ABSTRACT

OBJECTIVE: To compare the Edmonton Frail Scale (EFS) and Clinical-Functional Vulnerability Index-20 (CFVI-20) instruments regarding degree of agreement and correlation and compare descriptive models with frailty-associated variables in community-dwelling older people in Brazil.

METHODS: Cross-sectional study, nested in a population-based and household cohort. Baseline sampling was calculated based on a probabilistic approach by conglomerate in two stages. In the first stage, census tract was used as sampling unit. In the second, the number of households was defined according to the population density of individuals aged ≥ 60 years. The Kappa statistic evaluated the agreement between instruments and Pearson’s coefficient their correlation. Factors associated with frailty and high risk of clinical-functional vulnerability were identified by multiple analysis of Poisson regression with robust variance.

RESULTS: Kappa statistics was 0.599 and Pearson’s correlation coefficient 0.755 (p < 0.001). The EFS found a 28.2% prevalence of frailty, and the CFVI-20 found a 19.5% prevalence of high risk of clinical-functional vulnerability. Age equal to or greater than 80 years, history of stroke, polypharmacy, negative self-perceived health, fall in the past 12 months, and hospitalization in the past 12 months were variables associated with frailty in both instruments after multiple analysis. Less than four years of education, osteoarticular disease, and weight loss were associated with frailty only by EFS, and having a caregiver was associated with a high risk of clinical-functional vulnerability only by CFVI-20.

CONCLUSIONS: Although the analyses show moderate agreement and strong positive correlation between the instruments, the indicated prevalence of frailty is discrepant. Our results attest the need to standardize the instrument for assessing frailty in community-dwelling older people.

DESCRIPTORS: Aged. Frailty. Epidemiology. Reproducibility of Results. Risk Factors. Health Surveys, Instrumentation.
INTRODUCTION

By entailing a complex interaction of biological, psychological, and social factors, frailty in older people is a clinically recognizable multidimensional syndrome resulting from a decrease in energy reserves and age-related changes\textsuperscript{1–3}. It often affects older adults with disproportionate health condition changes after stressful events, causing adverse clinical outcomes, such as impairment in activities of daily living, physical limitation, falls, hospitalization, and even death\textsuperscript{2,4–6}.

The prevalence of frailty is expected to increase considerably with the population dynamics expected for the coming years\textsuperscript{2,4}. Identifying frail older adults or those at-risk of frailty is a public health priority. Further appropriate interventions are required to reverse this condition severity or, for those whose condition is irreversible, reduce adverse outcomes\textsuperscript{7}.

The Comprehensive Geriatric Assessment is the most appropriate strategy to identify and classify frail older adults\textsuperscript{3,4,8}. It enables the identification of conditions that compromise patients' health for developing a management plan addressing these conditions\textsuperscript{4,9}. However, this specialized assessment method is considered complex and costly, especially when applied without distinction in community-dwelling older people\textsuperscript{3,8,9}.

Although challenging, finding different ways of identifying frailty in community context is necessary due to the high cost incurred by older adults' care in inappropriate places. Patients must be referred for the appropriate place for care, according to their needs. Several simple, fast-tracking instruments were developed\textsuperscript{5,10,11}, but selecting from among them is difficult due to the lack of standard measure for frailty\textsuperscript{5}. Besides that, the reliability and validity of most of them were not assessed\textsuperscript{5,10}.

Among instruments following the best practices for complex measures development, we may stress the Edmonton Frail Scale (EFS)\textsuperscript{10} – an easy handling and simple application clinical proposal, even for professionals not specialized in geriatrics or gerontology\textsuperscript{12,13}. Recently, the Clinical-Functional Vulnerability Index-20 (CFVI-20) was also developed in Brazil. Despite presenting a high degree of validity and reliability\textsuperscript{14}, it is still little employed by researchers and health professionals.

EFS and CFVI-20 were not yet simultaneously employed in the same community-dwelling older population, and few studies compared these instruments with others serving the same purpose\textsuperscript{15–20}. Comparing two tests allow us to investigate evidence of convergent validity; that is, the degree of agreement between the measured constructs. Given that both instruments assess the same construct and were validated by the Comprehensive Geriatric Assessment, we could expect a high degree of correlation. This study aims to compare EFS and CFVI-20 regarding the degree of agreement and correlation and compare descriptive models with frailty-associated variables in community-dwelling older people in Brazil.

METHODS

This is a cross-sectional study nested with a population-based cohort and conducted with community-dwelling older people from the municipality of Montes Claros, in the north of Minas Gerais, Brazil. The municipality has approximately 400,000 inhabitants and is the main urban hub within the region.

Baseline sampling was calculated between May and July 2013 based on a probabilistic approach by conglomerate, in two stages. In the first stage, census tract was used as sampling unit. In the second, the number of households was defined according to the population density of individuals aged ≥ 60 years.

Our research data refer to the study first wave and were collected between November 2016 and February 2017. At this stage, the residence of all older adults interviewed at baseline was...
considered eligible for the new interview. As oriented by data collection instruments, older adults unable to answer the questionnaire were supported by family members or caregivers12-14.

EFS assesses nine domains (cognition, general health status, functional independence, social support, medication, nutrition, mood, urinary incontinence, and functional performance) distributed into 11 items with scores ranging from 0 to 17. Final score from 0 to 4 indicates no frailty; 5 and 6 indicate vulnerability to frailty; 7 and 8 mild frailty; 9 and 10, moderate frailty; and 11 or more indicate severe frailty12,13.

The CFVI-20 is a multidimensional assessment instrument containing 20 items that cover eight predictors of clinical-functional decline in older adults (age, self-perceived health, functional disabilities, cognition, mood, mobility, communication, and multiple comorbidities)14. Its score ranges from 0 to 40. Final score from 0 to 6 points indicates low risk of clinical-functional vulnerability; from 7 to 14 moderate risk; and 15 or higher indicate high risk, potentially frail21.

Dependent variables results were dichotomized at two levels: no frailty (final score ≤ 6) and frailty (final score > 6) according to the EFS; and no frailty (final score < 15) and frailty (final score ≥ 15) according to the CFVI-20. Independent variables were also dichotomized: gender, age group (up to 79 years or ≥ 80 years), marital status (with or without a partner), family arrangement (living alone or accompanied), education level (up to or more than four years of education), literacy (can read or not), own income (yes or no), household monthly income (up to or more than one minimum wage), self-reported chronic morbidities (hypertension, diabetes mellitus, heart disease, osteoarticular disease, neoplasia, stroke), polypharmacy (yes or no) and self-perceived health – assessed by the question “How would you rate your health status?”, with the following response options: “very good,” “good,” “fair,” “poor” or “very poor”.

Positive self-perceived health was classified as “very good” and “good” responses, while “fair,” “poor,” and “very poor” were classified as negative22,23. Self-reported weight loss in the past three months (yes or no), presence of caregiver (yes or no), fall in the past 12 months (yes or no), and hospitalization in the past 12 months (yes or no) were also evaluated.

Bivariate analyses were performed in both scales using the chi-square test to identify factors associated with response variable. Poisson regression with robust variance was used to calculate adjusted prevalence ratios (PR), considering independent variables associated with frailty in the bivariate analysis up to 20% significance level (p < 0.20). Analyses were performed separately for each instrument.

Considering frailty dichotomization (fragile × non-fragile), kappa statistics were applied to verify the agreement between EFS and CFVI-20 and interpreted according to Landis and Koch24. Instruments correlation was assessed based on the total scores, using Pearson’s coefficient25. A significance level of 5% (p < 0.05) was set for all analyses. Collected data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 17.0 (SPSS for Windows, Chicago, USA).

All participants were provided with information on the research and agreed to participate by signing an informed consent form. The project was approved by the Research Ethics Committee of the Faculdades Integradas Pitágoras de Montes Claros under the Opinion No. 1,629,395.

RESULTS

Among the 685 older adults evaluated at baseline, 92 refused to participate in the second stage of the study, 78 changed residence and could not be located, 67 were not found at home after three visits, and 54 had died. Then, 394 community-dwelling older adults participated in the study. The most predominant age group was between 60 and 79 years, representing 76.6% of the sample, with mean age of 73.9 years (SD = 7.9).
### Table 1. Demographic, social, economic, and morbidity characterization, health-related care, and frailty-associated factors in community-dwellers older adults (bivariate analysis), 2017.

| Independent variables | Sample Frailty in the Edmonton Frail Scale (n = 394) | Frailty in the Clinical-Functional Vulnerability Index-20 (n = 394) |
|------------------------|-----------------------------------------------------|---------------------------------------------------------------|
|                        | n | % | Yes | n | % | No | p | Yes | n | % | No | p |
| Gender                |   |   |     |   |   |     |   |     |   |   |     |   |
| Male                  | 131 | 33.2 | 37 | 28.2 | 94 | 71.8 | 25 | 19.1 | 106 | 80.9 |   |   |
| Female                | 263 | 66.8 | 74 | 28.1 | 189 | 71.9 | 52 | 19.8 | 211 | 80.2 |   |   |
| Age group             |   |   |     |   |   |     |   |     |   |   |     |   |
| Up to 79 years        | 302 | 76.6 | 70 | 23.2 | 232 | 77.8 | 35 | 11.6 | 267 | 88.4 |   |   |
| ≥ 80 years            | 92 | 23.4 | 41 | 44.6 | 51 | 55.4 | 42 | 45.7 | 50 | 54.3 |   |   |
| Marital status        |   |   |     |   |   |     |   |     |   |   |     |   |
| With partner          | 195 | 49.5 | 51 | 26.2 | 144 | 73.8 | 30 | 15.4 | 165 | 84.6 |   |   |
| Without partner       | 199 | 50.6 | 60 | 30.2 | 139 | 69.8 | 47 | 23.6 | 152 | 76.4 |   |   |
| Family arrangement    |   |   |     |   |   |     |   |     |   |   |     |   |
| Living alone          | 50 | 12.7 | 14 | 28.0 | 36 | 72.0 | 13 | 26.0 | 37 | 74.0 |   |   |
| Living accompanied    | 344 | 87.3 | 97 | 28.2 | 247 | 71.8 | 64 | 18.6 | 280 | 81.4 |   |   |
| Education level       |   |   |     |   |   |     |   |     |   |   |     |   |
| Up to 4 years         | 295 | 74.9 | 100 | 33.9 | 195 | 66.1 | 68 | 23.1 | 227 | 76.9 |   |   |
| > 4 years             | 99 | 25.1 | 11 | 11.1 | 88 | 88.9 | 9 | 9.1 | 90 | 90.9 |   |   |
| Literacy              |   |   |     |   |   |     |   |     |   |   |     |   |
| Yes                   | 300 | 76.1 | 72 | 24.0 | 228 | 76.0 | 51 | 17.0 | 249 | 83.0 |   |   |
| No                    | 94 | 23.9 | 39 | 41.5 | 55 | 58.5 | 26 | 27.7 | 68 | 72.3 |   |   |
| Own income            |   |   |     |   |   |     |   |     |   |   |     |   |
| Yes                   | 355 | 90.1 | 103 | 29.0 | 252 | 71.0 | 73 | 20.6 | 282 | 79.4 |   |   |
| No                    | 39 | 9.9 | 8 | 20.5 | 31 | 79.5 | 4 | 10.3 | 35 | 89.7 |   |   |
| Household monthly income |   |   |     |   |   |     |   |     |   |   |     |   |
| Up to one minimum wage| 102 | 25.9 | 35 | 34.3 | 67 | 65.7 | 27 | 26.5 | 75 | 73.5 |   |   |
| > one minimum wage    | 292 | 74.1 | 100 | 67 | 26.0 | 216 | 74.0 | 50 | 17.1 | 242 | 82.9 |   |   |
| Hypertension          |   |   |     |   |   |     |   |     |   |   |     |   |
| Yes                   | 281 | 71.3 | 88 | 31.3 | 193 | 68.7 | 62 | 22.1 | 219 | 77.9 |   |   |
| No                    | 113 | 28.7 | 23 | 20.4 | 90 | 79.6 | 15 | 13.3 | 98 | 86.7 |   |   |
| Diabetes mellitus     |   |   |     |   |   |     |   |     |   |   |     |   |
| Yes                   | 90 | 22.8 | 30 | 33.3 | 60 | 66.7 | 16 | 17.8 | 74 | 82.2 |   |   |
| No                    | 304 | 77.2 | 81 | 66.6 | 223 | 73.4 | 61 | 20.1 | 243 | 79.9 |   |   |
| Heart disease         |   |   |     |   |   |     |   |     |   |   |     |   |
| Yes                   | 110 | 27.9 | 43 | 39.1 | 67 | 60.9 | 35 | 31.8 | 75 | 68.2 |   |   |
| No                    | 284 | 72.1 | 68 | 23.9 | 216 | 76.1 | 42 | 14.8 | 242 | 85.2 |   |   |
| Osteoarticular disease|   |   |     |   |   |     |   |     |   |   |     |   |
| Yes                   | 189 | 48.0 | 67 | 35.4 | 122 | 64.6 | 45 | 23.8 | 144 | 76.2 |   |   |
| No                    | 205 | 52.0 | 44 | 21.5 | 161 | 78.5 | 32 | 15.6 | 173 | 84.4 |   |   |
| Neoplasia             |   |   |     |   |   |     |   |     |   |   |     |   |
| Yes                   | 38 | 9.6 | 16 | 42.1 | 22 | 57.9 | 15 | 39.5 | 23 | 60.5 |   |   |
| No                    | 356 | 90.4 | 95 | 26.7 | 261 | 73.3 | 62 | 17.4 | 294 | 82.6 |   |   |
| Cerebrovascular accident|   |   |     |   |   |     |   |     |   |   |     |   |
| Yes                   | 29 | 7.4 | 16 | 55.2 | 13 | 44.8 | 13 | 44.8 | 16 | 55.2 |   |   |
| No                    | 365 | 92.6 | 95 | 26.0 | 270 | 74.0 | 64 | 17.5 | 301 | 82.5 |   |   |
| Polypharmacy          |   |   |     |   |   |     |   |     |   |   |     |   |
| Yes                   | 107 | 27.2 | 53 | 49.5 | 54 | 50.5 | 35 | 32.7 | 72 | 67.3 |   |   |
| No                    | 287 | 72.8 | 58 | 20.2 | 229 | 79.8 | 42 | 14.6 | 245 | 85.4 |   |   |
| Self-perceived health |   |   |     |   |   |     |   |     |   |   |     |   |
| Negative              | 207 | 52.5 | 90 | 43.5 | 117 | 56.5 | 62 | 30.0 | 145 | 70.0 |   |   |
| Positive              | 187 | 47.5 | 21 | 11.2 | 166 | 88.8 | 15 | 8.0 | 172 | 92.0 |   |   |

(Continue)
In total, 66.8% were female, 50.6% lived alone, and 74.9% had up to four years of education; 88.3% did not have a caregiver, 71.3% had hypertension, and 48% had osteoarticular diseases. Table 1 shows sample characteristics and bivariate analyses results.

Table 1. Demographic, social, economic, and morbidity characterization, health-related care, and frailty-associated factors in community-dwellers older adults (bivariate analysis), 2017. (Continuation)

| Independent variables | Sample | Frailty in the Edmonton Frail Scale (n = 394) | Frailty in the Clinical-Functional Vulnerability Index-20 (n = 394) |
|-----------------------|--------|-----------------------------------------------|--------------------------------------------------------|
|                       | n      | %                                             | n          | %                              | n          | %                              | p          | p                     |
| Weight loss           |        |                                                |            |                                |            |                                |            |                       |
| Yes                   | 59     | 15.0                                          | 31         | 25.2                           | 28         | 47.5                           | 21         | 35.6                  | 38         | 64.4                  | < 0.001    | 0.001                  |
| No                    | 335    | 85.0                                          | 80         | 23.9                           | 255        | 76.1                           | 56         | 16.7                  | 279        | 83.3                  | < 0.001    | < 0.001                |
| Presence of caregiver |        |                                                |            |                                |            |                                |            |                       |
| Yes                   | 46     | 11.7                                          | 25         | 54.3                           | 21         | 45.7                           | 23         | 50.0                  | 23         | 50.0                  | < 0.001    | < 0.001                |
| No                    | 348    | 88.3                                          | 86         | 24.7                           | 262        | 75.3                           | 54         | 15.5                  | 294        | 84.5                  | < 0.001    | < 0.001                |
| Fall in the past 12 months |       |                                                |            |                                |            |                                |            |                       |
| Yes                   | 123    | 31.2                                          | 54         | 43.9                           | 69         | 56.1                           | 39         | 31.7                  | 84         | 68.3                  | < 0.001    | < 0.001                |
| No                    | 271    | 68.8                                          | 57         | 21.0                           | 214        | 79.0                           | 38         | 14.0                  | 233        | 86.0                  | < 0.001    | < 0.001                |
| Hospitalization in the past 12 months |       |                                                |            |                                |            |                                |            |                       |
| Yes                   | 57     | 14.5                                          | 33         | 57.9                           | 24         | 42.1                           | 22         | 38.6                  | 35         | 61.4                  | < 0.001    | < 0.001                |
| No                    | 337    | 85.5                                          | 78         | 23.1                           | 259        | 76.9                           | 55         | 16.3                  | 282        | 83.7                  | < 0.001    | < 0.001                |

Table 2. Frequency of Edmonton Frail Scale components in community-dwellers older adults, 2017.

| Edmonton Frail Scale components | n | % |
|---------------------------------|---|---|
| Cognition (clock drawing test)  |   |   |
|Accepted                         | 78| 19.8|
|Rejected with minor mistakes     | 64| 16.2|
|Rejected with major mistakes     | 252| 64.0|
|General health status            |   |   |
|Hospitalization in the past 12 months |   |   |
|None                             | 337| 85.5|
|1 to 2                           | 48| 12.2|
|More than 2                      | 9 | 2.3 |
|Self-perceived health            |   |   |
|Excellent/very good/good         | 187| 47.5|
|Poor                             | 180| 45.7|
|Very poor                        | 27 | 6.8 |
|Functional independence          |   |   |
|Activities in which assistance is required |   |   |
|0–1                              | 267| 67.8|
|2–4                              | 123| 31.2|
|5–8                              | 4 | 1.0 |
|Social support                   |   |   |
|When assistance is needed, the older adult has someone to count on |   |   |
|Always                           | 332| 84.3|
|Sometimes                        | 57 | 14.5|
|Never                            | 5 | 1.2 |
|Medication (five or more)        |   |   |
|No                               | 287| 72.8|
|Yes                              | 107| 27.2|
|Forget to take a medication      |   |   |
|No                               | 269| 68.3|
|Yes                              | 125| 31.7|
|Nutrition (weight loss)          |   |   |
|No                               | 335| 85.0|
|Yes                              | 59 | 15.0|
|Mood (feel sad or depressed)     |   |   |
|No                               | 297| 75.4|
|Yes                              | 97 | 24.6|
|Urinary incontinence             |   |   |
|No                               | 298| 75.6|
|Yes                              | 96 | 24.4|
|Functional performance           |   |   |
|Timed up & Go test               |   |   |
|0–10 seconds                     | 121| 30.7|
|11–20 seconds                    | 189| 48.0|
|More than 20 seconds             | 84 | 21.3|

In total, 66.8% were female, 50.6% lived alone, and 74.9% had up to four years of education; 88.3% did not have a caregiver, 71.3% had hypertension, and 48% had osteoarticular diseases. Table 1 shows sample characteristics and bivariate analyses results.
The EFS found a 28.2% prevalence of frailty, and the CFVI-20 found a 19.5% prevalence of high risk of clinical-functional vulnerability (equivalent to frailty in EFS). Table 2 shows the frequency distribution of EFS components and Table 3 of CFVI-20 components.

In EFS, 190 older adults (48.2%) presented no frailty, 93 (23.6%) were apparently vulnerable to frailty, 74 (18.8%) had mild frailty, 32 (8.1%) moderate frailty, and 5 (1.3%) severe fragility. As for the CFVI-20, 207 (52.5%) were robust, or with low risk of frailty, 110 (28.0%) had moderate risk of clinical-functional vulnerability, and 77 (19.5%) high risk.

### Table 3. Frequency of Clinical-Functional Vulnerability Index-20 components in community-dwellers older adults, 2017.

| Clinical-Functional Vulnerability Index-20 components | n   | %    |
|-------------------------------------------------------|-----|------|
| **AGE**                                               |     |      |
| 60 to 74 years old                                    | 226 | 57.4 |
| 75 to 84 years old                                    | 128 | 32.5 |
| ≥ 85 years                                            | 40  | 10.1 |
| **SELF-PERCEIVED HEALTH**                            |     |      |
| Health compared to other people from the same age group |   |      |
| Excellent/very good/good                              | 226 | 57.4 |
| Fair or bad                                           | 168 | 42.6 |
| **ACTIVITIES OF DAILY LIVING (ADLs)**                 |     |      |
| Instrumental (ADL)                                    |     |      |
| Stopped grocery shopping                              | Yes | 85  | 21.6 |
| Stopped managing finances                             | No  | 309 | 78.4 |
| Stopped performing minor housework                    | Yes | 80  | 20.3 |
| Stopped bathing alone                                 | No  | 314 | 79.7 |
| Basic (ADL)                                           |     |      |
| Stopped bathing alone                                 | Yes | 24  | 6.1  |
| Stopped bathing alone                                 | No  | 370 | 93.9 |
| **COGNITION**                                         |     |      |
| Forgetfulness                                         | Yes | 103 | 26.1 |
| Forgetfulness                                         | No  | 291 | 73.9 |
| Worsening of forgetfulness in the past months         | Yes | 68  | 17.3 |
| Worsening of forgetfulness in the past months         | No  | 326 | 82.7 |
| Forgetfulness preventing the performance of daily activities | Yes | 55  | 14.0 |
| Forgetfulness preventing the performance of daily activities | No  | 339 | 86.0 |
| **MOOD**                                              |     |      |
| Dismay, sadness, or hopelessness in the past month    | Yes | 109 | 27.7 |
| Dismay, sadness, or hopelessness in the past month    | No  | 285 | 72.3 |
| Loss of interest or pleasure in the past month in     | Yes | 81  | 20.6 |
| previously enjoyable activities                       | No  | 313 | 79.4 |
| **MOBILITY**                                          |     |      |
| Reach, graspingness, and pincer grip                  |     |      |
| Inability to raise the arm above shoulder level        | Yes | 35  | 8.9  |
| Inability to raise the arm above shoulder level        | No  | 359 | 91.1 |
| Inability to handle or hold small objects             | Yes | 31  | 7.8  |
| Inability to handle or hold small objects             | No  | 363 | 92.2 |
| Aerobic and muscle capacity                           |     |      |
| Unintentional weight loss, BMI < 22 kg/m2, calf       | Yes | 49  | 12.4 |
| Aerobic and muscle capacity                           | No  | 345 | 87.6 |
| Walking difficulties preventing to perform some daily activities | Yes | 109 | 27.7 |
| Walking difficulties preventing to perform some daily activities | No  | 285 | 72.3 |
| Gait                                                  |     |      |
| Two or more falls in the past year                    | Yes | 110 | 27.9 |
| Two or more falls in the past year                    | No  | 284 | 72.1 |
| Sphincteral incontinence                              |     |      |
| Involuntary loss of urine or feces                    | Yes | 117 | 29.7 |
| Involuntary loss of urine or feces                    | No  | 277 | 70.3 |
| **COMMUNICATION**                                     |     |      |
| Vision                                                |     |      |
| Vision impairment that may prevent the performance of some daily activities | Yes | 80  | 20.3 |
| Vision impairment that may prevent the performance of some daily activities | No  | 314 | 79.7 |
| Hearing                                                |     |      |
| Hearing impairment that may prevent the performance of some daily activities | Yes | 79  | 20.1 |
| Hearing impairment that may prevent the performance of some daily activities | No  | 315 | 79.9 |
| **MULTIPLE COMORBIDITIES**                            |     |      |
| Polypathology                                         | Yes | 83  | 21.1 |
| Polypathology                                         | ≥ 5 chronic diseases | Yes | 83  | 21.1 |
| Polypathology                                         | ≥ 5 medications | Yes | 83  | 21.1 |
| Polypathology                                         | Hospitalization in the past 6 months | Yes | 83  | 21.1 |
Kappa statistics found a 0.599 agreement index between the instruments (Table 4). Pearson’s correlation coefficient between EFS and CFVI-20 was 0.755 (p < 0.001).

Age equal to or greater than 80 years, history of stroke, polypharmacy, negative self-perceived health, fall in the past 12 months, and hospitalization in the past 12 months were variables that remained statistically associated with frailty in both instruments after multiple analysis. Less than four years of education, osteoarticular disease, and weight loss were

### Table 4. Analysis of agreement for frailty classification according to Edmonton Frail Scale and Clinical-Functional Vulnerability Index-20 in community-dwellers older adults, 2017.

|                | Edmonton Frail Scale (EFS) | CFVI-20: (n) (%) | (n) (%) |
|----------------|----------------------------|------------------|---------|
|                | No frailty                 |                  | Frailty |
| CFVI-20:       |                           |                  |         |
| No frailty     | 271 85.5                   | 46 14.5          | 317     |
| Frailty        | 12 15.6                    | 65 84.4          | 77      |

Kappa = 0.599 (p < 0.001).

### Table 5. Frailty-associated factors in community-dwellers older adults according to Edmonton Frail Scale and Clinical-Functional Vulnerability Index-20 (multiple analysis), 2017.

| Independent variables | Frailty in the Edmonton Frail Scale | Frailty in the CFVI-20 |
|-----------------------|-------------------------------------|------------------------|
|                       | PR 95%CI p                          | PR 95%CI p              |
| Age group             | 0.001                               | < 0.001                |
| ≥ 80 years            | 1.643 1.239 – 2.178 3.327 2.204 – 5.021 | 2.139 1.484 – 3.082 2.546 1.619 – 4.004 |
| Up to 79 years        | 1 1                                 | 1 1                    |
| Education level       | 0.002                               | < 0.001                |
| Up to 4 years         | 2.171 1.314 – 3.589                 | 1 1                    |
| > 4 years             | 1 1                                 | 1 1                    |
| Osteoarticular disease| 0.016                               | < 0.001                |
| Yes                   | 1.410 1.065 – 1.865                 | 1.410 1.065 – 1.865    |
| No                    | 1 1                                 | 1 1                    |
| Cerebrovascular accident| < 0.001                           | < 0.001                |
| Yes                   | 2.139 1.484 – 3.082 2.546 1.619 – 4.004 | 2.139 1.484 – 3.082 2.546 1.619 – 4.004 |
| No                    | 1 1                                 | 1 1                    |
| Polypharmacy           | 0.001                               | 0.004                  |
| Yes                   | 1.610 1.217 – 2.130 1.657 1.174 – 2.337 | 1.610 1.217 – 2.130 1.657 1.174 – 2.337 |
| No                    | 1 1                                 | 1 1                    |
| Self-perceived health  | < 0.001                             | < 0.001                |
| Negative              | 3.115 2.085 – 4.654 3.294 2.081 – 5.213 | 3.115 2.085 – 4.654 3.294 2.081 – 5.213 |
| Positive              | 1 1                                 | 1 1                    |
| Weight loss           | 0.006                               |                        |
| Yes                   | 1.542 1.132 – 2.102                 |                        |
| No                    | 1 1                                 | 1 1                    |
| Presence of caregiver | 0.020                               |                        |
| Yes                   | 1.615 1.078 – 2.419                 |                        |
| No                    | 1 1                                 | 1 1                    |
| Fall in the past 12 months | 0.037                           | 0.029                 |
| Yes                   | 1.363 1.019 – 1.824 1.503 1.043 – 2.166 | 1.363 1.019 – 1.824 1.503 1.043 – 2.166 |
| No                    | 1 1                                 | 1 1                    |
| Hospitalization in the past 12 months | < 0.001                        | 0.005                |
| Yes                   | 1.825 1.382 – 2.409 1.715 1.181 – 2.490 | 1.825 1.382 – 2.409 1.715 1.181 – 2.490 |
| No                    | 1 1                                 | 1 1                    |

PR: prevalence ratio.
associated with frailty only by EFS, and having a caregiver was associated with a higher risk of fragility only by CFVI-20 (Table 5).

**DISCUSSION**

We found a moderate agreement and a strong positive correlation between EFS and CFVI-20. The prevalence of frailty in community-dwelling older people was higher in EFS. Demographic, social, economic, and morbidity-related factors, as well as health services use, influenced frailty in community-dwelling older people, but differences within the identification of these variables by the instruments was small.

The similarity and relevance of the main components justify the moderate agreement found between the instruments. Both scales assess cognition, functional independence, mood, and health conditions (or presence of morbidities). The EFS separately assesses social support, medication, nutrition, urinary incontinence, and functional performance; in turn, CFVI-20 assesses age, self-perceived health, mobility, and communication.

Our results differ from those reported by a systematic review and the meta-analysis of studies conducted in Latin America and the Caribbean, where the prevalence of frailty identified by the EFS in Brazilian community-dwelling older adults was 35.8%, with 95%CI 30.6–41.2. As for the CFVI-20, although validated in Brazil, few population-based studies employed it.

The different prevalence found in both instruments may be explained by the cutoff point. ICVF-20 cut-off point refer fewer older adults for specialized evaluation by screening, identifying those with greater needs. Considering the benefit-cost ratio, this process is considered positive due to the high cost of broad geriatric assessment. Given that specialized care services are not always available, this is an opportunity to optimize resources in primary care.

Another possible explanation for the discrepancy between scales prevalence is the differences among some of their components: while EFS assesses “social support,” CFVI-20 approaches “age” and “communication.” Besides that, similar components are approached differently by each instrument. While the EFS assesses “cognition” using the clock drawing test, the CFVI-20 does so by evoking words. As the clock drawing test requires number knowledge, the low education level among Brazilians older adults may compromise its result. Thus, the low performance in this test (which increases the prevalence of frailty) may be related to difficulties not necessarily associated to a cognitive deficit.

EFS assesses “health status” by the number of hospitalizations in the past 12 months; in turn, ICVF-20 addresses the number of hospitalizations in the past six months in the component “multiple comorbidities.” The instruments also differ regarding “functional independence,” or “functional disability”; while EFS approach it by preparing meals/cooking, getting around from place to place, using the phone, doing laundry, and taking medicines, CFVI-20 employs doing the dishes and bathing.

In the component “medication,” EFS approaches forgetting to take medications, which is unregarded by the CFVI-20. In EFS, “functional performance” is evaluated using the timed Up & Go Test with a distance of approximately three meters and time stratified by “0 to 10 seconds,” “11 to 20 seconds,” and “greater than 20 seconds.” CFVI-20, in turn, assesses whether the time spent on the 4-meter gait speed test is greater than five seconds.

CFVI-20 also differs from EFS by including the “mobility” component – which assesses the ability to raise the arms above the shoulder level and handle or hold small objects, Body Mass Index, calf circumference, walking difficulties that may interfere with activities of daily living, falls in the past year, and fecal incontinence – and addressing polypathology in the “multiple comorbidities” component.
These factors reveal that the instruments diverse characteristics influence the prevalence of frailty in older adults. A systematic review concluded that frailty components and corresponding indicators considerably vary depending on the method employed by the instrument. It also reported a lack of consensus regarding which elements should be considered to predict frailty and, consequently, increase this condition accurate diagnosis.

Our results found a correlation between advanced age and frailty regardless of the instrument used. However, frailty correlation with low education was only identified by the EFS. Other studies comparing instruments also observed this association between frailty, advanced age, and lower education level. A longitudinal study conducted in the Netherlands identified, besides the association with low education, an association between low income and frailty.

The history of stroke and falls – factors associated with frailty in both instruments, – as well as the osteoarticular disease identified by the EFS corroborate results reported by other studies. Osteoarticular disease and stroke sequelae engender functional limitations that impair the performance of basic, instrumental, and advanced activities that were previously performed without restrictions, increasing the risk of falls.

We also found an association between polypharmacy and frailty in both instruments, a result confirmed in this condition consensus and also reported by other authors. A French study found independent and combined effects of polypharmacy and frailty on mortality risk factors in older adults. This vulnerability may be explained by drugs pharmacokinetic and pharmacodynamic properties in the aging body, as well as by the potential adverse reactions of drug interaction.

The two instruments also showed an association between frailty and negative self-perceived health – an indicator that incorporates physical, cognitive, and emotional components, as well as aspects related to well-being and personal life satisfaction. Considering that, this measure can predict mortality, functional capacity decline, and frailty in older adults.

We also found an association between frailty and weight loss in the EFS. Impaired nutritional status is an important sign of frailty in older adults, and dietary intervention is a non-pharmacological treatment capable of correcting macro and micronutrient deficiency, preventing weight loss that can lead to frailty syndrome.

Frailty and the presence of a caregiver were only associated in the CFVI-20 and probably indicates a reverse causality, that is: the frail older adult needs a caregiver to assist him in the activities of daily living. Thus, caregivers demand or presence would be markers of existing fragility.

Hospitalization was associated with frailty in both instruments – a result also confirmed in meta-analysis. Although chronic diseases are not necessarily accompanied by frailty, acute episodes of certain illnesses or exacerbation of chronic conditions may increase the risk of adverse events, leading to frailty in older people and, consequently, to unfavorable clinical outcomes, such as hospitalization. Hospitalizations for any reason cause important changes in older adults’ daily life.

Comparing instruments capable of identifying frailty in community-dwellers older adults may contribute to the search for an applicable instrument, especially at primary healthcare and places with few professionals specialized in geriatrics. Despite their peculiarities, both scales were akin in identifying associated factors or fragility markers and may be useful to health teams in outlining components that most interfere with fragility and in identifying older adults who require specialized care. The CFVI-20 seems more useful in a context of few resources, for determining a smaller number of patients to be referred for comprehensive geriatric assessment.
Our study has some limitations. The main limitation is the lack of a comprehensive geriatric assessment, which would allow other simultaneous analyses of the two instruments. However, this procedure was separately performed in the instruments validation. As this is a cross-sectional study, we could not establish causal relationships. Moreover, both instruments include self-reported components, relying on the memory of the interviewee or their caregiver. However, our study carefully evaluated a representative random sample of community-dwellers older adults using validated and reliable instruments.

CONCLUSIONS

The EFS and CFVI-20 instruments showed moderate agreement and strong positive correlation, as well as similar features for identifying associations. However, the prevalence of frailty differed between them. This result stresses the need to standardize the instrument for measuring frailty in community-dwellers older adults.

REFERENCES

1. Xue QL. The frailty syndrome: definition and natural history. Clin Geriatr Med. 2011;27(1):1-15. https://doi.org/10.1016/j.cger.2010.08.009

2. Clegg A, Young J, Iliffe S, Rikkert MO, Rockwood K. Frailty in elderly people. Lancet. 2013;381(9868):752-62. https://doi.org/10.1016/S0140-6736(12)62167-9

3. Morley JE, Vellas B, Kan GA, Anker SD, Bauer JM, Bernabei R, et al. Frailty Consensus: a call to action. J Am Med Dir Assoc. 2013;14(6):392-7. https://doi.org/10.1016/j.jamda.2013.03.022

4. Cesari M, Prince M, Thiagarajan JA, Carvalho IA, Bernabei R, Chan P, et al. Frailty: an emerging public health priority. J Am Med Dir Assoc. 2016;17(3):188-92. https://doi.org/10.1016/j.jamda.2015.12.016

5. Dent E, Kowal P, Hoogendijk EO. Frailty measurement in research and clinical practice: a review. Eur J Intern Med. 2016;31:3-10. https://doi.org/10.1016/j.ejim.2016.03.007

6. Vermeiren S, Vella-Azzopardi R, Beckwée D, Habbig AK, Scafoglieri A, Jansen B, et al. Frailty and the prediction of negative health outcomes: a meta-analysis. J Am Med Dir Assoc. 2016;17(12):1163.e1-1163.e17. https://doi.org/10.1016/j.jamda.2016.09.010

7. Chen X, Mao G, Leng SX. Frailty syndrome: an overview. Clin Interv Aging. 2014;9:43341. https://doi.org/10.2147/CIA.S45300

8. Clegg A, Rogers L, Young J. Diagnostic test accuracy of simple instruments for identifying frailty in community-dwelling older people: a systematic review. Age Ageing. 2015;44(1):148-52. http://doi: 10.1093/ageing/afu137

9. Lacas A, Rockwood K. Frailty in primary care: a review of its conceptualization and implications for practice. BMC Med. 2012;10:4. https://doi.org/10.1186/1741-7015-10-4

10. Bouillon K, Kivimaki M, Hamer M, Sabia S, Fransson EI, Singh-Manoux A, et al. Measures of frailty in population-based studies: an overview. BMC Geriatr. 2013;13:64. https://doi.org/10.1186/1471-2318-13-64

11. Vries NM, Staal JB, Ravensberg CD, Hobbelen JS, Olde-Rikkert MG, Nijhuis-van der Sanden MW. Outcome instruments to measure frailty: a systematic review. Ageing Res Rev. 2011;10(1):104-14. http://doi.org/10.1016/j.arr.2010.09.001

12. Rolfsen DB, Majumdar SR, Tsuyuki RT, Tahir A, Rockwood K. Validity and reliability of the Edmonton Frail Scale. Age Ageing. 2006;35(5):526-9. https://doi.org/10.1093/ageing/af041

13. Fabrício-Wehbe SCC, Schiaveto FV, Vendrusculo TRP, Haas VJ, Dantas RAS, Rodrigues RAP. Adaptação cultural e validade da Edmonton Frail Scale - EFS em uma amostra de idosos brasileiros. Rev. Latino-Am. Enfermagem. 2009;17(6):1043-9. https://doi.org/10.1590/S0104-11692009000600018

14. Moraes EN, Carmo JA, Moraes FL, Azevedo RS, Machado CJ, Montilla DER. Clinical-Functional Vulnerability Index-20 (CFCV-20): rapid recognition of frail older adults. Rev Saude Publica. 2016;50:81. https://doi.org/10.1590/s1518-8787.2016050006963
15. Chang CI, Chan DC, Kuo KN, Hsiung CA, Chen CY, Ching-I. Prevalence and correlates of geriatric frailty in a northern Taiwan community. J Formos Med Assoc. 2011;110(4):247-57. https://doi.org/10.1016/S0929-6646(11)60037-5
16. Cesari M, Gambassi G, Kan GA, Vellas B. The frailty phenotype and the Frailty Index: different instruments for different purposes. Age Ageing. 2014;43(1):10-2. https://doi.org/10.1093/ageing/aft160
17. Jung HW, Kim SW, Ahn S, Lim JY, Han JW, Kim TH, et al. Prevalence and outcomes of frailty in Korean elderly population: comparisons of a multidimensional frailty index with two phenotype models. PLoS One. 2014;9(2):e87958. https://doi.org/10.1371/journal.pone.0087958
18. García-Peña C, Ávila-Funes JA, Dent E, Gutiérrez-Robledo L, Pérez-Zepeda M. Frailty prevalence and associated factors in the Mexican Health and Aging Study: a comparison of the Frailty Index and the phenotype. Exp Gerontol. 2017;79:55-60. https://doi.org/10.1016/j.exger.2016.03.016
19. Harmand MGC, Meillon C, Bergua V, Teguo MT, Dartigues JF, Avila-Funes JA, et al. Comparing the predictive value of three definitions of frailty: results from the Three-City Study. Arch Gerontol Geriatr. 2017;72:153-63. https://doi.org/10.1016/j.archger.2017.06.005
20. Ramírez Ramírez JU, Cadena Sanabria MO, Ochoa ME. Aplicación de la Escala de Fraildad de Edmonton en población colombiana. Comparación con los criterios de Fried. Rev Esp Geriatr Gerontol. 2017;52(6):322-5. https://doi.org/10.1016/j.regg.2017.04.001
21. Moraes EN, Moraes FL. Avaliação multidimensional do idoso. 5.ed. Belo Horizonte, MG: Foliúm; 2016. (Coleção Guia de Bolso em Geriatria e Gerontologia, 1).
22. Silva RJS, Smith-Menezes A, Tribess S, Rómulo-Perez V, Virtuoso Júnior JS. Prevalência e fatores associados à percepção negativa da saúde em pessoas idosas no Brasil. Rev Bras Epidemiol. 2012;15(1):49-62. https://doi.org/10.1590/S1415-790X2012000100005
23. Medeiros SM, Silva LSR, Carneiro JA, Ramos GCF, Barbosa ATF, Caldeira AP. Fatores associados à autopercetção negativa da saúde entre idosos não institucionalizados de Montes Claros, Brasil. Cienc Saude Coletiva. 2016;21(11):3377-86. https://doi.org/10.1590/1413-812320152111.18752015
24. Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics. 1977;33(1):159-74. https://doi.org/10.2307/2529310
25. Figueiredo Filho DB, Silva Júnior JA. Desvendando os mistérios do Coeficiente de Correlação de Pearson (r). Rev Política Hoje. 2009;18(1):115-46.
26. Da Mata FAF, Pereira PPS, Andrade KRC, Figueiredo ACMG, Silva MT, Pereira MG. Prevalence of frailty in Latin America and the Caribbean: a systematic review and meta-analysis. PLoS One. 2016;11(8):e0160019. https://doi.org/10.1371/journal.pone.0160019
27. Xie B, Larson JL, Gonzalez R, Pressler SJ, Lustig C, Arslanian-Engoren C. Components and indicators of frailty measures: a literature review. J Frailty Aging. 2017;6(2):76-82. https://doi.org/10.14283/jfa.2017.11
28. Herr M, Robine JM, Pinot J, Arvieu JI, Ankri J. Polypharmacy and frailty: prevalence, relationship, and impact on mortality in a French sample of 2350 old people. Pharmacoepidemiol Drug Saf. 2015;24(6):637-46. https://doi.org/10.1002/pds.3772
29. Saum KU, Schöttker B, Meid AD, Holleczek B, Haefeli WE, Hauer K, et al. Is polypharmacy associated with frailty in older people? Results from the ESTHER Cohort Study. J Am Geriatr Soc. 2017;65(2):e27-e32. https://doi.org/10.1111/jgs.14718
30. Pagotto V, Bachion MM, Silveira EA. Autoavaliação da saúde por idosos brasileiros: revisão sistemática da literatura. Rev Panam Salud Publica. 2013;33(4):302-10.

Authors’ Contribution: Study conception and planning: JAC, ASOS, LCM, FMC, ENM, APC. Data collection: JAC, ASOS, FMC. Data analysis and interpretation: JAC, LCM, FMC, APC. Manuscript preparation and draft: JAC, ASOS, LCM, FMC, ENM, APC. Manuscript critical review: JAC, LCM, FMC, ENM, APC. Final approval: All authors. Public responsibility for the content of this article: JAC.

Conflict of Interest: The authors declare no conflict of interest.