2].

In a 2018 systematic review by the Brazilian Consensus on Frailty, the rate of frailty ranged from 6.7-74.1%. This variability might be attributed to the instruments used to classify frailty in older people or the setting in question: community, hospital, outpatient or long-term care facility (LTCF)[3].

In the older population, frail individuals are those who most need health care and, for this reason, frailty can serve as a potential marker to help plan the health management of older patients. Frailty syndrome is associated with a major burden in terms of hospital and gerontological care, with the need for regular checkups, preventive interventions and multidisciplinary care, and constitutes a strong predictor of death in older people across all settings[2,3].

Determining the prevalence of frailty and its associated factors is important to inform health care policies, given the syndrome is both predictable and avoidable. The implementation of effective interventions helps toward treating the syndrome, and even reversing it, while improving the quality of life of older individuals and delaying the occurrence of adverse events[4].

Therefore, the primary objective of this study was to report the factors associated with the prevalence of frailty syndrome in older users of 2 health units in the city of Rio Branco, Acre state.

METHODS

A cross-sectional study of older users of 2 Basic Health Units in the city of Rio Branco, Acre state was carried out between October 2016 and June 2017.

Rio Branco, the capital city of Acre State, covers a land area of 9,222.58 km^2 and is situated in the North Region of the country. According to data from the Brazilian Institute of Geography and Statistics, the city has a population of 370,550 people. Regarding the Health System, the city relies chiefly on the Primary Health Network which provides coverage of 56.99% and is organized hierarchically under the framework of the National Health System (SUS)[5].

The Network is currently divided into 12 health regions, the catchment area of Basic Health Units, supported by 61 Family Health Teams (ESF), 8 Community Health Worker Program Teams (PACS), 5 Primary Care Referral Units (URAP), 7 Health Centers and a Multidisciplinary Home Care Team (EMAD type2)[5].

Drawing on the list of Health Units that make up the regional public health network, furnished by the Municipal Secretariat for Health, a Primary Care Referral Unit and a Family Health Unit located in 2 different health regions were selected for the study. The criteria for selection of these units were: having an up-to-date registry of families; and having the largest contingent of older people registered.

The eligibility criteria for participation in the study were older individuals of both sexes residing in the vicinity of, and registered with, the units selected. Exclusion criteria were institutionalized older individuals and subjects whose health status precluded participation, such as patients diagnosed with cognitive disorders. Losses were defined as cases in which subjects refused to answer the questionnaire, were not located at the household after 2 tries at the place of residence or due to change of address, and respondents that failed to fully complete all items required for classification on the frailty scale.

The sample size was calculated based on the number of older users registered at the Health Units

selected (N=953), an estimated frailty prevalence of 10%[6], 95% confidence interval, and sampling error of 3%, giving a sample required of 302 individuals. A further 20% margin was added to allow for possible sample losses, yielding an estimated final sample of 365 older patients. Simple random sampling was performed using the listings of older adults registered at the Basic Health Units involved in the study.

Data collection was performed by interviewing participants at their homes, after having signed the Free and Informed Consent Form. Interviews were conducted by a team comprising the coordinator of the study and medical students and health sciences graduates, all of whom underwent introductory training *in loco* of 4 hours covering the following topics: 1. Presentation of the relevance of the study and its objectives; 2. Ethical aspects during data collection for research, Resolution no. 466 of the 12th of December 2012 by the National Board of Health; and 3. Procedures and materials for data collection.

The instrument used was a validated questionnaire containing 13 theme-based blocks collecting socioeconomic and demographic information and data on life habits and health status. The Edmonton Frail Scale (EFS)[7] was applied, from which data was collected to assess the outcome of interest of the study.

Frailty was defined according to the version of the EFS, originally devised at the University of Alberta, Canada, and subsequently translated and validated for use in Brazil[8]. The EFS measures 9 domains: cognition (application of clock test), general health status, functional independence, social support, use of medications, nutrition, mood, continence and functional performance (Up and Go test). Scores on the scale range from 0-17 points and respondents are classified as follows: not frail (0-4 points); vulnerable (5-6); mild frailty (7-8); moderate frailty (9-10); and severe frailty (≥11). However, for the analysis of the data as an outcome, this variable was dichotomized into frail (mild, moderate and severe frailty) and not frail (not exhibiting frailty and vulnerable).

Based on the literature review, the exploratory variables were selected, as described in more detail in the study by Bezerra and Santos[9]. Briefly, the independent variables analyzed were: sex, age group (stratified by decade); self-declared ethnicity/skin color; place of birth; marital status; education (5 categories); family income (3 categories); perceived safety of home neighborhood; use of tobacco and alcohol; body mass index; engagement in physical activity (measured by International Physical Activity Questionnaire); perceived health (2 categories); cognitive deficit (measured using the Mini-Mental State Exam); depressive symptoms (measured by the Geriatric Depression Scale GDS-15); functional disability (measured by the basic and instrumental activities of daily living scale); nutritional risk; history of falls; polypharmacy; and self-reported comorbidities (disease name and number).

For prevalence estimates, Poisson Regression with robust variance, along with their respective confidence intervals ($CI_{95\%}$), was used to determine crude and adjusted prevalence ratios. Crude prevalence ratios were obtained on bivariate analyses and, based on their results, variables with $p \leq 0.20$ were included in the multivariate analysis. Only variables exhibiting goodness-of-fit for prevalence ratios and $p \leq 0.05$ were retained in the final model.

All statistical analyses were performed considering the effect of sample design, incorporating sample weights, i.e. the calculation of weighting factor (no. of individuals registered/no. actually assessed) at the respective health units. The parameters deviance, Akaike information criterion (AIC) and Bayesian information criterion (BIC) were used for the analysis of the fitted model and residuals.

The study was submitted to and approved by the Research Ethics Committee of the Sergio Arouca National School of Public Health - ENSP/FIOCRUZ (Permit no. 1.722.418), having complied with all recommendations of Resolution no. 466/12 and 510/2016, of the National Board of Health of the Ministry of Health.

RESULTS

There was a total of 67 losses, due to cases in which subjects were not located at the household after 2 tries at the place of residence or due to change of address (n=59); lacking all elements required to classify the frailty outcome; or refused to answer

the whole questionnaire (n=8). Thus, the final study population comprised 298 older adults aged 60-99 (mean 71.4; SD = 8.5) years.

Regarding overall prevalence of frailty syndrome strata in the sample, 35.1% were classified as having some level of frailty, with 15.6% mild, 11.3% moderate and 8.2% severe (Table 1). The rate of frailty syndrome was higher in women (37.5%) (p-value<0.05).

There was a predominance of females and subjects who self-declared as brown ethnicity/race (67.6%), whereas 2.1% of participants self-declared as indigenous (Table 2). For marital status, most were married or had a partner(47.4%) and were widowed (28.2%). Most participants had no education (42.5%) and almost 1 in 10 lived alone (9.8%). The analysis of sociodemographic factors for the different ages revealed that the rate of frailty increased with age group and exhibited statistically significant differences, except for self-declared ethnicity/skin color and living alone. Frailty prevalences were 29.6% in sexagenarians, 40.7% in septuagenarians, and 29.6% in octogenarians or older.

Frailty rates were higher among participants who were female (66.5%), (59.3%), had no partner (59.3%), were born in other cities in Acre or the North Region (73.9%), illiterate (59.0%), had a family income of under 1 minimum wage (54.1%) and who did not feel safe in their neighborhood (90.0%) (Table 2).

Of the group classified as frail, 83.0% rated their general and oral health as unsatisfactory and 3.3% reported alcohol abuse. Frailty rates were higher in participants with a morbidity (98.2%), that were sedentary (93.4%), exhibited depressive symptoms (90.7%), nutritional risk (82.4%), obesity (78%), cognitive deficit (65.3%), functional disability (63,8%), multimorbidity (54,4%), had a history of falls (58.3%) and polypharmacy (50.9%). With regard to the reported morbidities investigated, those with a significant p-value for frailty prevalence were arterial hypertension (78.1%), back/spine problems (65.3%), cardiovascular problem (40.0%), diabetes (37.2%), osteoporosis (35.8%) and cancer (11.2%).

Prevalence of frailty syndrome was associated with age ≥75 years (1.43; $CI_{95\%}$ 1.19 – 1.70), sedentarism (1.57; $CI_{95\%}$ 1.10 – 2.23), nutritional risk (1.76; $CI_{95\%}$ 1.43 – 2.17), cognitive deficit (1.22; $CI_{95\%}$ 1.03 – 1.43), negative perceived health (1.77; $CI_{95\%}$ 1.41 – 2.21), use of ≥ 5 medications (1.64; $CI_{95\%}$ 1.39 – 1.93), cancer history (1.86; $CI/_{95\%}$ 1.25 – 2.77), history of fall in past year (1.32 ; $CI_{95\%}$ 1.11 – 1.57), living alone (1.40; $CI_{95\%}$ 1.02 – 1.93), unsatisfactory neighborhood safety (1.27; $CI_{95\%}$ 1.07 – 1.50) and non-white ethnicity/skin color (1.26; $CI_{95\%}$ 1.03 – 1.55),on the final model of the multivariate analysis. Functional dependence (2.19; $CI_{95\%}$ 1.81 – 2.66) and the presence of risk for depression (2.02 $CI_{95\%}$ 1.49 – 2.73) were the variables most strongly associated with frailty syndrome (Table 4).

Table 1. Frailty Classification of participants assessed, according to sex (n=298). Rio Branco, Acre state, 2016 – 2017.

Frailty	Total		Sex	
	N	N Exp[a] (%)	Male	Female
			nExp[a] (%)	nExp[a] (%)
Not frail	135	424 (44.6)	184 (51.0)	240 (40.7)
Vulnerable	60	194 (20.4)	65 (18.0)	129 (21.9)
Mild frailty	50	148 (15.6)	57 (15.8)	91 (15.4)
Moderate frailty	32	107 (11.3)	27 (7.5)	80 (13.6)
Severe frailty	21	78 (8.2)	28 (7.8)	50 (8.5)

Source: Produced by authors based on data from study, 2023. P-value of distribution by sex 0.006. [a] N expanded based on weights and sample design

Table 2. Frailty Prevalence according to sociodemographic characteristics of participants assessed (n=298). Rio Branco, Acre state, 2016 – 2017.

Variables	Total sample		Frailty		
			Yes	No	
	n 298	N exp (%) 953	N exp (%) 334	N exp (%) 619	p-value
Sex					0.042
Male	116	361 (37.9)	112 (33.5)	249	
Female	182	592 (62.1)	222 (66.5)	370	
Age group (years)					<0.001
60- 69	140	445 (46.6)	99 (29.6)	346 (55.8)	
70- 79	103	324 (33.9)	136 (40.7)	188 (30.3)	
≥ 80	55	185 (19.4)	99 (29.6)	86 (13.9)	
Age group (years)					<0.001
< 75	205	652 (68.4)	184 (55.1)	488 (75.6)	
≥ 75	93	301 (31.6)	150 (44.9)	151 (24.4)	
Self-declared ethnicity/skin color					0.081
White	48	153 (16.0)	63 (18.9)	90 (14.5)	
Non-white[a]	250	801 (84.0)	271 (81.1)	530 (85.5)	
Place of birth					0.016
Rio Branco	64	198 (20.8)	65 (19.5)	133 (21.5)	
Other city in Acre	160	523 (54.9)	198 (59.5)	325 (52.5)	
Other cities in North Region	43	130 (13.7)	48 (14.4)	82 (13.2)	
Other cities in Brazil	31	101 (10.6)	22 (6.6)	79 (12.8)	
Has partner					0.003
Yes	145	451 (47.4)	136 (40.7)	315 (50.9)	
No	153	502 (52.6)	198 (59.3)	304 (49.1)	
Lives alone					0.082
No	269	860 (9.8)	309 (92.5)	551 (89.0)	
Yes	29	93 (90.2)	25 (7.5)	68 (11.0)	
Education (years)					<0.001
≥11	12	34 (4.3)	3 (0.9)	31 (5.1)	
8 – 10	31	101 (10.6)	16 (4.8)	85 (13.9)	
4 – 7	73	245 (25.8)	58 (17.5)	187 (30.5)	
1 – 3	57	160 (16.7)	59 (17.8)	101 (16.5)	
0	125	405 (42.5)	196 (59.0)	209 (34.0)	
Family income[a]					0.002
≥ 3 m.w	9	34 (3.5)	14 (42.0)	20 (3.2)	
1 to <3 m.w	72	242 (25.5)	106 (31.7)	136 (22.0)	
1 m.w	217	677 (71.0)	214 (64.1)	463 (74.8)	
Safety of neighborhood					0.043
Satisfactory	187	122 (13.0)	32 (9.9)	90 (14.6)	
Unsatisfactory	105	818 (87.0)	291 (90.1)	527 (85.4)	

Source: Produced by authors based on data from study, 2023. N exp = expanded N based on weights and sample design; % = proportion based on expanded N; χ^2= p-value= Pearson´s chi-square test. [a]Differences in absolute values of frequencies correspond to losses or not applicable .[a] Self-declared ethnicity/skin color. Non-white: yellow, black, brown, indigenous.

[b]m.w: minimum wage at time of study (2016:R$880.00 and 2017:R$937.00).

Table 3. Frailty Prevalence, according to lifestyle and health variables, of participants assessed (n=298). Rio Branco, Acre state, 2016 – 2017.

Variables	Total		Frailty		p-value
			Yes	No	
	n 298	N exp 953	N exp 334	N exp 619	
Tobacco use					0.482
No	94	277 (80.5)	91 (28.0)	186 (30.2)	
Yes	17	664 (19.5)	234 (72.0)	430 (69.8)	
Alcohol abuse[a]					<0.001
No	278	883 (92.8)	323 (96.7)	560 (90.5)	
Yes	20	70 (7.2)	70 (3.3)	59 (9.5)	
Engage in physical activity[*,b]					<0.001
Yes	64	205 (21.5)	22 (6.6)	183 (29.6)	
No	234	748 78.5)	312 (93.4)	436 (70.4)	
Level of physical activity[c]					0.057
Physically active	55	134 (17.4)	36 (13.8)	98 (19.3)	
Sedentary	243	635 (82.6)	225 (86.2)	410 (80.7)	
Nutritional risk[d]					<0.001
No	96	285 (38.2)	51 (17.6)	234 (51.3)	
Yes	146	460 (61.8)	238 (82.4)	222 (48.7)	
BMI[*,e]					<0.001
Normal weight	92	33 (4.4)	11 (3.8)	22 (4.8)	
Underweight	14	33 (4.4)	25 (8.6)	8 (1.8)	
Overweight	87	61 (8.2)	27 (9.3)	34 (7.5)	
Obese	66	619 (83.0)	227 (78.3)	392 (86.0)	
Self-rated health status[*]					<0.001
Very good	12	38 (4.1)	11 (3.5)	27 (4.4)	
Good	96	292 (31.3)	43 (13.6)	249 (40.4)	
Fair	131	424 (45.4)	139 (43.8)	285 (46.3)	
Poor	41	134 (14.4)	90 (28.4)	44 (7.1)	
Very poor	13	45 (4.7)	34 (10.7)	11 (1.8)	
Perceived health					<0.001
Satisfactory	108	330 (34.6)	54 (17.0)	276 (44.8)	
Unsatisfactory	185	603 (65.4)	263 (83.0)	340 (55.2)	
Perceived oral health					0.010
Satisfactory	163	330 (34.6)	54 (17.0)	276 44.8)	
Unsatisfactory	123	603 (65.4)	263 (83.0)	340 (55.2)	
Cognitive deficit[f]					<0.001
No	167	522 (57.2)	114 (34.7)	408 (70.0)	
Yes	119	390 (42.8)	215 (65.3)	175 (30.0)	

to be continued

Continuation of Table 3

Variables	Total		Frailty		p-value
			Yes	No	
	n 298	N exp 953	N exp 334	N exp 619	
Functional Disability[g]					<0.001
No	214	666 (71.2)	121 (36.2)	545 (90.5)	
Yes	81	270 (28.8)	213 (63.8)	57 (9.5)	
History of fall in past year					<0.001
No	166	529 (56.2)	138 (41.7)	391 (64.0)	
Yes	128	413 (43.80)	193 (58.3)	220 (36.0)	
Polypharmacy[h]					<0.001
No	216	685 (71.9)	163 (49.1)	522 (84.3)	
Yes	81	266 (28.1)	169 (50.9)	97 (15.7)	
Geriatric Depression[i] Scale					<0.001
No risk of depression	67	229 (25.5)	28 (9.3)	201 (33.6)	
Risk of depression	217	670 (74.5)	272 (90.7)	398 (66.4)	
Self-reported morbidities					0.031
No	9	34 (3.6)	6 (1.8)	28 (4.5)	
Yes	287	914 (96.4)	325 (98.2)	589 (95.5)	
Number of self-reported morbidities					<0.001
None	9	34 (3.6)	6 (1.8)	28 (4.5)	
1 - 3	178	547 (57.8)	145 (43.8)	402 (65.3)	
≥ 4	109	366 (28.6)	180 (54.4)	186 (30.2)	
Spine/Back problems					0.013
No	117	380 (40.1)	115 (34.7)	263 (43.0)	
Yes	179	567 (59.9)	216 (65.3)	351 (57.0)	
Hypertension					0.009
No	81	256 (27.1)	72 (21.9)	184 (29.9)	
Yes	214	689 (72.9)	257 (78.1)	432 (70.1)	
Rheumatism, arthritis, arthrosis					<0.001
No	169	534 (56.3)	159 (48.0)	375 (60.8)	
Yes	127	414 (43.7)	172 (52.0)	242 (39.2)	
Heart/cardiovascular disease					<0.001
No	214	675 (71.3)	197 (59.5)	478 (77.6)	
Yes	82	272 (28.7)	134 (40.5)	138 (22.4)	
Osteoporosis					<0.001
No	217	697 (73.5)	213 (64.2)	484 (78.6)	
Yes	79	151 (26.5)	119 (35.8)	132 (21.4)	
Depression					0.155
No	237	766 (81.2)	257 (78.8)	509 (82.6)	
Yes	57	176 (18.8)	69 (21.2)	107 (17.4)	

to be continued

Continuation of Table 3

Variables	Total		Frailty		p-value
			Yes	No	
	n 298	N exp 953	N exp 334	N exp 619	
Diabetes					<0.001
No	227	713 (75.2)	208 (62.8)	505 (82.0)	
Yes	69	234 (24.8)	123 (37.2)	111 (18.0)	
Cancer					<0.001
No	274	880 (92.8)	294 (88.8)	586 (95.1)	
Yes	22	67 (7.2)	37 (11.2)	30 (4.9)	

Source: Produced by authors based on data from study, 2023. N exp = expanded N based on weights and sample design; % = proportion based on expanded N.; χ^2 = p-value = Pearson´s chi-square test. *Differences in absolute values of frequencies correspond to losses or not applicable.

[a]Identified using Alcohol Use Disorders Identification Test.

[b]At least 3x/week

[c]According to International Physical Activity Questionnaire .

[d]Mini nutritional risk assessment used.

[e] BMI= body mass index calculated as weight/(height^2), classification for older people, according to the WHO.

[f] Mini-mental state exam.

[g] Instrumental activities of daily living.

[h] ≥ 5 medications.

[i] Geriatric Depression Scale.

Table 4. Analysis of Crude and Adjusted Prevalence Ratio by Poisson Regression, according to lifestyle and health variables, of participants assessed (n=298). Rio Branco, Acre state, 2016 – 2017.

Variables	PR_{Crude} ($CI_{95\%}$)	p-value	$PR_{Adjusted\ model}$ ($CI_{95\%}$)
Sex			
Male	1		
Female	1.22 (1.02 – 1.45)	0.030	
Age group (years)			
60- 69	1		
70 - 79	1.90 (1.55 – 2.34)	<0.001	
≥ 80 years	2.43 (1.97 – 3.00)	<0.001	
Age group (years)			
< 75	1	<0.001	1
≥ 75	1.79 (1.52 – 2.09)		1.43 (1.19 – 1.70)
Self-declared ethnicity/skin color			
White	1		1
Non-white[a]	0.82 (0.67 – 1.01)	0.060	1.26 (1.03 – 1.55)
Place of birth			
Rio Branco	1		
Other city in Acre	1.15 (0.92 – 1.43)	0.216	
Other cities in North Region	1.14 (0.86 – 1.51)	0.363	
Other cities in Brazil	0.66 (0.44 – 0.98)	0.41	

to be continued

Continuation of Table 4

Variables	PR $_{Crude}$ ($CI_{95\%}$)	p-value	PR $_{Adjusted\ model}$ ($CI_{95\%}$)
Has partner			
Yes	1		
No	1.31 (1.10 – 1.55)	0.002	
Lives alone			
No	1		1
Yes	0.74 (0.53 – 1.03)	0.075	1.40 (1.02 – 1.93)
Education (years)			
≥11	1		
8 – 10	1.95 (0.61 – 6.23)	0.262	
4 – 7	2.83 (0.94 – 8.55)	0.065	
1 – 3	4.40 (1.46– 13.22)	0.008	
0	5.76 (1.94– 17.08)	0.002	
Family income[a]			
≥ 3 m.w	1		
1 to <3 m.w	1.04 (0.69 – 1.56)	0.865	
<1 m.w	0.76 (0.51 – 1.14)	0.182	
Safety of neighborhood			
Satisfactory	1		1
Unsatisfactory	1.40 (1.02 – 1.89)	0.036	1.27 (1.07 – 1.50)
Tobacco use			
No	1		
Yes	1.06 (0.88 – 1.28)	0.515	
Alcohol abuse[a]			
No	1		
Yes	0.44 (0.26 – 0.74)	0.002	
Engage in physical activity[*,b]			
Yes	1		1
No	3.90 (2.65 – 5.74)	<0.001	1.57 (1.10 – 2.23)
Level of physical activity[c]			
Physically active	1		
Sedentary	1.30 (0.97 – 1.72)	0.077	
Nutritional risk[d]			
No	1		1
Yes	2.87 (2.24 – 3.69)	<0.001	1.76 (1.43 – 2.17)
BMI[*,e]			
Normal weight	1		
Underweight	2.25 (1.37 – 3.71)	0.001	
Overweight	1.30 (0.76 – 2.23)	0.330	
Obese	1.09 (0.68 – 1.75)	0.715	

to be continued

Continuation of Table 4

Variables	PR_{Crude} ($CI_{95\%}$)	p-value	$PR_{Adjusted\ model}$ ($CI_{95\%}$)
Self-rated health status*			
Very good	1		
Good	0.52 (0.30 – 0.89)	0.018	
Fair	1.15 (0.70 – 1.90)	0.577	
Poor	2.36 (1.44 – 3.85)	0.001	
Very poor	2.63 (1.58 – 4.35)	<0.001	
Perceived health			
Satisfactory	1	<0.001	1
Unsatisfactory	2.66 (2.08 – 3.41)		1.77 (1.41 – 2.21)
Perceived oral health			
Satisfactory	1	0.005	
Unsatisfactory	1.28 (1.08 – 1.52)		
Cognitive deficit[f]			
No	1	<0.001	1
Yes	2.51 (2.10 – 3.00)		1.22 (1.03 – 1.43)
Functional Disability[g]			
No	1	<0.001	1
Yes	4.23 (3.63 – 5.04)		2.19 (1.81 – 2.66)
History of fall in past year			
No	1	<0.001	1
Yes	1.76 (1.49 – 2.01)		1.32 (1.11 – 1.57)
Polypharmacy[h]			
No	1	<0.001	1
Yes	2.63 (2.25 – 3.07)		1.64 (1.39 – 1.93)
Geriatric Depression[i] Scale			
No risk of depression	1	<0.001	1
Risk of depression	3.36 (2.38 – 4.75)		2.02 (1.49 – 2.73)
Self-reported morbidities			
No	1	0.044	
Yes	2.13 (1.02 – 4.45)		
Number of self-reported morbidities			
None	1		
1 - 3	1.60 (0.76 – 3.37)	0.212	
≥ 4	2.93 (1.40 – 6.13)	0.004	
Spine/Back problem			
No	1		
Yes	1.26 (1.05 – 1.50)	0.011	
Hypertension			
No	1		
Yes	1.35 (1.09 – 1.66)	0.005	
Rheumatism, arthritis, arthrosis			
No	1		
Yes	1.36 (1.16 – 1.61)	<0.001	

to be continued

Continuation of Table 4

Variables	PR_{Crude} ($CI_{95\%}$)	p-value	$PR_{Adjusted\ model}$ ($CI_{95\%}$)
Heart/cardiovascular disease			
No	1		
Yes	1.65 (1.40 – 1.94)	<0.001	
Osteoporosis			
No	1		
Yes	1.53 (1.30 – 1.80)	<0.001	
Depression			
No	1		
Yes	1.20 (1.00 – 1.47)	<0.001	
Diabetes			
No	1		
Yes	1.76 (1.50 – 2.07)	<0.001	
Cancer			
No	1		1
Yes	1.69 (1.35 – 2.10)	<0.001	1.86 (1.25 – 2.77)

Source: Produced by authors based on data from study, 2023. PR: Prevalence Ratio; PRcrude: crude analysis; PRadjusted model: analysis adjusted by variables.

[a]Self-declared ethnicity/skin color. Non-white: yellow, black, brown, indigenous.

[b]m.w: minimum wage at time of study (2016:R$880.00 and 2017:R$937.00).

[c]Identified using Alcohol Use Disorders Identification Test.

[d]At least 3x/week.

[e]According to International Physical Activity Questionnaire.

[f]Mini nutritional risk assessment used.

[g]BMI= body mass index calculated as weight/(height^2), classification for older people, according to the WHO.

[h] Mini-mental state exam.

[i] Instrumental activities of daily living.

[j] ≥5 medications.

[k] Geriatric Depression Scale

DISCUSSION

The study centered on frailty syndrome and the factors associated with the condition in a sample of older users of 2 primary healthcare units in the city of Rio Branco, Acre state. The sociodemographic and health profiles were similar to those of a previous population-based study performed in Montes Claros, Minas Gerais state, for which the instrument used to determine frailty syndrome in the present investigation was validated[8] .

The overall prevalence of frailty identified in the present study sample was 35.1%. This rate proved higher than those found for both São Paulo of 8.5%[4] and Ribeirão Preto of 7.6%[10]. The international rate of frailty ranges from 4.2-15.0%[11,12], lower than the prevalence found nationally and in Rio Branco.

However, mirroring the elevated rate in the current sample, the prevalence of frailty found based on Fried´s frailty phenotype in a population-based study conducted in 2013 at 7 sites in Brazil was 39.1%[13]. Moreover, the rate identified by the above-cited study in Montes Claros of 47.2%[8] exceeded the prevalence found in Rio Branco. According to a systematic review on the prevalence of frailty syndrome in Brazil, rates were heterogeneous, where standardization of the method of screening for the frailty syndrome may aid comparison across studies

and help inform and guide intervention strategies, particularly in Brazil, a culturally diverse country with major regional disparities[14].

Functional dependence (2.19; 95%CI 1.81 – 2.66) and the presence of depression (2.02 95%CI 1.49 – 2.73) were the variables most strongly associated with frailty syndrome. The association between frailty and functional disability can negatively impact mobility, social interaction and motivation of older people. This situation places physical, material and emotional burden on the family and increases the demand for care from public and private health systems. It is important to gather data on this association and use them to help professionals perform prevention and early rehabilitation of functional capacity limitations[15].

Studies estimate that 1-9% of community-dwelling older individuals have depression[16]. The present study findings for depression are consistent with the results obtained by Liu et al. (2021)[17] in community-dwellers in the United States, showing an association between the prevalence of frailty and depression. According to Ramos et al. (2015)[18], frailty in older individuals is more strongly associated with depressive symptoms related to exhaustion than to affective symptoms. According to these authors, frailty may be more connected with neurovegetative aspects than with dysphoric or ideational aspects of the condition. This hypothesis is supported by Fiske et al. (2009)[19] who identified cognitive changes (psychomotor slowing, verbal fluency, naming, initiation/perseverance), somatic symptoms (gastrointestinal, loss of appetite, constipation, sleep problems) and loss of interests as the most common symptoms of depression in older people. Several different geriatric variants of depression have been proposed, such as "depression without sadness", "depletion syndrome" and "depression-executive dysfunction syndrome"[19].

In addition, for samples that are predominantly female, such as that of the present study, the association between menopause and depression should also be taken into account, along with the impact caused to other systems, such as vasomotor, genitourinary, cerebral, cutaneous, bone, joint and metabolic, among others, which may exacerbate factors predisposing to depression and stressor events. The social and structural changes that accompany this stage of the life cycle in women may also be a factor.

The present study results showed that frailty was 1.57 times more prevalent among participants who did not engage in physical activity compared with physically active individuals. Sedentarism leads to loss of muscle strength and reduction in muscle mass, important components of sarcopenia, a condition which is part of the frailty syndrome in older adults[2].

According to Tylutka et al. (2021)[21], regular physical activity can regulate the immune system, lower the release of inflammatory cytokines, as well as delay the onset of immunosenescence. Both functional disability and frailty are associated with depression[22], falls[23] and impaired physical mobility[24]. Some studies show that frailty is a significant predictor of mortality[25] and disability in older people[26].

Notably, almost all (96.6%) participants assessed in the present study self-reported at least 1 morbidity. This high prevalence of morbidities in older individuals has been confirmed nationally[13,27]. In the present investigation, of the different morbidities reported, cancer was retained in the descriptive model of frailty.

Population-based studies have shown a cancer prevalence of 6.5-26.5% in older Brazilians[13,27]. The study findings are consistent with the results of Perez and Lourenço (2013)[28], who found an association of cancer with risk of recurrent hospitalizations among frail older patients.

Another variable contributing to the prevalence of frailty was nutritional risk. In Recife, an investigation involving community-dwelling older people concluded that individuals subject to malnutrition have double the risk of developing frailty, while those at nutritional risk have a 5-fold higher risk of frailty.[23.]

More recently, studies have sought to correlate frailty with dietary patterns. In general, the data suggest a positive association of frailty with mixed dietary patterns in Asian countries and in those with less adherence to the Mediterranean diet [29]. The

traditional food culture of the region also plays a key role, with high intake of simple carbohydrates, such as manioc flour. No scientific studies are available investigating a protein-deficient diet in the region in question. Further studies are needed confirming the authors´ theory of a local dietary pattern which has low protein intake, a nutrient needed to maintain and build muscle mass.

Similar results regarding polypharmacy were found by the FIBRA study, where the breakdown of drugs consumed daily by the older participants was as follows: 15.5% used no medications vs 12.0% in Rio Branco; 42.1% used 1-2 medications daily vs 31.8% in Rio Branco, and 41.7% used ≥ 3 medications daily vs 56.2% in Rio Branco[13].

The physiological changes that typically accompany aging may have a significant effect on pharmacokinetics and pharmacodynamics in older patients. The greater the number of medications prescribed, the higher the risk of adverse reactions, drug-drug interactions and toxicity in older users. Drug-drug interactions and toxicity in older individuals tends to result in cognitive impairments and behavioral changes that are often mistaken for dementia[30]. Nevertheless, the prevalence ratio in Rio Branco was lower compared with that of Rio de Janeiro (PR 1.45, 95%CI 1.12 – 1.89) and São Paulo (PR 2.2, 95%CI 1.5 – 2.9)[26,29]. Greater use of medications was also associated with frailty in investigations conducted in China (≥3 or 4 medications), USA (≥5 medications), Japan and Sweden, among others[31,32].

The association of frailty syndrome with falls mirrors the findings of previous studies[2]. The relationship between frailty and the occurrence of falls can be bidirectional i.e. falls can lead to frailty while frailty can lead to falls. According to global data, falls in older individuals are associated with 12% of deaths in this group, and account for 40% of deaths due to resultant injuries. Estimates show that following a fall, 20% of older individuals who sustain hip fractures die within a year[33].

Many studies have shown that self-rated health is a predictor of death, particularly in the older population[7]. The finding of a higher prevalence of cognitive deficit among frail subjects is congruent with the hypothesis of common causes proposed by other authors[33]. These authors hold that the biological bases of the etiology for both these conditions are caused by markers of chronic inflammation, diabetes, cardiovascular problems and brain disorders (both vascular and neurodegenerative). Evidence indicates there is a cumulatively higher risk of the outcome of death in cases of co-occurrence of the two conditions[34].

With regard to sociodemographic factors, age ≥75 years, unsafe neighborhood, non-white ethnicity and living alone were the variables retained in the model of frailty in the present study. Age of 75 years and over remained in the descriptive model. By contrast, international studies report stronger association in older age strata, such as 80+ or 85+[24]. This indicates that frailty developed earlier in the present sample relative to the cited studies.

Some studies have found living alone to be associated with the profile of frailty risk[28]. Living alone may reflect preserved autonomy, social isolation or low social support when needing care. Regarding ethnicity, although the association with non-white ethnicity was shown in the classic study of the frailty phenotype by Fried et al. (2001)[2], this aspect has been little explored and/or reported in the recent scientific literature, hampering comparison of the present findings.

The unsafe neighborhood factor showed a positive association with frailty prevalence. Individuals residing in a neighborhood which evokes feelings of lack of public safety may promote a constant state of alert, starting a stress cascade with release of cortisol and cytokines, impacting homeostasis and triggering a cycle conducive to the development of frailty[35].

Another aspect may be the tendency to avoid the use of public spaces, and remaining house-bound and socially isolated, where this may give rise to frailty, besides other factors associated with the syndrome, such as sedentarism, depression, and telomere shortening, among others. Recent studies have shown that places with poor social cohesion are harmful for maintenance of telomeres and may increase the pace of shortening, a phenomenon that holds true for any level of income[35].

The data reported in the cited study should be interpreted with caution, since this does not involve a causal relationship, but rather an association detected in a cross-sectional study. Limitations inherent to an observational cross-sectional design include the inability to cover all possible confounding conditions of the relationship being investigated, although attempts were made to control for the most important ones cited in the literature. It is noteworthy that the syndrome studied has been a focus of scientific output in the area. However, further investigations focusing hitherto unexplored factors, such as the relationship with laboratory biomarkers, are warranted.

The present study has some limitation that should be noted, such as the high loss rate at one of the health units involved. These losses were largely due to changes of address during the period between sample selection and the field work, moves promoted by the authorities of the State because the area was considered high risk. Almost none of the participants approached refused to take part in the study. It is important to point out that the study design allows results to be extrapolated only for the catchment areas served by the health units investigated. However, the health units were chosen precisely because they had a high proportion of older users seen by the primary health service of Rio Branco. If the other regions of the city have a similar profile of older people to that of the study sample, then these results may be representative of the overall population of older users treated in primary care at the capital city of Acre. Further investigations are needed to confirm this theory. Another potential limitation was the exclusion of patients diagnosed with cognitive disorders, given that this group may constitute a specific stratum of frail subjects which is not represented in the study. Nonetheless, this criteria was applied to prevent information bias, in as far as most of the questionnaires used in the methodologies of similar studies are self-administered.

Strengths of the study include the use of a validated questionnaire, with broad themes collecting data on living and health conditions pertinent to the older population. This information allowed a comprehensive analysis that encompassed little explored aspects of frailty, especially in Brazil, for the first time exploring the nature of the association of the environmental variable "feeling unsafe in the neighborhood" with the frailty outcome. Another strength of the study was the sampling process, which ensured randomness and representativeness of the population of older people investigated.

Furthermore, the present study supports actions defined in public policies aimed at the older population to identify, at the primary care level, users who are frail or pre-frail and promote their rehabilitation, prevent functional decline, and restore maximal functional autonomy. From a scientific perspective, the results of descriptive studies are of utility to managers and clinicians.

CONCLUSION

Taken together, the results of this study showed a prevalence of frailty syndrome of 35.1% and identified its associated factors for the target population as age ≥75 years, self-declared non-white ethnicity/skin color, living alone, unsatisfactory neighborhood safety, cognitive impairment, functional disability, history of falls in past year, polypharmacy, depressive symptoms and history of cancer.

Thus, determining the screening profile that predicts frailty can help in the routine of health unit professionals in the delivery of care to the study population and in the planning of interventions, treatment plans to reduce excess risk of death and other complications associated with frailty in older people.

This knowledge can also inform prevention and care policies, actions and programs for older individuals in the region. The findings also reveal the need for implementing and strengthening specific programs, such as provision of healthcare for the older population and involvement of multi-professional groups supporting Family Health centers.

AUTHOR CONTRIBUTIONS

- Polyana C. L. Bezerra – conception, design, data analysis and interpretation; writing of article; approval of draft to be published, and

responsible for all aspects of the study, vouching for issues involving accuracy or integrity of any part of the work.

- Bruna L. Rocha – writing of article; approval of draft to be published, and responsible for all aspects of the study, vouching for issues involving accuracy or integrity of any part of the work.
- Gina T. R. Monteiro – conception, design, data analysis and interpretation; writing of article; approval of draft to be published, and responsible for all aspects of the study, vouching for issues involving accuracy or integrity of any part of the work.

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