



## Prevalence of and factors associated with frailty in elderly users of the Family Health Strategy

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### Resumo

**Objetivo:** analisar a prevalência e fatores associados à fragilidade em idosos usuários da Estratégia Saúde da Família. **Método:** estudo epidemiológico de corte transversal com 377 idosos. A variável dependente, a fragilidade, foi investigada através do *Tilburg Frailty Indicator* (TFI). As variáveis independentes foram as sociodemográficas e as condições de saúde (avaliadas através dos instrumentos validados: Escala de Katz, Escala de Lawton, Escala de Depressão Geriátrica - GDS-15, Miniavaliação Nutricional - MAN, CIRS-G e polifarmácia). Foi realizada análise descritiva das variáveis categóricas e numéricas. Na análise bivariada calculou-se as razões de prevalência através do teste qui-quadrado de Mantel Haenszel e, na análise múltipla, utilizou-se a regressão de *Poisson*. **Resultados:** a prevalência estimada de fragilidade para a amostra foi de 65,25%. Na análise múltipla as variáveis estado civil (divorciado ou separado, viúvo ou solteiro), presença de sintomas depressivos, dependência em atividades instrumentais de vida diária, estado nutricional (desnutrição/risco de desnutrição) e presença de comorbidades se mantiveram associadas, com significância estatística, à fragilidade. **Conclusão:** o presente estudo apontou elevada prevalência de fragilidade, ressaltando a importância no conhecimento dessa temática a fim de estimular ações preventivas para minimizar desfechos adversos na população idosa, como hospitalização, quedas, fraturas e morte.

**Keywords:** Frailty. Health of the Elderly. Risk Factors.

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## INTRODUCTION

The term aging is usually used to describe different changes that occur throughout life. At the biological level, aging is associated with the accumulation of a variety of molecular and cellular damage. There is a gradual loss of physiological reserves, an increased risk of developing various diseases and a general decline in the intrinsic capacity of the individual. This process does not occur in a linear manner, but in a dynamic and progressive way<sup>1</sup>.

The most recent demographic research indicates that Brazil, like many developing countries, faces a rapid process of population aging, leading to a major increase in demand for health care services<sup>2</sup>.

In Brazil, the point of entry and treatment of the spontaneous health care needs of the elderly is carried out by the Family Health Strategy (FHS), through specific programmatic actions defined by the Ministry of Health<sup>3</sup>. However, the health service sometimes has difficulty identifying and responding to all the complicating factors of the aging process.

In this context, frailty has grown in importance as another condition that allows the identification of health problems in the elderly<sup>4,5</sup>. While there are several concepts of frailty, one of the most up to date is defined by Gobbens<sup>4</sup>, where it is considered a multidimensional syndrome involving a complex interaction of biological, psychological and social factors in the life course of the individual, culminating in a state of greater vulnerability, associated with an increased risk of adverse outcomes such as functional decline, falls, hospitalization, institutionalization and death.

The Tilburg Frailty Indicator (TFI)<sup>6,7</sup>, a tool that was transculturally adapted and validated for the evaluation of frailty in Brazil was found to be adequate for the socioeconomic and cultural conditions of the Brazilian population. Literature has demonstrated the importance of the frailty syndrome among the elderly and its relationship with adverse effects such as falls, disability, hospitalization and death. Therefore, the identification of frail elderly people in primary health care using the TFI as a screening instrument enables the elaboration of adequate health policies for the prevention of these adverse events and the treatment of already established disabilities.

The present study used a simple instrument that can be applied by any trained health professional, and which includes not only biological characteristics, but also psychological and social dimensions. The study follows the objectives of the field of geriatrics and gerontology, as it seeks to jointly study biological, psychological and social aspects to improve the care provided to the elderly.

Thus, the objective of the present study was to analyze the prevalence and factors associated with frailty in elderly users of the Family Health Strategy.

## METHOD

A cross-sectional epidemiological study was performed with elderly individuals living in Várzea Grande, Mato Grosso, the second most populous municipal region in the state, and which borders the state capital, Cuiabá. Its population is estimated at 282,009 inhabitants, with 18,030 individuals aged 60 years and over<sup>8</sup>.

The sample was determined from the calculation for finite populations, considering a 95% confidence interval, a sampling error of 5% and an assumed prevalence of frailty of 50%. We chose to add 10% of the total sample to perform the tests of association. Using the cluster sampling model, nine FHS were selected from the 15 existing units in the municipal region at the time of data collection. The sample size was divided proportionally by the same units, according to the population of the 4364 elderly persons enrolled in the 15 FHS of Várzea Grande<sup>9</sup>, 43 elderly persons in the Água Vermelha FHS, 36 elderly persons in the Capão Grande FHS, 52 elderly persons in the Jardim Glória I FHS, 18 elderly persons in the Jardim União FHS, 27 elderly persons in the Manaíra FHS, 29 elderly persons in the Manga FHS, 93 elderly persons in the São Matheus FHS, 55 elderly persons in the Unipark FHS and 24 elderly persons in the Vila Arthur FHS, giving a total of 377 elderly individuals. If the elderly had cognitive deficits, refused to participate or were absent at the time of the interview, they were replaced by the elderly person in the next nearest residence. The interviews were carried out between March and June of 2016 in the homes of the elderly and were applied by three medical students and two nurses, after training and standardization of data collection among the interviewers.

All individuals aged 60 years or older were eligible for inclusion in this study. The inclusion criterion was to live permanently at home, while individuals with cognitive deficits, conditions such as dementia, psychiatric disorders, mental disability, stroke sequelae with language impairment, blindness and deafness were excluded. Cognitive deficit was evaluated by the Mini Mental State Exam (MMSE), using the version adapted for the Brazilian population which considers two different cutoff points according to educational level<sup>10</sup>.

The dependent variable of the study was the presence of frailty, evaluated through the Tilburg Frailty Indicator (TFI)<sup>6,7</sup>. This instrument is composed of 15 objective, self-referential questions, distributed in three domains: physical, psychological and social. Most questions are answered with yes or no, except for four questions that include the option "sometimes". The end result is a score ranging from zero to 15 points. Higher scores mean higher levels of frailty or, alternatively, scores  $\geq$  five points indicate that the individual is frail<sup>6</sup>.

As independent variables, the following sociodemographic characteristics were evaluated: age; gender; self-reported ethnicity/skin color; marital status; schooling; number of residents or household arrangement (live alone or with others); and per capita income (calculated by dividing the total family income in reais by the number of people living in the household). Functional dependence in activities of daily living (ADL) and instrumental activities of daily living (IADL) were evaluated, respectively, by the Katz and Lawton scales<sup>11,12</sup>. Depressive symptoms were investigated by the Geriatric Depression Scale (GDS-15)<sup>13</sup>; nutritional risk was evaluated by the Mini Nutritional Assessment (MNA)<sup>14</sup>; and the classification of comorbidities was performed using the Cumulative Illness Rating Scale (CIRS-G)<sup>15</sup>, where the fourteen most prevalent morbidities among the elderly were considered and later regrouped into up to two and three or more morbidities. Polypharmacy was included, taking as a reference the use of five or more regular medications<sup>16</sup>.

The data collected were double entered for comparison between data bases and the detection and correction of typing errors.

The variables were described in absolute (n) and relative (%) frequencies. In the bivariate analysis, the

associations between the response variable (frailty) and the other exposure variables were identified. For the calculation of the statistical significance of the association, the Chi-Squared Test with the Mantel-Haenszel method was used (CI 95%). Also in the bivariate analysis, Fisher's Exact Test was used for the analyzes where the expected frequency was less than five. The variables with  $p \leq 0.20$  were selected for multiple analysis through Poisson Regression. After progressive withdrawal of the variables (stepwise backward), those whose a level of significance less than or equal to 0.05 were maintained in the model. Poisson regression was chosen as a multiple model instead of Logistic Regression due to the fact that the odds ratio, the measurement used in the latter method, overestimates the magnitude of the association when the event studied is common (not rare). Another reason is that Poisson regression reports the Prevalence Ratio itself as a measure of association, the same measurement as is used in the bivariate analysis.

This study is part of the "Vulnerability and Frailty: Proposal of Epidemiological Indicators for Monitoring the Health of the Elderly in Basic Health Care" of the Graduate Program of the Institute of Public Health (ISC) of the Universidade Federal de Mato Grosso (UFMT).

The present study was approved by the Ethics Research Committee of the Hospital Universitário Júlio Muller (HUJM) under number 1.243.299. The structuring and planning of this project follow the rules set forth in Resolution 466/2012 of the National Research Ethics Council. All participants signed a Free and Informed Consent Form.

## RESULTS

The mean age of the study population was 69.6 years, with a median of 68.0 years ( $\pm 7.48$ ). The majority of the individuals were female (60.21%), brown-skinned (58.89%); had a partner (56.24%) and were literate (71.62%) (Table 1).

In the distribution of the elderly according to frailty, according to the cut-off point proposed by the TFI, the estimated prevalence among the sample was 65.25%. The mean total score of this instrument in the evaluated population was 5.93 points (values not shown in table).

In the bivariate analysis, the sociodemographic variables that were found to be associated with frailty in this population were: absence of a partner (PR = 1.20 CI 95% 1.04-1.39) and, in relation to schooling, not being literate (PR = 1.21 CI 95% 1.05-1.40) (Table 2). The variables related to the health conditions associated with frailty were dependence in basic activities of daily living (ADL) (PR= 1.35 CI95% 1.18-1.55); dependence in IADL (PR= 1.83 CI95% 1.49-2.24); presence of depressive symptoms (PR= 1.59 CI95% 1.38-1.82) or severe depression (PR= 1.83 CI95% 1.64-2.05); presence of nutritional condition of risk of malnutrition (PR= 1.44, CI 95% 1.23-

1.70); classified as malnourished (PR = 1.91, 95% CI 1.68-2.18); (PR = 1.18 CI 95% 1.02-1.36) and the use of five or more medications (PR = 1.23 CI 95% 1.05-1.44) (Table 3).

In multiple analysis via Poisson regression, the following variables remained in the model: marital status (absence of partner); symptoms of depression or severe symptoms of depression, nutritional status of at risk of malnutrition or malnutrition, dependence in IADL and presence of comorbidities, as they maintained a statistically significant association with frailty (Table 4).

**Table 1.** Sociodemographic aspects of the elderly population of Várzea Grande, Mato Grosso, 2016.

Variables	n (%)
Gender	
Female	227 (60.21)
Male	150 (39.79)
Skin Color	
Brown	222 (58.89)
White	73 (19.36)
Black	71 (18.83)
Yellow	8 (2.12)
Indigenous	1 (0.80)
Marital status	
Married	186 (49.34)
Living with a partner	26 (6.90)
Divorced or separated	47 (12.47)
Widower	95 (25.20)
Not married	23 (6.09)
Education	
Literate	270 (71.62)
Illiterate	107 (28.38)

**Table 2.** Prevalence and Prevalence Ratio of frailty according to sociodemographic characteristics. Várzea Grande, Mato Grosso, 2016.

Variables	Prevalence of Frailty			
	n (377)	Frail (%)	Gross PR* (CI95%)	p value
Gender				
Male	150	91 (60.67)	1	0.129
Female	227	155 (68.28)	1.12 (0.96-1.31)	
Household arrangement				
Live with others	319	198 (62.07)	1	0.002
Live alone	58	48 (82.76)	1.33 (1.15-1.54)	

to be continued

Continuation of Table 2

Variables	Prevalence of Frailty			<i>p</i> value
	n (377)	Frail (%)	Gross PR* (CI95%)	
Age group				
60 to 69 years	214	141 (65.89)	1	
70 to 79 years	117	79 (59.83)	0.91 (0.76-1.08)	0.274
80 years and over	46	35 (76.09)	1.15 (0.96-1.39)	0.180
Ethnicity/skin color				
White	73	43 (58.90)	1	0.198
Others	302	202 (66.89)	1.13 (0.92-1.39)	
Marital status				
Lives with partner	212	127 (58.91)	1	0.013
Lives without partner	165	119 (72.12)	1.20 (1.04-1.39)	
Per capita income				
Up to 1 MW **	333	219(65.77)	1	0.564
Over 1 MW	44	27 (61.33)	1.07 (0.84-1.37)	
Education				
Literate	270	166 (61.48)	1	0.014
Illiterate	107	80 (74.77)	1.21 (1.05-1.40)	

\*Prevalence Ratio; \*\*Minimum wage at time (R\$ 880.00).

**Table 3.** Prevalence and Prevalence Ratio of frailty according to dimensions of overall health of the elderly of Várzea Grande, Mato Grosso, 2016.

Variables	Prevalence of Frailty			<i>p</i> value
	n (377)	Frailty (%)	Gross PR (CI95%)	
Basic activities of daily living				
Independent	274	163 (59.49)	1	<0.001
Dependent	103	83 (80.58)	1.35 (1.18-1.55)	
Instrumental Activities of daily living				
Independent	142	61 (42.96)	1	<0.001
Dependent	235	185 (78.72)	1.83 (1.49-2.24)	
Emotional condition				
Without depression	259	141 (54.44)	1	
Symptoms of Depression	97	84 (86.60)	1.59 (1.38-1.82)	<0.001
Severe Symptoms of Depression	21	21 (100.00)	1.83 (1.64-2.05)	<0.001
Nutrition assessment				
Not at risk	205	107 (52.20)	1	
At nutritional risk	135	102 (75.56)	1.44 (1.23-1.70)	<0.001
Malnutrition	37	37 (100.00)	1.91 (1.68-2.18)	<0.001
Comorbidities				
Up to two	315	198 (62.86)	1	0.030
Three of more	62	48 (77.42)	1.18 (1.02-1.36)	
Polypharmacy				
No	295	187 (63.39)	1	0.027
Yes	82	59 (71.95)	1.23 (1.05-1.44)	

PR: Prevalence Ratio; CI 95%: confidence interval for prevalence of 95%.

**Table 4** – Analysis of final Poisson regression model for variables associated with frailty of the elderly of Várzea Grande, Mato Grosso, 2016.

Variables	PR* (CI 95%)	p value
Marital status		
Divorced or separated / widowed / single	1.17 (1.033-1.336)	0.014
Depressive state		
Symptoms of depression	1.17 (1.001-1.363)	0.050
Severe symptoms of depression	1.19 (1.034-1.355)	0.014
Instrumental activities of daily living		
Dependent	1.54 (1.261-1.885)	<0.001
Nutritional assessment		
At nutritional risk	1.18 (1.071-1.307)	0.001
Undernourished	1.72(1.400-2.100)	<0.001
Comorbidities		
3 or more	1.23 (1.055-1.434)	0.008

\* Prevalence ratio.

## DISCUSSION

The prevalence of frailty found in this study was 65.25%, corroborating Brazilian studies that found a high prevalence of frailty in the elderly. In a study carried out in Bahia of 139 elderly people living in the community, which applied the Fried method of evaluation<sup>17</sup>, 61.8% were pre-frail and 18.6% were frail. A longitudinal study on living and health conditions in Latin American and Caribbean countries, which in Brazil involved the elderly of the city of São Paulo, found that 40.6% of the elderly were frail<sup>18</sup>. However, this study involved different concepts of frailty and instruments, and the TFI considers issues beyond the physical, psychological and social domain. In a study with Dutch elderly persons aged 75 years or older residing in communities that used the TFI instrument, a lower prevalence of frailty was detected (47%)<sup>19</sup>.

It is important to consider that instruments that evaluate only the physical domain tend to find lower prevalences of frailty in similar populations than instruments that include the evaluation of other domains, such as the psychological and social. In addition, there is some complexity in standardizing the meaning of frailty. Different instruments have been used, with the objective of a more efficient identification of frailty based on clinical judgment, geriatric assessment and the accumulation of

deficits<sup>20</sup>. Among these, the TFI seems to be the most appropriate for the current concept of frailty<sup>7</sup> and one of the most suitable for use in assessing the health of the elderly in basic care<sup>21</sup>.

In the present study, the TFI identified a strong correlation with quality of life, in particular the psychological and social components of frailty, strengthening the integral definition of the condition<sup>22</sup>. In a review study to verify the efficiency of the Tilburg Frailty Indicator, there was evidence of its reliability and validity, as well as the ease and speed of its application. However, the author himself suggests that there is a need for further studies among specific groups, such as hospitalized patients<sup>23</sup>.

There is therefore a need for periodic evaluation by a multidisciplinary team for the early detection of signs of frailty<sup>24</sup>.

The association found in this study between the absence of a partner and frailty does not differ from many studies that discuss this relationship. In a study using one-dimensional instruments with 958 elderly people from the urban area of the city of Uberaba, Minas Gerais, there was a higher proportion of elderly people in a situation of frailty among those who did not live with a partner<sup>25</sup>. A study that also used an instrument that evaluated only the physical domain identified that frailty is associated with being older, female, living alone, being underweight, being



insufficiently active and with the number of falls<sup>18</sup>. In a study carried out in Mexico, the authors also found higher prevalences of frailty among elderly individuals living alone<sup>26</sup>. The presence of a partner may result in greater economic stability, a source of support and improvement in health habits, while the absence of a partner can be a stressful factor, with the impairment of longevity, requiring changes and adaptations<sup>27</sup>. However, it is known that a large number of the elderly sometimes choose to live alone, and, in this condition, such individuals may be less frail.

In the present study, dependence in both basic and instrumental activities of daily living was associated with the presence of frailty in bivariate analysis, similar to the findings of a study<sup>28</sup> that used the TFI and evaluated individuals aged 75 years or older residing in Roosendaal, in the Netherlands, and which identified strong associations between these variables. Inability or dependence in performing activities of daily living, both basic and instrumental, is often described as representative of the disability process in frailty studies<sup>25</sup>. The early detection of frailty is important in order to prevent the decline in functional capacity, indicating a certain bi-directionality between functional disability and frailty<sup>29</sup>.

A Brazilian study carried out in Belo Horizonte using a one-dimensional instrument found an association between disability in instrumental activities of daily life in increasing degrees of severity and the stages of frailty, as well as a greater chance of reduced accomplishment of advanced activities of daily living<sup>30</sup>. It is worth noting the lack of Brazilian studies to date that evaluated IADL and frailty with the TFI instrument.

Only IADL remained associated with frailty in the final model, most probably due to the collinearity between the ADL and the IADL instruments. Disability in instrumental activities occurs first, causing other activities, including basic, to no longer remain associated when both are included as explanatory variables in the multiple model.

In the present study, a positive association was found between the presence of symptoms of depression and frailty. A study that evaluated the

relationship between frailty, depression and quality of life in 100 hospitalized elderly heart failure patients in Wrocław, Poland, also identified this association<sup>29</sup>. A previously mentioned study, which used the same instruments for the classification of symptoms of depression, found a significantly higher proportion of such symptoms among frail elderly persons than among the non-frail<sup>25</sup>.

Other studies have also suggested this association, even when using different instruments to evaluate depressive symptoms and frailty. Research has found an association between depressive symptomatology and frailty, suggesting that these associations may be linked to the overlapping of coexisting characteristics in such health conditions, such as inactivity, weight loss, exhaustion and reduced levels of physical activity<sup>31</sup>.

The present study identified an association between nutritional risk and malnutrition and frailty. In studies which used different instruments for the evaluation of frailty and nutritional status, a three times greater prevalence of frailty was found among elderly patients with nutritional risk in a sample of 143 elderly persons in hospitals in Vienna, Austria, while there was a twelvefold increase in the prevalence of frailty among those with malnutrition<sup>32</sup>. It seems that the concomitance of these two health conditions are complicating factors for other outcomes. In a longitudinal study of 143 colorectal cancer patients in the Netherlands evaluated prior to chemotherapy using the multi-dimensional GFI (Groningen Frailty Indicator) for the classification of frailty and the Mini Nutritional Assessment found that malnutrition together with frailty was strongly associated with an increased risk of mortality in these patients<sup>33</sup>.

The presence of comorbidities was associated with frailty in the present study. A study to evaluate predictors of frailty in elderly people living in a community in the city of Roosendaal, Netherlands, which used the TFI instrument, found that the presence of comorbidities explained an additional 2.4% in frailty variance, concluding that the inclusion of the evaluation of comorbidities in data analysis is significant for the completeness of the explanatory model<sup>19</sup>. A Brazilian study evaluating the profile of

frail elderly people receiving treatment at a referral outpatient clinic in Campinas, São Paulo, found an association between frailty and referral for respiratory diseases, using a different instrument from our study to evaluate frailty. Aging brings greater morbidity and mortality as a cause or consequence of frailty. The elderly suffer a greater number of chronic diseases, especially cardiovascular diseases, systemic arterial hypertension, diabetes mellitus, pulmonary diseases, cancer and strokes, diseases described as the most closely associated with the worst possible health conditions of this population<sup>34</sup>.

Polypharmacy was associated with a greater prevalence of frailty only in bivariate analysis. It is known that there is a fine line between the risks and the benefits of the use of polypharmacy by the elderly, where the increased use of medications can adversely affect the quality of life of the elderly due to the greater occurrence of adverse effects and drug interactions. On the other hand, these same medicines help to prolong life<sup>35</sup>. Nor should we disregard the joint effect of the presence of comorbidities and polypharmacy, thus justifying the loss of significance of the latter in the final analysis.

The limitations of the study are its cross-sectional nature, which means there is no possibility of establishing a cause and effect relationship, as well as the fact that some instruments use subjective or self-reported information, which can lead to memory bias. Longitudinal investigations are necessary to allow inferences about the predictive indicators of frailty. However, the use of the prevalence ratio as a measure of effect in both the bivariate analysis and the multiple Poisson model allows a good fit of the measures of effect and prevents the overestimation of the measures of association.

Some of the positive aspects of the present study are the fact that it is one of the first to use the Tilburg Frailty Indicator (TFI) instrument in the elderly population living in the community in Brazil. The TFI has a suitable configuration for this purpose, both in relation to the current concept of frailty, and the sociocultural context of the Brazilian elderly<sup>11</sup>. Additionally, among the other multidimensional instruments that evaluate frailty, the TFI seems to be the most accurate and one of the most adequate

for the joint evaluation of the physical, psychological and social domains of the elderly<sup>4</sup>.

The identification of situations of frailty should be a priority in primary care in order to allow early interventions and the mitigation of harm through primary and secondary health prevention. It is therefore important to understand the factors associated with frailty in elderly groups in public health.

The results described the diversity of factors that are directly related to frailty, and that different aspects of both daily living and the physiological process of aging can influence the autonomy and quality of life of the elderly.

## CONCLUSION

There was a high prevalence of frailty among the elderly persons in this study. The main variables associated with frailty were being divorced, separated, widowed or single, exhibiting symptoms of depression, dependence in activities of daily living, being at nutritional risk and suffering from comorbidities.

Understanding the factors associated with frailty, bearing in mind its multifactorial nature, is essential for the elaboration and implementation of actions and strategies of prevention, rehabilitation and health promotion.

The Tilburg Frailty Indicator, by evaluating the physical, psychological and social domains, tends to detect elderly people with frailty in these dimensions, and as such is an important instrument to guide the planning of care in the basic health units. It is therefore recommended that this instrument is used in the identification and monitoring of frail elderly persons in Family Health Strategies in order to increase the benefits to the health of the elderly population.

Other longitudinal studies are also suggested, which should evaluate the association of frailty with other health conditions in elderly persons living in the community and make it possible to reduce the occurrence of adverse outcomes in this population.



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