Comparison of frailty in oldest-old people using the Clinical-Functional Vulnerability Index-20 (IVCF-20) and Edmonton Frail Scale (EFS)

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Abstract

Objective: To compare Clinical-Functional Vulnerability Index-20 (IVCF-20) and Edmonton Frail Scale (EFS) scores among community-dwelling older people aged ≥80 years for prevalence and degree of agreement. *Method*: A cross-sectional study nested within a population-based cohort, was conducted. Baseline sampling was probabilistic by two-stage clustering. In the first stage, the census tract was used as the sampling unit. In the second stage, the number of households was defined according to the population density of individuals aged ≥60 years. Sensitivity, specificity and predictive values were determined and Kappa statistics expressed degree of agreement between the instruments. *Results*: 92 oldest-old people were evaluated. The prevalence of high risk of clinical and functional vulnerability on the IVCF, indicating frailty, was 45,7%, whereas the prevalence of frailty using the EFS was 44,6%. Sensitivity, specificity, positive predictive value and negative predictive values were 88,23%, 87,80%, 90,0% and 85,71%, respectively. Accuracy was 88,04% and the Kappa statistic 0.759 (p<0.001). *Conclusion:* The IVCF-20 and EFS instruments showed good accuracy and strong agreement when applied to community-dwelling oldest-old people. The identification of frailty was superior using the IVCF-20. These results show that the instruments detected similar frailty prevalence in community-dwelling oldest-old people.

Keywords: Aged. Aged, 80 and over. Frail Elderly. Frailty. Elderly Health.

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INTRODUCTION

Amid the process of Brazilian population aging - a consequence of demographic and epidemiological transitions - the proportion of older individuals aged 80 or over has grown considerably[1]. Oldest-old people tend to have multiple comorbidities and complex clinical conditions, leading to an increased prevalence of frailty and higher costs with health care[2,3].

Recognized as a multidimensional syndrome, frailty can be identified clinically in older people with age-related physiological vulnerability, which may be the result of factors ranging from a reduced homeostatic reserve to disproportionate changes in health status following stressor events. Frailty renders older people susceptible to adverse clinical events, such as impacted activities of daily living, physical limitation, falls, hospitalizations and mortality[2,4].

Identifying older individuals at risk of frailty is a public health priority[2,5]. A number of instruments are available for screening and measuring frailty in this population group. Currently, there is no consensus on the best choice of instrument for use by researchers and clinicians, since no universal standard measure for frailty exists[6]. This situation creates the need for studies comparing tools for detecting frailty in this group by applying them concomitantly in the same population. The results yielded can help elucidate more standardized ways of measuring frailty in older adults.

The Clinical Functional-Vulnerability Index-20 (IVCF-20) and the Edmonton Frail Scale (EFS) are tools frequently analyzed for their clinimetric properties[6]. The IVCF-20 offers a high degree of validity and reliability[7], whereas the EFS adheres to recommendations describing the best practices in the development of complex measures[8]. The IVCF-20 was developed in Brazil and has been highly recommended for routine use in Primary Care services[7]. The EFS is acknowledged as clinical tool that is easy-to-use and apply for detecting frailty in the older population[9]. Culturally adapted for use in Brazil, the EFS is considered reliable, valid and easy to apply, including professionals who are not specialists in geriatrics or gerontology[10].

The growth in the oldest-old, together with the dearth of studies comparing instruments for identifying and measuring frailty, creates the need to investigate this condition in older individuals aged 80 and over living in the community. Including oldest-old in assessments with age strata using a cut-off of 60 years can mask the important specificities of this group. A search of the relevant literature[11-13] confirmed that the IVCF-2 and EFS have not hitherto been employed concomitantly in the same non-institutionalized population aged 80 and over. Moreover, few studies are available comparing these instruments, developed to measure frailty in individuals aged 60 or older, in the primary care setting in Brazil[11-13]. In the study by Carneiro et al.[11], the EFS and IVCF-20 instruments were compared for degree of agreement and correlation in community-dwelling older people from Montes Claros city, Minas Gerais state. The results showed moderate agreement and strong positive correlation between the instruments although the frailty prevalence proved disparate. Another study[12], in Belo Horizonte, Minas Gerais state, compared the EFS versus the IVCF-20 and found a positive correlation and significant agreement among individuals aged 60 or over. However, detection of frailty was higher when using the EFS. In a study[13] carried out in the city of Três Lagoas, Minas Gerais state, comparing the IVCF-20 with the Subjective Frailty Assessment (SFA), agreement between the 2 instruments ranged from low to moderate. Overall, there is an evident need to standardize the ways of screening frailty. Comparing different instruments enables analysis of evidence of convergent validity, i.e. the level of agreement between the constructs assessed. Working on the assumption that both the IVCF-20 and EFS identify and measure frailty in community-dwelling older adults and were developed based on Comprehensive Geriatric Assessment (CGA), a high level of correlation between the 2 instruments can be expected. The objective of the present study was to compare the EFS and IVCF-20 instruments in community-dwelling older adults for prevalence, accuracy and level of agreement.

METHOD

A cross-sectional study, nested within a population-based cohort of community-dwelling oldest-old, longitudinally assessing frailty in older

people was carried out. The study was conducted in a medium-sized city situated in the state of Minas Gerais, Southeast Brazil. The city has a population of approximately 400,000 people and constitutes the main urban center in the region. The larger study involved 2 stages comprising the baseline and first wave.

Sample size at baseline was calculated based on the estimated older population of 30,790 in the urban region, according to data from the Brazilian Institute of Geography and Statistics (IBGE), for a 95% confidence level, conservative prevalence of 50% and sample error of 5%.

Given cluster sampling was employed, the estimated sample size was multiplied by a correction factor and design effect (*deff*) of 1,5%, with the addition of 15% to allow for losses. The minimum number of older people defined by the sample size calculation was 656 participants.

Probabilistic sampling by 2-stage clustering was used. In the first stage, census sector was used as the sample unit. During this stage, the districts, streets and blocks were identified on maps of the census sectors of the urban area of the city. A total of 42 census sectors were randomly selected from among the 362 urban sectors of the city, according to IBGE data.

In the second stage, the number of households, according to population density of individuals aged ≥60 years, was defined. In this stage, the sectors with a higher number of older individuals had more households allocated, so as to produce a more representative sample.

The inclusion criteria were: age ≥60 years, residing at the household allocated; and agreeing to take part in the study. Subjects not available after a minimum of 3 visits during different times and days, despite previous scheduling, were deemed losses.

The first data (baseline) collection was carried out at participants´ homes between May and July 2013. The interviewers (nursing and medical graduates), previously trained and calibrated according the Kappa agreement statistic (0.8), visited the census sectors from a pre-defined point in each census sector to conduct the interviews. The households to be investigated were defined by visiting the randomly selected sector, commencing from the start point and visiting every other (alternating) household. At the household visited, if older individuals were present, one was invited to take part in the study. In the case of no older individuals at the household, the next household was selected according to the criteria of alternating house numbers. If more than one older individual lived at the address, the oldest was selected for interview.

The first wave of the study (second collection) was carried out after a mean interval of 42 months from baseline, i.e. between November 2016 and February 2017. In this stage, households of all older respondents interviewed at baseline were eligible for the second interview (first wave). A total of 334 older individuals participated in the first wave.

In the present study, only individuals aged ≥ 80 years (oldest-old) were included, giving a total sample of 92 participants. The population of oldest-old has grown considerably and has specific inherent characteristics which require individual assessment[1]. Losses were defined as older individuals not available to take part after a minimum of 3 visits during different hours and days, in addition to those who had moved with change of address[14]. The questions from the questionnaire were answered with the help of family members or guardians/caregivers for older respondents unable to answer, as per instructions contained in the data collection instruments[7,9,10].

The frailty status of the participants was measured by the IVCF-20[7] and EFS[9,10]. The IVCF-20 is a 20-item multidimensional assessment instrument covering 8 conditions predicting clinical-functional decline of older adults[7]. The scale score ranges from 0-40, where a final score of 0-6 points indicates low risk of clinical-functional vulnerability; 7-14 moderate risk; and ≥15 points high risk of clinical-functional vulnerability, or potentially frail[15]. For interpreting the IVCF-20 results, the respondent is classified as: robust (0-6 points), displays independence and autonomy and no functional disability; risk of frailty/pre-frail (7-14 points) where, despite enjoying autonomy, there is risk of functional loss; and frail (≥15 points), including older individuals exhibiting functional decline and disabilities that affect

autonomy[16]. The EFS measures 9 domains across 11 items scored 0-17. A final score of 0-4 indicates no frailty; 5-6, defines apparently vulnerable for frailty; 7-8, mild frailty; 9-10, moderate frailty; and ≥11, severe frailty[9,10].

The results for frailty status were dichotomized into 2 levels: Not Frail (final score <15) on IVCF-20, including robust older individuals and those at risk of frailty (pre-frail); and Frail (final score ≥15[16]). Using the EFS, Not Frail was defined for final score ≤6, including "non-frail" older individuals and "vulnerable"; and Frail (final score >6) including those with mild, moderate and severe frailty"[9,10].

Similarly, social, demographic and economic variables, as well as the morbidity and health-related care characteristics assessed, were also dichotomized: sex (male x female), age group (≤84 x ≥85 years), marital status (with partner, including married and de facto partnership x no partner, including single, widowed and divorced), family arrangement (lives alone x lives with others), formal education (≤ 4 x >4 years), literacy (can read x cannot read), own income (yes x no), monthly family income (≤ 1 minimum wage x > 1 minimum wage), presence of self-reported chronic morbidities (arterial hypertension, diabetes mellitus, heart disease, osteoarticular disease, neoplasia, stroke), polypharmacy – defined by regular use of ≥5 medications (yes x no) and self-rated health assessed by the question "How would you rate your health status?". Choice of answers were: "Very good"; "Good"; "Fair"; "Poor"; and "Very poor". For analysis, a positive perceived health status included the answers "Very good" and "Good", whereas a negative status included "Fair", "Poor" and "Very poor", attributions consistent with those used by a similar study on the subject[17]. Other parameters assessed were reported weight loss (yes x no), presence of caregiver (yes x no), fall in past 12 months (yes x no), and hospitalization in past 12 months (yes x no).

For data analysis, a descriptive analysis of the frequency distribution of independent variable was performed. The prevalence of frailty was also estimated for the 2 instruments. For the analysis of normality of the variables, the Kolmogorov-Smirnov was employed. In order to analyze the accuracy of the IVCF-20 as compared to the EFS, the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated, evaluating rates of false-positive, false-negative, true-negative and true-positive cases. Interpretation of the data was performed, defining sensitivity as a percentage of correctly identified frail participants and specificity as percentage of correctly identified non-frail individuals. The PPV was defined as the percentage of positive tests that correctly identified non-frail individuals. Sensitivity and specificity values ≥ 50% were deemed adequate, values of 51-69% poor/limited accuracy and >70% good accuracy. The Kappa statistic was applied to check level of agreement between the instruments for the dichotomization of frailty (frail x non-frail). For analysis of the results of the Kappa statistic, values were interpreted according to Landis & Koch[18]. A final level of significance of 5% ($p<0.05$) was adopted for all analyses. The data collected were analyzed using the Statistical Package for the Social Sciences (SPSS), version 20 (SPSS for Windows, Chicago, USA).

All participants were provided with explanations about the study and agreed to take part by signing the Free and Informed Consent Form. The study project was approved by the local Research Ethics Committee, officially regulated by Permit no. 1.629.395 in compliance with Resolution no. 466/2012 of the National Board of Health/Ministry of Health.

RESULTS

A total of 92 community-dwelling oldest-old individuals took part in this study. Most of the study participants (58,7%) were aged 80-84 years. Regarding sample characteristics, 64,1% were female, 68,5% lived alone and 80,4% had ≤4 years of education. Overall, 70,7% of participants had no caregiver, 73,9% hypertension, 52,2% negative self-rated health, 39,1% reported falls in past 12 months, and 82,6% had a medical consultation in past 12 months. Characteristics of the group are presented in Tables 1 and 2, which show similar prevalence for independent variables on the 2 instruments.

Table 1. Sociodemographic and economic characteristics of community-dwelling oldest-old, according to Edmonton Frail Scale (EFS) and Clinical-Functional Vulnerability Index (IVCF-20) (N=92). Montes Claros, Minas Gerais, 2017.

Independent Variables	Sample	Frail on EFS		P-value	Frail on IVCF-20		P-value
		Yes	No		Yes	No	
	n (%)	n (%)	n (%)		n (%)	n (%)	
Sex				0.455			0.642
Male	33 (35.9)	13 (39.4)	20 (60.6)		14 (42.4)	19 (57.6	
Female	59 (64.1)	28 (47.5)	31 (52.5)		28 (47.5)	31 (52.5)	
Age Group				<0.001			<0.001
≤ 84 years	54 (58.7)	15 (27.8)	39 (70.2)		16 (29.6)	38 (70.4)	
≥ 85 years	38 (41.3)	26 (68.4)	12 (31.6)		26 (68.4)	12 (31.6	
Marital status				0.973			0.428
With partner	29 (31.5)	13 (44.8)	16 (55.2)		15 (51.7)	14 (48.3)	
Without partner	63 (68.5)	28 (44.4)	35 (55.6)		27 (42.9)	36 (57.1)	
Family Arrangement				0.633			0.574
Lives alone	13 (14.1)	05 (38.5)	08 (61.5)		05 (38.5)	08 (61.5)	
Lives with other(s)	79 (85.9)	36 (45.6)	43 (54.4)		37 (46.8)	42 (53.2)	
Education				0.008			0.026
≤ 4 years	74 (80.4)	38 (51.4)	36 (48.6)		38 (51.4)	36 (48.6)	
> 4 years	18 (19.6)	03 (16.7)	15 (83.3)		04 (22.2)	14 (77.8)	
Can read				0.037			0.293
Yes	60 (65.2)	22 (36.7)	38 (63.3)		25 (41.7)	35 (58.3)	
No	32 (34.8)	19 (59.4)	13 (40.6)		17 (53.1)	15 (46.9)	
Own income				0.421			0.397
No	04 (04.3)	01 (25.0)	03 (75.0)		01 (25.0)	03 (75.0)	
Yes	88 (95.7)	40 (45.5)	48 (54.5)		41 (46.6)	47 (53.4)	
Monthly Family Income				0.165			0.914
≤ 1 minimum wage	29 (31.5)	16 (55.8)	13 (44.8)		13 (44.8)	16 (55.2)	
> 1 minimum wage	63 (68.5)	25 (39.7)	38 (60.3)		29 (46.0)	34 (54.0)	
Private health plan				0.466			0.589
Yes	38 (41.3)	14 (36.8)	24 (63.2)		13 (34.2)	25 (65.8)	
No	54 (58.7)	27 (50.0)	27 (50.0)		29 (53.7)	25 (46.3)	
Difficulty accessing health services				0.017			0.076
Yes	39 (42.4)	23 (59.0)	16 (41.0)		22 (56.4)	17 (43.6)	
No	53 (57.6)	18 (34.0)	35 (66.0)		20 (37.7)	33 (62.3)	

The prevalence of high risk of clinical-functional vulnerability, indicating frail status, was 45,7% on the IVCF-20 versus 44,6% on the EFS. The frequency distribution for the IVCF-20 components is given in Table 3, and for the EFS components is presented in Table 4.

With regard to clinical-functional vulnerability profile, 28 (30,4%) participants were classified as low risk, 22 (23,9%) as moderate risk, and 42 (45,7%) as high risk of vulnerability, i.e. frail status on the IVCF-20. Using the EFS, the profile of frailty indicated that 26 (28,3%) participants were not frail, 25 (27,2%)

apparently vulnerable, 26 (28,3%) mild frailty, 13 (14,1%) moderate frailty and 2 (2,2%) had severe frailty.

The Kappa statistic revealed an agreement index of 0.759 (p<0.001), 95%CI=[2.98-13.29] between EFS and IVCF-20 values. Sensitivity, specificity, positive predictive value and negative predictive value were 88,23%, 87,80%, 90,0% and 85,71%, respectively. The rate of accuracy obtained was 88,04% (Table 5).

Table 2. Morbidity and health-related care characteristics of community-dwelling oldest-old, according to Edmonton Frail Scale (EFS) and Clinical-Functional Vulnerability Index (IVCF-20) (N=92). Montes Claros, Minas Gerais, 2017.

Independent Variables	Sample	Frail on EFS		P-value	Frail on IVCF-20		P-value
		Yes	No		Yes	No	
	n (%)	n (%)	n (%)		n (%)	n (%)	
Arterial Hypertension				0.740			0.983
Yes	68 (73.9)	31 (45.6)	37 (54.4)		31 (45.6)	37 (54.4)	
No	24 (26.1)	10 (41.7)	14 (58.3)		11 (45.8)	13 (54.2)	
Diabetes Mellitus				0.394			0.137
Yes	17 (18.5)	06 (35.3)	11 (64.7)		05 (29.4)	12 (70.6)	
No	75 (81.5)	35 (46.7)	40 (53.3)		37 (49.3)	38 (50.7)	
Cardiovascular Disease				0.316			0.031
Yes	33 (35.9)	17 (51.5)	16 (48.5)		20 (60.6)	13 (39.4)	
No	59 (64.1)	24 (40.7)	35 (59.3)		22 (37.3)	37 (62.7)	
Osteoarticular disease				0.098			0.062
Yes	45 (48.9)	24 (53.3)	21 (46.7)		25 (55.6)	20 (44.4)	
No	47 (51.1)	17 (36.2)	30 (63.8)		17 (36.2)	30 (63.8)	
Cancer				0.112			0.041
Yes	16 (17.4)	10 (62.5)	06 (37.5)		11 (68.8)	05 (31.2)	
No	76 (82.6)	31 (40.8)	45 (59.2)		31 (40.8)	45 (59.2)	
Osteoporosis				0.016			0.008
Yes	41 (44.6)	24 (58.5)	17 (41.5)		25 (61.0)	16 (39.0)	
No	51 (55.4)	17 (33.3)	34 (66.7)		17 (33.3)	34 (66.7	
Stroke				0.925			0.154
Yes	07 (07.6)	03 (42.9)	04 (57.1)		05 (71.4)	02 (28.6)	
No	85 (92.4)	38 (44.7)	47 (55.3)		37 (43.5)	48 (56.5)	
Asthma				0.950			0.528
Yes	11 (12.0)	05 (45.5)	06 (54.5)		06 (54.5)	05 (45.5)	
No	81 (88.0)	36 (44.4)	45 (55.6)		36 (44.4)	45 (55.6)	
Polypharmacy				0.012			0.055
Yes	25 (27.2)	15 (60.0)	10 (40.0)		15 (60.0)	10 (40.0)	
No	67 (72.8)	26 (38.8)	41 (61.2)		27 (40.3)	40 (59.7)	
Self-rated health				<0.001			<0.001
Negative	48 (52.2)	34 (70.8)	14 (29.2)		32 (66.7)	16 (33.3)	
Positive	44 (47.8)	07 (15.9)	37 (84.1)		10 (22.7)	34 (77.3)	
Weight Loss				0.289			0.659
Yes	40 (43.5)	18 (45.0)	22 (55.0)		20 (50.0)	20 (50.0)	
No	52 (56.5)	23 (44.2)	29 (55.8)		22 (42.3)	30 (57.7)	

to be continued

Continuation of Table 2

Independent Variables	Sample	Frail on EFS		P-value	Frail on IVCF-20		P-value
		Yes	No		Yes	No	
	n (%)	n (%)	n (%)		n (%)	n (%)	
Has Caregiver				0.022			0.009
Yes	27 (29.3)	17 (63.0)	10 (37.0)		18 (66.7)	09 (33.3)	
No	65 (70.7)	24 (36.9)	41 (63.1)		24 (36.9)	41 (63.1)	
Fall in past 12 months				0.098			0.271
Yes	36 (39.1)	20 (55.6)	16 (44.4)		19 (52.8)	17 (47.2)	
No	56 (60.9)	21 (37.5)	35 (62.5)		23 (41.1)	33 (58.9)	
Medical consultation in past 12 months				0.532			0.701
Yes	76 (82.6)	35 (46.1)	41 (53.9)		34 (44.7)	42 (55.3)	
No	16 (17.4)	06 (37.5)	10 (62.5)		08 (50.0)	08 (50.0)	
Hospital admission in past 12 months				<0.001			0.015
Yes	13 (14.1)	12 (92.3)	01 (07.7)		10 (76.9)	03 (23.1)	
No	79 (85.9)	29 (36.7)	50 (63.3)		32 (40.5)	47 (59.5	

Table 3. Frequency distribution of components of Clinical-Functional Vulnerability Index (IVCF-20) in community-dwelling oldest-old (N=92). Montes Claros, Minas Gerais, 2017.

Components of Clinical-Functional Vulnerability Index	n (%)
Age	
80-84 years	54 (58.7)
≥85 years	38 (41.3)
Self-rated HEALTH (Health compared to others of same age)	
Excellent / Very Good/ Good	54 (58.7)
Fair or Poor	46 (50.0)
Activities of Daily Living (Instrumental)	
Stopped doing shopping	
Yes	38 (41.3)
No	46 (50.0)
Stopped controlling finances	
Yes	41 (44.6)
No	51 (55.4)
Stopped doing small domestic chores	
Yes	42 (45.7)
No	50 (54.3)
Activities of Daily Living (Basic)	
Stopped bathing alone	
Yes	16 (17.4)
No	76 (82.6)
Cognition	
Becoming forgetful	
Yes	30 (32.6)
No	62 (67.4)

to be continued

Continuation of Table 3

Components of Clinical-Functional Vulnerability Index	n (%)
Forgetfulness worsened in recent months	
Yes	22 (23.9)
No	70 (76.1)
Forgetfulness preventing performance of daily activities	
Yes	18 (19.6)
No	74 (80.4)
Mood	
Dispiritedness, sadness or hopelessness in last past	
Yes	33 (35.9)
No	59 (64.1)
Loss of interest or pleasure in previously enjoyable activities	
Yes	24 (26.1)
No	68 (73.9)
MOBILITY (reach, grasp and pincer grip)	
Inability to raise arm above shoulder level	
Yes	11 (12.0)
No	81 (88.0)
Unable to hold or handle small objects	
Yes	9 (09.8)
No	83 (90.2)
Aerobic and/or muscle capacity	
Unintentional weight loss/ BMI <22 kg/m²/ calf circumference <31 cm or gait speed test time (4m) >5 sec	
Yes	17 (18.5)
No	75 (81.5)
Gait	
Walking difficulty preventing daily activities	
Yes	37 (40.2)
No	55 (59.8)
≥2 falls in past year	
Yes	18 (19.6)
No	74 (80.4)
Urinary/Fecal Continence	
Involuntary loss of urine or feces	
Yes	39 (42.4)
No	53 (57.6)
Communication	
Vision problems	
Yes	29 (31.5)
No	63 (68.5)
Hearing problems	
Yes	32 (34.8)
No	60 (65.2)
Multiple comorbidities	
Polypathology polypharmacy/ recent hospitalization (< 6 months)	
Yes	23 (25.0)
No	69 (75.0)

Table 4. Frequency distribution of components of Edmonton Frail Scale (EFS) in community-dwelling oldest-old people (N=92). Montes Claros, Minas Gerais, 2017.

Components of Edmonton Frail Scale	n (%)
Cognition (Clock Drawing Test)	
No errors	07 (07.6)
Failed minor errors	05 (05.4)
Failed with major errors	80 (87.0)
General health status (hospital admissions in past 12 months)	
None	79 (85.9)
1-2	10 (10.9)
>2	03 (03.2)
Sell-rated health	
Excellent / Very Good / Good	44 (47.8)
Fair	41 (44.6)
Poor	07 (07.6)
Functional Independence (Activities needing help)	
0-1	37 (40.2)
2-4	54 (58.7)
5-8	01 (01.1)
Social Support (When needing help, can count on someone)	
Always	85 (92.4)
Sometimes	05 (05.4)
Never	02 (02.2)
Medications use (≥5)	
No	62 (67.4)
Yes	30 (32.6)
Forget to take medications	
No	65 (70.7)
Yes	27 (29.3)
Nutrition (Weight loss)	
No	72 (78.3)
Yes	20 (21.7)
Mood (Sad or depressed)	
No	69 (75.0)
Yes	23 (25.0)
Urinary incontinence	
No	59 (64.1)
Yes	33 (35.9)
Functional Performance (Timed “stand-to-walk”)	
0-10 seconds	15 (16.3)
11-20 seconds	41 (44.6)
> 20 seconds	36 (39.1)

Table 5. Analysis of agreement for frailty classification, according to Clinical-Functional Vulnerability Index (IVCF-20) and Edmonton Frail Scale, in community-dwelling oldest-old people (N=92). Montes Claros, Minas Gerais, 2017.

	Edmonton Frail Scale		
	Not Frail	Frail	Total
Clinical-Functional Vulnerability Index-20	n (%)	n (%)	
Not Frail	45(a) (90.0)	05(b) (10.0)	50
Frail	06(c) (14.3)	36(d) (85.7)	42

S=a/(a+c)=88.23%; E=d/(b+d)=87.80%; PPV=a/(a+b)=90.0%; NPV=d/(c+d)=85.71%; accuracy=a+d/(a+b+c+d)=88.04%; Kappa=0.759 95%CI=[2.98-13.29] (p<0.001).

DISCUSSION

This study found good accuracy of the IVCF-20 as compared with the EFS and strong agreement between the two instruments in the screening and measuring of frailty in the oldest-old community-dwelling individuals assessed. The prevalence of frailty detected in the group was slightly higher when using the IVCF-20. Previous studies[11,12] applying the same two instruments concomitantly among older individuals aged ≥60 years have found major disparities in values. The current results suggest the instruments correlated more closely for identifying frailty in the oldest-old population assessed.

Older individuals scoring ≥15 are classified as frail, with the IVCF-20 exhibiting high sensitivity of over 88% and specificity exceeding 87% This high sensitivity is desirable where, ideally, screening instruments should be sufficiently sensitive to detect the majority of individuals with frailty (false negatives).

The strong agreement between the IVCF-20 and EFS reflects the relevance and similarity of the main constituent components making up the instruments[7,9,10,15]. The IVCF-20[7,15] contains 8 sections probing age, self-rated health, functional disabilities, cognition, mood, mobility, communication and multiple comorbidities. The EFS[9,10] covers 9 domains: cognition, general health status, functional independence, social support, medication use, nutrition, mood, urinary continence and functional performance.

It is important to note the differences among some of the components of the two instruments. While the IVCF-20[7,15] contains the components "Age" and "Communication", the EFS[9,10] has "Social Support". Moreover, similar components are treated differently. For example, "Cognition" as assessed by the IVCF-20[7,15] involves memory via forgetfulness, whereas the EFS[9,10] uses the Clock Drawing Test (CDT). This component of the EFS[9,10] warrants attention. The low performance on the CDT seen in the oldest-old respondents of the present study might be explained by difficulties not necessary associated with cognitive deficit[10], given that 87,0% failed with significant errors and 80.4% had ≤4 years of education. The low educational level in oldest-old individuals can negatively distort the identification and measurement of frailty when using the EFS, promoting a high estimate of frailty prevalence, since the CDT requires prior knowledge of numbers[10].

The items "hospitalization" and "self-rated health" are also addressed differently by the 2 frailty screening instruments. The IVCF-20[7,15] asks whether the hospitalization occurred or not in the past 6 months under the component "multiple comorbidities". The EFS[9,10], on the other hand, records the number of times admitted to a hospital in the past 12 months under the component "general health status". Regarding "self-rated health", the IVCF-20[7,15] stratifies response into 2 levels ("Excellent/Very good/Good" and "Fair or Poor"), assessing this status relative to other individuals of the same age. The EFS[9,10], however, stratifies this parameter into 3 levels ("Excellent/Very good/Good", "Fair" and "Poor").

With respect to "activities of daily living" or "functional independence", there are also differences between the instruments. The IVCF-20[7,15] addresses each of the following activities individually: "doing

shopping", "handling money", "perform light household chores", "take a bath alone". The EFS[9,10], however, attributes a single score to all activities as a whole: "meal preparation, shopping, transportation, telephone, housekeeping, laundry, managing money and taking medication".

The instruments also differ for other specificities. The IVCF-20[7,15] addresses polypathology in the "multiple comorbidities" component, while the EFS[9,10] features the component "medication use" to probe forgetting to take medications on a regular basis. The IVCF-20[7,15] evaluates whether the time taken on the 4-meter gait speed test exceeds 5 seconds or not. In the component "functional performance" of the EFS[9,10], the timed "stand-to-walk" test is stratified into ">20 seconds", "11-20 s" and "0-10 s" for a 3-meter distance.

The IVCF-20[7,15] also differs to the EFS[9,10] by incorporating the "mobility component", which evaluates the ability to raise arms above shoulder level, handle or grip small objects, body mass index, calf circumference, an ordeal to walk which hampers the performance of routine activities, falls in past year, and fecal incontinence. The IVCF-20[7,15] contains a larger number of components for identifying and measuring frailty in older adults than the EFS[9,10]. Consequently, the IVCF-20 may take longer to assess frailty in older adults. When comparing two instruments which are very similar, the one which takes less time to apply has the edge. Future studies could determine the mean application time of each instrument in the same older respondent to assess frailty.

These results confirm that the instruments have some different features. Nonetheless, the analysis also revealed a positive correlation and strong agreement for measuring frailty in oldest-old community-dwelling individuals. A systematic review on the subject[19] found a lack of consistency in the components of frailty and in the corresponding indictors used to measure these components. The components of frailty and corresponding indicators vary widely across different frailty instruments. Depending on the method employed, the instruments can cover different domains, while each domain may include many elements, measured by a variety of indicators. There is a gap in knowledge on which conditions should be incorporated into instruments to predict frailty and, consequently, improve accuracy for screening older people that actually display frailty[19].

Taken together, the evidence demonstrates that comparing instruments designed for screening and measuring frailty in community-dwelling older adults is important, because this can help in the analysis of their components both individually and as a group. This helps inform both the decision on which instrument can be used immediately in primary care in settings with few specialists in geriatrics[11], and also toward refining or creating instruments with better sensitivity and flexibility[20]. The IVCF-20 and EFS tools were shown to have similar characteristics, despite the differences outlined. Further studies are warranted to assess the pertinence of each instrument in the work process of Family Health (Primary Care) Teams. Both instruments can be used for screening and may be useful to health teams, highlighting those components which most impact the development of frailty in older patients and allowing timely detection of components that require specialist care.

This study has some limitations. The main limitation was not performing a Comprehensive Geriatric Assessment (CGA) for the sample of older individuals aged ≥80 years included in the study. Comparing the IVCF-20 and EFS against the CGA could yield other information useful for devising a more appropriate instrument for use by researchers and clinicians, given there is currently no universal standard instrument for measuring frailty in older adults. It is also Important to bear in mind that some components of the 2 instruments are self-reported and rely on respondent memory or that of their carer. Nonetheless, it is worth highlighting that this study included a random representative sample of community-dwelling older people aged 80 or over which was carefully assessed by validated, reliable instruments applied in many previous studies.

CONCLUSION

The IVCF-20 and EFS instruments exhibited good accuracy and strong agreement when applied to community-dwelling oldest-old individuals. The prevalence of frailty detected was higher for the IVCF-20. This result shows that the instruments

assessed are largely similar for identifying frailty in community-dwelling oldest-old.

AUTHORSHIP

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- Walker Henrique Viana Caixeta - critical review, approval of final version for publication.
- Ronilson Ferreira Freitas - critical review and approval of final version for publication.
- Antônio Prates Caldeira - concepção e delineamento, revisão crítica e aprovação da versão a ser publicada.
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