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# Factors associated to the frailty phenotype components among hospitalized elderly patients

## *Fatores associados aos componentes do fenótipo de fragilidade entre idosos hospitalizados*

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**Abstract** – The aim of this study was to verify the factors associated with the frailty phenotype components among hospitalized elderly patients. This is a cross-sectional and analytical study with 255 elderly patients admitted to the Medical and Surgical Clinic units at a General Hospital of Uberaba-MG. The following instruments were used: Frailty phenotype according to Fried, Scales (Short Geriatric Depression, Katz and Lawton and Brody) and structured questionnaire with socioeconomic and health data. Descriptive, bivariate and logistic regression analyses were performed ($p < 0.05$). The frailty phenotype components with the highest percentages were slow gait speed (40.0%) and self-report of exhaustion and/or fatigue (38.8%). The following associated factors were identified: self-report of exhaustion and/or fatigue [depression indicative (OR: 3.12; CI: 1.69-5.75)]; decreased muscle strength [advanced age (OR:2.20; CI: 1.40-3.47); absence of partner (OR: 1.86, CI: 1.02-3.39); inability to perform basic (OR: 2.38; CI: 1.27-4.44) and instrumental (OR: 2.53; CI: 1.29-4.97) activities of the daily living]; slow gait speed [women (OR:2.13; CI:1.16-3.92), advanced age (OR:2.90; CI:1.82-4.61), inability to perform instrumental activities of the daily living (OR:2.08; CI:1.14-3.77); and low level of physical activity [advanced age (OR: 1.57; CI: 1.01-2.44)]. The frailty phenotype components were associated with socioeconomic and health variables. The identification of the factors associated to the frailty phenotype components demonstrates the relevance for the development of preventive strategies in order to postpone this condition as well as follow-up actions at this level of service.

**Key words**: Frail elderly; Health of the elderly; Health status; Hospitalization.

**Resumo** – *O estudo teve por objetivo verificar os fatores associados aos componentes do fenótipo de fragilidade entre idosos hospitalizados. Trata-se de estudo transversal e analítico, com 255 idosos internados nas unidades de Clínicas Médica e Cirúrgica em um Hospital de Clínicas de Uberaba-MG. Foram utilizados: Fenótipo de Fragilidade de Fried, escalas (Depressão Geriátrica Abreviada, Katz e Lawton e Brody) e questionário estruturado com dados socioeconômicos e de saúde. Procedeu-se às análises descritiva, bivariada e modelo de regressão logística ($p<0,05$). Os componentes do fenótipo de fragilidade com os maiores percentuais foram a lentidão na velocidade de marcha (40,0%) e o autorrelato de exaustão e/ou fadiga (38,8%). Consolidaram-se como fatores associados: autorrelato de exaustão e/ou fadiga [indicativo de depressão (OR:3,12; IC:1,69-5,75)]; diminuição da força muscular [maior faixa etária (OR:2,20; IC:1,40-3,47), ausência de companheiro(OR:1,86; IC:1,02-3,39), incapacidade para atividades básicas (OR:2,38; IC:1,27-4,44) e instrumentais (OR:2,53; IC:1,29-4,97) de vida diária]; lentidão na velocidade de marcha [sexo feminino (OR:2,13; IC:1,16-3,92), maior faixa etária (OR:2,90; IC:1,82-4,61), incapacidade para atividades instrumentais de vida diária (OR:2,08; IC:1,14-3,77) e baixo nível de atividade física [maior faixa etária (OR:1,57; IC:1,01-2,44)]. Os componentes do fenótipo de fragilidade foram associados às variáveis socioeconômicas e de saúde. A identificação dos fatores associados aos componentes do fenótipo de fragilidade remete a relevância para o desenvolvimento de estratégias preventivas visando postergar esta condição bem como ações de acompanhamento neste nível de serviço.*

**Palavras-chave**: *Hospitalização; Idoso fragilizado; Nível de saúde; Saúde do idoso.*

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## INTRODUCTION

The frailty syndrome in the elderly can be characterized by a biological basis[1] and defined as a medical syndrome with multiple causes and contributing factors, characterized by reduced strength, resistance and physiological functions that increase the vulnerability of an individual for the development of functional dependence and/or death[2].

From the operational point of view, data from the Cardiovascular Health Study (CHS), a frailty phenotype based on five objective and measurable components was developed and validated by Fried et al.[1]: weight loss, exhaustion, decreased muscle strength, slow gait speed and low level of physical activity[1], which were considered as the object of research in the present study.

This syndrome is related to adverse health effects, such as: mortality, functional disability, institutionalization, hospitalization and worsening of chronic diseases. This demonstrates the need for the identification of functional alterations and their early diagnosis[1].

A study carried out in São Paulo identified the following as factors associated with frailty components in the elderly: greater number of diseases, age advancement, low schooling level, sedentary lifestyle and depression[3].

A study with older hospitalized patients in India found that 33.2% of them were frail[4]; while these percentages were 46.5% in Passo Fundo – RS[5] and 95.2% in Ribeirão Preto – SP[6]. In investigations with this age group and living in the community of Belo Horizonte – MG[7] and in the United States[1], 8.7% and 6.9% presented the frailty condition, respectively. It is noteworthy that the prevalence of this syndrome among older hospitalized patients is high and therefore, there is a need to know the profile of patients in this environment, the factors associated with frailty and interdisciplinary care during hospitalization[5].

A longitudinal study carried out in hospitals in Canada and the United States identified an association between the decrease in gait speed and older women with short stature, diabetes mellitus, and dependence on at least one instrumental activity of the daily living (IADL)[8].

In Brazil, only one study mentioning the frailty phenotype components in the hospital environment has been identified, although their associated factors have not been investigated. The decrease in muscular strength had higher percentage of impairment among frail elderly patients, and statistical difference was found among frailty conditions and the five components[5].

Considering the scarcity of studies with frail elderly patients in the hospital environment and/or related to the frailty phenotype components, it is believed that the investigation of the health and clinical conditions associated with these aspects can provide support for the understanding and management of this syndrome at this level of service and provide the development of strategies to prevent, postpone or even control this condition[3]. Thus, the aim of the present study was to verify the factors associated to frailty phenotype components among hospitalized elderly patients.

## METHODOLOGICAL PROCEDURES

A cross-sectional, observational and analytical study carried out with elderly patients hospitalized at Medical Clinical (CM) and Clinical Surgery Units (CC) of the General Hospital - Federal University of Triângulo Mineiro (HC-UFTM), Uberaba, Minas Gerais, Brazil.

For the sample size calculation, frailty prevalence of 30.0% was considered, analyzing studies with hospitalized elderly patients (33.2%)[4] (27%)[9]. With 5% accuracy and 95% confidence interval, for a finite population of 1455 eligible older adults, a sample of 265 participants was reached. Considering sampling loss of 50%, the maximum number of interview attempts was 530. The recruitment process occurred by systematic random sampling, with range of k = 2.

Data collection took place between April 2013 and March 2014. Inclusion criteria were: to be 60 years old or over; both sexes and absence of cognitive decline. A total of 445 elderly subjects were included in the study, of whom losses and exclusions were: refusals (75), cognitive decline without companion (57), decline with PFEFFER equal to or greater than six (44) and other reasons (14). Therefore, 255 older adults participated in this study (97 belonging to CM and 158 to CC).

Data were preferably collected in a reserved space on the floor of CM and CC sectors of HC/UFTM. Before starting the interview, the Mini Mental State Examination (MMSE) was translated and validated in Brazil[10]. For the elderly who presented cognitive decline in the MMSE evaluation, the caregiver, called informant, was asked to participate. The PFEFFER questionnaire[11] was applied to the informant. For PFEFFER results below six points, the interview was performed with the elderly, and information was supplemented, if necessary, by the informant. When the final score was equal to or greater than six, the interview was terminated.

For the characterization of sociodemographic, economic and health data, a structured instrument was used. The regular use of medicines was identified through medical records. Individuals who were able to walk were submitted to anthropometric evaluation through the following measures: body mass, height and body mass index (BMI). For those unable to walk, estimated weight and height were calculated according to formulas recommended by Rabito et al.[12] for hospitalized patients. For this, brachial circumference, waist circumference, calf circumference and semi-span were measured[12].

Functional capacity was assessed using the Scale of Independence in Activities of the Daily Living (Katz Scale) adapted to the Brazilian reality for BADL[13]. IADL were evaluated by the Lawton and Brody Scale, adapted in Brazil[14]. Functional disability was considered when the patient presented one or more partial and/or total dependence for both BADL and IADL.

Depression indicative was measured using the Geriatric Depression Scale, validated in Brazil[15]. Depression indicative was considered when the elderly presented score above five points[15].

The five frailty phenotype components proposed by Fried et al.[1] were

evaluated by physical questions and/or tests. The impairment of the unintentional weight loss component occurred through loss greater than 4.5 kg in the last year or greater than 5% of body weight; reduction in muscle strength: verified by handgrip strength using JAMAR dynamometer model SAEHAN®, using three measurements (kilogram/force), considering the average value between these and the cutoff points proposed by Fried et al.[1].; self-report of exhaustion and/or fatigue: measured by two questions ("He felt that he had to make an effort to deal with his usual tasks"; "He was not able to do his things")[16]; slow gate speed: considered the gating time spent to cover a distance of 4.6 meters. Three measures were taken (in seconds) to obtain the mean value of these and verification of the compromise according to cutoff points proposed by Fried et al.[1]; and low level of physical activity: verified through questions related to physical activities performed in a usual week (vigorous, moderate and light intensity), with minimum duration of 10 continuous minutes[17]. Those who spent 150 weekly minutes or more of physical activity were considered as active, and those who spent from 0 to 149 minutes as inactive.

The study variables were: gender, age group in years, marital status, schooling in years of study, monthly individual income in minimum wages; number of morbidities; dependence on BADL and IADL; depression indicative, and the five frailty phenotype components.

A spreadsheet was built through the Microsoft Office 2010 Excel® software and data collected was typed in double entry to check for inconsistencies. The database was imported into the Statistical Package for Social Sciences (SPSS) version 17.0 software for analysis.

Categorical variables were analyzed by means of absolute and percentage frequencies and numerical variables by means of position (mean) and dispersion measures (standard deviation). In order to verify factors associated to frailty phenotype components, preliminary bivariate analysis was performed using simple logistic regression. Predictors were: gender, age, schooling (in years), income, number of morbidities, regular use of medications, functional disability in BADL and IADL and depression indicative. The variables of interest ($p < 0.10$) were included in the logistic regression model (enter method), considering 5% significance level ($p < 0.05$) and 95% confidence interval (CI).

The project was submitted to the Human Ethics Research Committee of UFTM and approved under protocol No. 2511. Study participants were approached in the HC-UFTM, and the Informed Consent Form was presented. The interview was initiated only after signing the Informed Consent Form.

## RESULTS

Among the 255 interviewees, mean age was 68.68 years (sd = ± 6.56), the majority were male (61.2%), aged 60├-70 years (61.6%), 1├-4 years of schooling (56.3%) and individual income of one minimum wage (56.5%).

The most prevalent frailty phenotype components were slow gait speed (40%) and self-report of exhaustion and / or fatigue (38.8%); followed by unintentional weight loss (33.3%), decreased muscle strength (32.5%) and low level of physical activity (26.3%).

In the preliminary bivariate analysis, the only component that did not present the established inclusion criterion (p <0.10) for the logistic regression model was unintentional weight loss. Thus, depression indicative was considered as a factor associated with self-report of exhaustion and / or fatigue component (p <0.001). Decreased muscle strength was associated with older age group (p = 0.001), absence of partners (p = 0.044), inability for BADL (p = 0.006) and IADL (p = 0.007). Slow gait speed component was associated with female gender (p = 0.015), older age group (p <0.001) and inability for IADL (p = 0.017); while low level of physical activity with older age group (p = 0.043), Tables 1 and 2.

**Table 1.** Final logistic regression model for socioeconomic and clinical predictors for self-report of exhaustion and / or fatigue and decreased muscle strength among hospitalized elderly patients. Uberaba-MG, 2014.

| Variables | Self-report of exhaustion and / or fatigue | | | Decreased muscle strength | | |
|---|---|---|---|---|---|---|
| | OR | 95% CI | p | OR | 95% CI | p |
| Gender | | | | | | |
| Male | 1.42 | 0.79-2.57 | 0.244 | - | - | - |
| Female | | 1 | | | 1 | |
| Age group | | | | | | |
| 60├69 | | 1 | | | 1 | |
| 70├79 | - | - | - | - | - | - |
| ≥80 | - | - | - | 2.20 | 1.40-3.47 | 0.001 |
| Marital status | | | | | | |
| Partner | | 1 | | | 1 | |
| No partner | - | - | - | 1.86 | 1.02-3.39 | 0.044 |
| Schooling | | | | | | |
| No schooling | - | - | - | 0.97 | 0.68-1.38 | 0.867 |
| 1├4 | - | - | - | - | - | - |
| 4├8 | - | - | - | - | - | - |
| ≥8 | | 1 | | | 1 | |
| Monthly individual income | | | | | | |
| 0 | - | - | - | 0.99 | 0.61-1.62 | 0.973 |
| ≤1 | - | - | - | - | - | - |
| 1├3 | - | - | - | - | - | - |
| >3 | | 1 | | | 1 | |
| Morbidities | | | | | | |
| 0 | | 1 | | | 1 | |
| 1├5 | - | - | - | - | - | - |
| ≥5 | 1.08 | 0.99-1.18 | 0.094 | - | - | - |
| Medications | | | | | | |
| 0 | | 1 | | | 1 | |
| 1├5 | - | - | - | - | - | - |
| ≥5 | - | - | - | - | - | - |
| Inability for BADL | | | | | | |
| Yes | 1.08 | 0.56-2.06 | 0.816 | 2.38 | 1.27-4.44 | 0.006 |
| No | | 1 | | | 1 | |

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| Variables | Self-report of exhaustion and / or fatigue | | | Decreased muscle strength | | |
|---|---|---|---|---|---|---|
| | OR | 95% CI | p | OR | 95% CI | p |
| Inability for IADL | | | | | | |
| Yes | - | - | - | 2.53 | 1.29-4.97 | 0.007 |
| No | | 1 | | | 1 | |
| Depression Indicative | | | | | | |
| Yes | 3.12 | 1.69-5.75 | <0.001 | - | - | - |
| No | ... | | | 1 | | |

Note. OR: Odds Ratio; CI: Confidence Interval; BADL: Basic activities of daily living; IADL: Instrumental activities of daily living; p <0.05; 1: Reference category.

**Table 2.** Final logistic regression model for socioeconomic and clinical predictors for slow gait speed and low level of physical activity among hospitalized elderly patients. Uberaba-MG, 2014.

| Variables | Slow gait speed | | | Low level of physical activity | | |
|---|---|---|---|---|---|---|
| | OR | 95% CI | p | OR | 95% CI | p |
| Gender | | | | | | |
| Male | | 1 | | | 1 | |
| Female | 2.13 | 1.16-3.92 | 0.015 | - | - | - |
| Age group | | | | | | |
| 60├69 | | 1 | | | 1 | |
| 70├79 | - | - | - | - | - | - |
| ≥80 | 2.90 | 1.82-4.61 | <0.001 | 1.57 | 1.01-2.44 | 0.043 |
| Marital status | | | | | | |
| Partner | | 1 | | | 1 | |
| No partner | - | - | - | - | - | - |
| Schooling | | | | | | |
| No schooling | - | - | - | - | - | - |
| 1├4 | - | - | - | - | - | - |
| 4├8 | - | - | - | - | - | - |
| ≥8 | | 1 | | | 1 | |
| Monthly individual income | | | | | | |
| 0 | 1.36 | 0.85-2.18 | 0.195 | 0.96 | 0.59-1.56 | 0.870 |
| ≤1 | - | - | - | - | - | - |
| 1├3 | - | - | - | - | - | - |
| >3 | | 1 | | | 1 | |
| Morbidities | | | | | | |
| 0 | | 1 | | | 1 | |
| 1├5 | - | - | - | - | - | - |
| ≥5 | - | - | - | - | - | - |
| Medications | | | | | | |
| 0 | | 1 | | | 1 | |
| 1├5 | - | - | - | - | - | - |
| ≥5 | 1.61 | 0.94-2.76 | 0.080 | - | - | - |
| Inability for BADL | | | | | | |
| Yes | - | - | - | 1.70 | 0.91-3.18 | 0.097 |
| No | | 1 | | | 1 | |
| Inability for IADL | | | | | | |
| Yes | 2.08 | 1.14-3.77 | 0.017 | 1.47 | 0.77-2.78 | 0.243 |
| No | | 1 | | | 1 | |
| Depression Indicative | | | | | | |
| Yes | 1.38 | 0.73-2.59 | 0.319 | 1.51 | 0.80-2.84 | 0.201 |
| No | | 1 | | | 1 | |

Note. OR: Odds Ratio; CI: Confidence Interval; BADL: Basic activities of daily living; IADL: Instrumental activities of daily living; p <0.05; 1: Reference category.

## DISCUSSION

Slow gait speed and self-report of exhaustion and/or fatigue were the frailty phenotype components with the highest percentages. There was an association between these components and the following variables: self-report of exhaustion and/or fatigue and depression indicative; decreased muscle strength and older age group, absence of partner, incapacity for BADL and IADL; gait speed and female gender, older age group and inability for IADL; low level of physical activity and older age group.

Diverging data regarding the prevalence of frailty phenotype components were identified in research with hospitalized elderly patients in Passo Fundo, RS, with the highest percentage being between frail and pre-frail, with low level of physical activity (77.8%) and decreased strength muscle (44.3%)[5]. Similar results were obtained in a study carried out in India, with decreased muscle strength (93.2%) and slow gait speed (39.6%), with the highest percentages[4].

Regarding factors associated to the frailty phenotype components, it was observed that the self-report of exhaustion and/or fatigue is considered a frailty indicator and is related to adverse health outcomes in the elderly[18]. According to a study carried out in São Paulo with older adults in the community, depression indicative was associated with the exhaustion and/or fatigue component[3], consistent with this research. The commitment of this component may be related to the presence of underlying diseases, which is consistent with its high percentage in the hospital setting.

Psychosocial factors, such as depression indicative, may be related to fatigue[18]. It is emphasized that the questions that evaluate this phenotype[16] are directed towards usual tasks. On the other hand, depression indicative can be related to the decrease of the general state and physical fitness[19], influencing fatigue/exhaustion. Therefore, these data should be evaluated with caution, considering the bidirectional relationship among these variables. The negative consequences of this associated variable on physical and social aspects and health costs denote the importance of the development of interventions[20] and early screening strategies at the time of hospitalization in order to avoid the involvement of this component.

With regard to decreased muscle strength, it is noteworthy that studies pointed to an association between this component and age[3,21]; and functional disability[21], although coming from subjects residents in the community. A survey on hospitalized elderly patients showed that the ability to go shopping was the only IADL with strong and negative association with decreased muscle strength. In relation to the other activities, an inverse relationship was observed in the present study, i.e., the higher the handgrip strength, the more independent in IADL ($r = 0.640$, $p = 0.025$)[22]. Low muscle strength has been related to reduced functional capacity among older adults[23] due to the need for the upper limbs to perform these activities[22], evidencing the need for actions aimed at improving this component.

Regarding the association of this component with the absence of

partner, a divergent result was obtained among community elderly participants of the SABE[3] study, in which marital status was not related to this component. In a cross-sectional survey with older adults from two Basic Health Units of Curitiba (PR), it was found that the majority of participants (30.6%) who presented impairment of this component were widowers[24]. The absence of partner can be a factor contributing for social and family isolation and reduction of the stimulus for self-care practices; as well as the development of attitudes of family members that compromise the independence and autonomy of these individuals[24].

The association between low level of physical activity component and older age group corroborates data from the study in São Paulo with older adults in the community[3] and is also identified in the international scope through a systematic review that verified a greater sedentary lifestyle among older people with more advanced age when compared with younger adults[25]. This may occur because with advancing age, some factors may impair the practice of physical activity. Longitudinal research conducted with adults in Germany identified significant association ($p = 0.002$) between advanced age group (80 years or more) and poor health status as the main barrier to physical activity[26].

The slow gait speed component and its association with older age, female gender, and IADL dependence are consistent with investigations conducted with hospitalized elderly patients[8] residents in the community[3]. A population-based survey conducted in Brazil with older adults identified association between this component and advanced age (OR = 3.56; $p < 0.001$); and difficulty in one or more IADL (OR = 2.74, $p < 0.001$)[27], corroborating the present study. Similarly, a retrospective study carried out in a city in Canada found association between gait speed and female gender ($p = 0.026$)[28]; while in Texas, with hospitalized elderly patients, this component was associated with age advancement ($p < 0.001$)[29].

Slow gait speed concomitant with aging is considered a universal biological phenomenon and reflects the functional integration of several systems. The hospitalization episode results in the development of some obstacles inherent in this environment, such as mobility limitation and, consequently, changes in gait, such as decreased speed[30]. Thus, since it is considered a clinical marker, an important instrument for measuring functional capacity[27] and being one of the five frailty phenotype components[1], its screening becomes essential among this age group, especially during hospitalization.

The study presents as limitations the cross-sectional design, not allowing establishing causal relationships among variables and the use of questionnaires that may underestimate or overestimate some information found.

## CONCLUSION

Slow speed gait and self-report of exhaustion and/or fatigue were the frailty phenotype components with the highest percentages. The frailty phenotype

components were associated with socioeconomic and health variables.

Therefore, it is essential to detect frailty phenotype components that present greater impairment, and to propose actions directed at associated variables aiming at delaying or minimizing the development of the frailty syndrome and its adverse health effects. From the detection of older adults presenting greater risk, evaluations and interventions can be directed to sociodemographic, psychosocial and physical aspects. In addition, it is important to consider that the hospitalization environment may contribute to the development or worsening of variables associated to these components, given the possible worsening of health status and hospitalization conditions.

## COMPLIANCE WITH ETHICAL STANDARDS


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### Ethical approval

Ethical approval was obtained from the local Human Research Ethics Committee – Federal University of Triangulo Mineiro and the protocol was written in accordance with standards set by the Declaration of Helsinki.

### Conflict of interest statement

The authors have no conflict of interests to declare.

### Author Contributions

Conceived and designed the experiments: LCS, MSP, FAD, GFM, DMST. Performed the experiments: MSP, FAD, GFM, DMST. Analyzed data: MSP, GFM. Contributed with reagents/materials/analysis tools: MSP, FAD, GFM. Wrote the paper: LCS, MSP, FAD, GFM, DMST.

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