# Worsening frailty in community-dwelling older people with hypertension and associated factors

Marianne Silva Soares[1]
Gabriela Alves de Brito[2]
Isamara Corrêa Guimarães Horta[2]
Isabella Ribeiro Gomes[3]
Jair Almeida Carneiro[4]
Fernanda Marques da Costa[4]

## Abstract

*Objective:* To estimate the prevalence and factors associated with the worsening of frailty in older people with arterial hypertension. Methods: Quantitative, longitudinal, prospective and analytical study. Carried out in community-dwelling hypertensive older people from Minas Gerais. Sampling was probabilistic, by clusters in two stages. Data collection took place at the older people's homes in two moments. Demographic, socioeconomic and clinical-assistance variables were analyzed. Frailty was measured by the Edmonton Frailty Scale. Poisson regression with robust variance was used to obtain crude and adjusted prevalence ratios. Results: 281 older people participated in the study, 23.1% showed a worsening of their state of frailty. The prevalence of frailty increased from 38.0% in the base year to 31.2% in the first wave. The worsening of frailty was associated with negative self-perception of health, polypharmacy and hospitalization in the last 12 months. *Conclusion*: There was a transition between states of frailty. An important contingent of the older people showed worsening frailty.

**Keywords:** Frailty. Aged. Hypertension. Primary Health Care. Health of the Elderly.

[1] Universidade Estadual de Montes Claros, Programa de Pós-graduação em Cuidado Primário à Saúde. Montes Claros, MG, Brasil.

[2] Universidade Estadual de Montes Claros, Centro de Ciências Biológicas e da Saúde (CCBS). Montes Claros, MG, Brasil.

[3] Centro Universitário FIPMoc/Afya (UNIFIPMoc/Afya), Programa Afycionados por Ciência. Montes Claros, MG, Brasil.

[4] Universidade Estadual de Montes Claros, Programa de Pós-Graduação em Cuidado Primário em Saúde da Unimontes, Centro Universitário FIPMoc/Afya (UNIFIPMoc/Afya). Programa Afycionados por Ciência. Montes Claros, MG, Brasil.

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Correspondence
Marianne Silva Soares
melrysnane@yahoo.com.br

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## INTRODUCTION

The Brazilian population is changing its age profile with a clear tendency towards aging[1]. Life expectancies identified with projections close to one hundred years for developing countries are seen in the middle of this century. However, the changes are not unidirectional. The history of humanity was surprised by the COVID-19 pandemic, which resulted in early deaths, impacting on life expectancy and the expansion of the population, especially in older people, giving strength to the uncertainties related to health, financial conditions and autonomy for the future older population[2]. Given this scenario, the great challenge is to promote quality in these additional years of life. Among other aspects, the scarcity of social and health resources for this growing demand stands out[3].

Aging can naturally cause physical decline and a consequent decrease in the ability to perform daily activities[4]. In addition, as it has been widely demonstrated in the literature that aging is a risk factor for the emergence of chronic noncommunicable diseases (NCDs) and also the frailty syndrome, higher rates of chronic conditions and frailty are expected among older people[3,5,6].

The main CNCD among older Brazilians is systemic arterial hypertension (SAH). It is in the aging process that vascular changes are produced that lead to peculiarities in the diagnosis and treatment of SAH in older people, in addition to partly explaining the significant increase in this condition in people over 60 years of age[7]. Data in Brazil regarding SAH in the population tend to vary according to the methods used. In adults, the prevalence is around 32.3%, predominantly in males, and there is an increase with age, reaching up to 71.7% for individuals over 70 years of age[8]. This justifies carrying out studies with the older population, considering this CNCD to be so prevalent, especially considering studies that analyze the behavior of frailty among older people with SAH.

In addition to a greater risk of developing SAH, the older population also has an important probability of developing frailty, defined as a complex and multifactorial syndrome and characterized by reduced adaptive capacity, causing a maladjustment to the stressors to which they are exposed. Therefore, it promotes cumulative declines in several physiological systems, increasing their vulnerability with an unfavorable clinical outcome[9,10]. The presence of frailty in older people is strongly associated with a poor prognosis in the medium term, usually co-occurring with chronic coronary syndromes and increased mortality[11].

As SAH is present in more than half of the older population, it has also been documented that the frailty syndrome, to some degree, is present in most older people[12]. It is possible that older people with SAH have a greater tendency to worsen frailty due to the cyclical accumulation of deleterious health effects determined by the two conditions. Therefore, it is important to investigate the transition to worse levels of frailty over time in older hypertensive individuals. Knowledge of the behavior of worsening levels of frailty among older people with SAH and its associated factors may contribute to the elucidation of appropriate conducts in the clinical management of these cases. It can also guide the development of care protocols for hypertensive older people with progressive frailty.

In addition, there are few studies that assess the worsening of frailty in older people, which address the factors associated with the worsening of frailty in older people in general, in view of the difficulty of carrying out longitudinal population-based studies[12,13]. The present study is relevant and proposes innovation by longitudinally assessing the worsening of frailty, as a dependent variable, in an older and hypertensive population, and its associated factors. Therefore, the objective of this study is to estimate the prevalence and factors associated with the worsening of frailty in older people with arterial hypertension.

## METHODS

This is a study with a prospective and analytical longitudinal design, population-based and household-based, with a quantitative approach, part of a larger study on the health conditions of the older population in the municipality of Montes Claros (MG), Brazil, original project entitled " Frailty in older people: a longitudinal study".

In the construction of this study, EQUATOR guidelines were used, through the instrument *Strengthening the Reporting of Observational Studies in Epidemiology* (STROBE). Developed in a medium-sized municipality, with a population of approximately 417,478 thousand inhabitants, located in Minas Gerais, Brazil. The period of data collection occurred in two stages. The first was carried out from May to July 2013, being the baseline. After an average period of 42 months, the second stage, or first wave of the study, took place from November 2016 to February 2017, with the community-dwelling older people public in the urban area.

The population sample for the base year was calculated considering a population residing in the urban area estimated at 30,790 older people, according to data from the Brazilian Institute of Geography and Statistics (IBGE). For the sample calculation, a conservative prevalence of 50% was adopted for unknown outcomes, a 5% margin of error and a 95% confidence level.

Sampling was probabilistic, in clusters and occurred in two stages. In the first stage, the census sector was the sampling unit, in which the neighborhoods, streets and blocks were demarcated on a map of the urban census area of the city. Then, 42 census sectors were randomly selected among the 362 urban sectors of the municipality. The selection of the 42 sectors was based on the estimated population average of each sector. In the second stage, the number of households with individuals aged 60 years or older, according to population density, was identified. The sectors with the highest number of older individuals had more households allocated. Considering cluster sampling, the identified number was multiplied by a correction factor (*deff*) of 1.5 with an increase of 15% for possible losses, totaling 685 individuals in the study.

This research is part of a larger study of the health conditions of the older population in the city[10]. The following inclusion criteria were adopted for the larger study: being older, that is, aged 60 years or older; living in the selected household; being able to respond, with no change in level of consciousness; or otherwise, having a caregiver/relative to answer for them. For the present study, in addition to the aforementioned criteria, only older patients with SAH with a diagnosis confirmed by a physician were included. This professional, who performs the clinical-laboratory investigation, confirms high blood pressure (BP), identifies causes of hypertension, target organ damage, associated diseases and also stratifies cardiovascular risk[7].

Individuals who changed address, who died or who were not found in at least three visits on different days and times, notified in advance, were considered losses.

For data collection, the interviewers were trained and calibrated (Kappa 0.8). Their route was predefined from a starting point in the census tracts that should be covered. The households were visited alternately in search of older people to carry out the interviews. In households with an older person, an invitation to participate was made, if not, the next household was selected, according to the criterion of alternate households. If more than one older person resided in the household, the oldest one was invited. So that no more than one older person was interviewed in each household.

The same previously used data collection instruments were used, all validated[10]. As a dependent variable: the transition to a worse state of the Edmonton Frail Scale (EFS) component. This scale has nine domains, distributed in eleven items with scores from zero to seventeen. The score varies between zero and four, indicating that there is no presence of frailty; five and six, for apparently vulnerable older person; seven and eight, indicating mild frailty; nine and ten, moderate frailty; and eleven or more, severe frailty[14].

The classification of each older person was compared in two moments of the study (first wave and baseline). The results of the dependent variable were dichotomized into two levels: worsening and non-worsening of the EFS score.

To generate the dependent variable, the frailty scores were analyzed considering the general score by the EFS. That is, the difference between the scores of the second moment in relation to the first moment of the evaluation was analyzed. From the analysis of this difference, variations in the stages

of frailty were observed between the two moments. When evaluating the score of each older person, it was found that there was a worsening, maintenance and even improvement of the score. Then, the reclassification of the older people was performed for the present analysis. According to the EFS validation study, there is no guidance on variations that could be considered within normality between the two periods, so there was no such weighting. Thus, it was considered as frailty worsening those older people who showed an increase in the general frailty score and that, when applying the proposed classification for the EFS, placed the older person in a worse frailty stage than their previous one.

The independent variables selected for the study were categorized: gender (male or female); age group (up to 79 years old or ≥80 years old); marital status (with a partner, including married and stable union, or without a partner, including single, widowed and divorced); family arrangement (lives alone or lives with other people); schooling (up to four years of study or more than four years of study); literacy (can read or cannot read); religious practice (yes or no); own income (yes or no); monthly family income (up to one minimum wage or more than one minimum wage); presence or absence of chronic diseases referred to - diabetes mellitus, heart disease, neoplasia, arthritis, rheumatism, arthrosis, osteoporosis, embolism, pulmonary effusion, cerebrovascular accident (CVA), pulmonary emphysema, chronic obstructive pulmonary disease (COPD), asthma, allergic bronchitis; polypharmacy, defined as the use of five or more medications (yes or no); self-perception of health (positive or negative); self-reported weight loss (yes or no); presence of caregiver (yes or no); fall in the last 12 months (yes or no); medical consultation in the last 12 months (yes or no); and hospitalization in the last 12 months (yes or no).

For the variable self-perception of health, it was evaluated through the question: "*How would you classify your health status?*", whose possible answers were "very good", "good", "regular", "poor" " or "very poor". For analysis purposes, the responses "very good" and "good" were defined as positive perceptions of health, while the responses "regular", "poor" and "very poor" were classified as negative perceptions of health, following similar studies on the topic[15,16].

Descriptive analyzes were performed. Then, bivariate to identify factors associated with the response variable. The magnitude of the associations was estimated from the prevalence ratios (PR). Bivariate analyzes were performed using *Pearson's* chi-square test. Those that were associated up to a level of 20% ($p \leq 0.20$) were selected for multiple association analyzes between the exposure variables and the outcome variable using multiple Poisson regression, with robust variance. Poisson regression, with robust variance, was used to calculate the adjusted PRs, jointly considering the independent variables that were most strongly associated with the worsening of the EFS component in the bivariate analysis, were considered up to the significance level of 20% ($p<0.20$). For the final model, a significance level of 0.05 ($p<0.05$) was considered.

To choose the most adjusted final model, the *Deviance goodness-of-fit* and *Pearson goodness-of-fit* tests were used, values and changes in the *Log Likelihood* were also analyzed. The analysis of the residues was performed using the adjusted R2. Multicollinearity was evaluated and, through it, variables correlated with each other were identified, which were removed for a better fit of the final model.

The study was conducted in accordance with national and international ethics guidelines and approved by the Research Ethics Committee of the State University of Montes Claros – UNIMONTES (Opinion: 1,626,395). Free and Informed Consent was obtained from all individuals involved in the study in writing.

## RESULTS

In this study, 685 individuals were selected for the first assessment (baseline). Of the total of 685 older people evaluated in the base year, (92) refused to participate in the second phase of the study, (78) changed address, (67) could not be found at home after three attempts and (54) died. Therefore, 394 older people participated in this stage of the study and of these 281 were hypertensive, forming the sample of this study.

Table 1 shows the comparison of the characteristics of the base year between the older

population followed up and the older population considered as a loss during the follow-up of this study. It verified that the loss was non-differential since no significant differences were found for the main characteristics of the groups.

A prevalence of frailty was identified at 38.0% in the base year (first assessment), while in the first wave of the survey (second assessment) there was a reduction in the percentage to 31.2%. As for the transition between the stages of frailty assessed by the EFS, it was identified that among the hypertensive older people (281) a percentage of 23.1% individuals presented a worsening of frailty, however, 36.7% of the older people improved and 40.2% had no change in their state of frailty (Table 2).

Table 3 shows the bivariate analysis between the transition to worse stages of the EFS components and demographic, social and economic variables. None of these variables was significantly associated with worsening frailty in hypertensive older people.



**Table 1.** Comparison of the main characteristics between followed-up and lost older people in the first follow-up wave of the study. Montes Claros, MG, 2013-2017.

| Variables | Followed-up | Follow-up losses | *p*-value |
|---|---|---|---|
| | n (%) | n (%) | |
| Sex | | | 0.163 |
| Male | 130(33.0) | 111(38.1) | |
| Female | 264(67.0) | 180(61.9) | |
| Age group (years) | | | 0.089 |
| < 80 | 341(86.5) | 238(81.8) | |
| ≥ 80 | 53(13.5) | 53(18.2) | |
| Schooling | | | 0.964 |
| ≤ 4 years | 300(76.1) | 222(76.3) | |
| > 4 years | 94(23.9) | 69(23.7) | |
| Monthly family income | | | 0.158 |
| ≤ 1 minimum wage | 121(30.7) | 75(25.8) | |
| > 1 minimum wage | 273(69.3) | 216(74.2) | |
| Arterial hypertension | | | 0.937 |
| Yes | 280(71.1) | 206(70.8) | |
| No | 114(28.9) | 85(29.2) | |
| Diabetes *Mellitus* | | | 0.137 |
| Yes | 80(20.3) | 73(25.1) | |
| No | 314(79.7) | 218(74.9) | |
| Depressive symptoms | | | 0.870 |
| Yes | 116(29.4) | 84(28.9) | |
| No | 278(70.6) | 207(71.1) | |
| Polypharmacy | | | 0.229 |
| Yes | 86(21.8) | 75(25.8) | |
| No | 308(78.2) | 216(74.2) | |
| Frailty | | | 0.209 |
| Frail | 132(33.5) | 111(38.1) | |
| Non frail | 262(66.5) | 180(61.9) | |

**Table 2.** Transition between levels of frailty, according to the *Edmonton Frail Scale* (EFS), from baseline to the first wave of the study. Montes Claros, MG, 2013-2017.

| Baseline | | First wave | | | | |
|---|---|---|---|---|---|---|
| Frailty levels (EFS) | | Without Frailty | Apparently Vulnerable | Mild Frailty | Moderate Frailty | Severe Frailty |
| | n (%) | n(%)* | n(%)* | n(%)* | n(%)* | n(%)* |
| Without Frailty | 109(38.8) | 71(65.1) | 27(24.8) | 9(8.30 | 2(1.8) | 0(0.0) |
| Apparently Vulnerable | 65(23.1) | 30(46.2) | 20(30.8) | 11(16.8) | 4(6.2) | 0(0.0) |
| Mild Frailty | 56(20.0) | 16(28.6) | 16(28.6) | 16(28.6) | 8(14.2) | 0(0.0) |
| Moderate Frailty | 31(11.0) | 1(3.2) | 7(22.6) | 14(45.2) | 5(16.1) | 4(12.9) |
| Severe Frailty | 20(7.1) | 1(5.0) | 4(20.0) | 7(35.0) | 7(35.0) | 1(5.0) |
| Total | 281(100) | 119(42.3) | 74(26.3) | 57(20.3) | 26(9.3) | 5(1.6) |

* The percentages refer to the proportion of each frailty level in relation to the baseline; in green, the older people who improved frailty; in blue those who maintained the situation of frailty and in yellow those who worsened frailty, that is, 36.7% of the older people improved their condition and 40.2% worsened.

**Table 3.** Sociodemographic characterization and association between transition to worse levels of frailty in hypertensive older people, followed-up in the first wave (bivariate analysis). Montes Claros, MG, 2017.

| Independent Variables | Sample | Transition to worse frailty levels | | | | |
|---|---|---|---|---|---|---|
| | | Yes | No | | | |
| | n (%) | n (%) | n (%) | PR | 95%CI | *p*-value |
| Sex | | | | 1.041 | 0.969 - 1.118 | 0.182 |
| Male | 85(30.2) | 24(28.2) | 61(71.8) | | | |
| Female | 196(69.8) | 41(20.9) | 155(79.1) | | | |
| Age group | | | | 1.050 | 0.970- 1.136 | 0.367 |
| <79 years | 213(75.8) | 52(24.4) | 161(75.6) | | | |
| ≥ 80 years | 68(24.2) | 13(19.1) | 55(80.9) | | | |
| Marital status | | | | 1.020 | 0.956 - 1.087 | 0.726 |
| With partner | 133(47.3) | 32(24.1) | 101(75.9) | | | |
| Without partner | 148(52.7) | 33(22.3) | 115(77.7) | | | |
| Family arrangement | | | | 1.021 | 0.936 - 1.115 | 0.479 |
| Lives alone | 40(14.2) | 11(27.5) | 29(72.5) | | | |
| Doesn't live alone | 241(85.8) | 54(22.4) | 187(77.6) | | | |
| Schooling | | | | 1.042 | 0.969 - 1.121 | 0.762 |
| ≤ 4 years | 221(78.6) | 52(23.5) | 169(76.5) | | | |
| > 4 years | 60(21.4) | 13(21.7) | 47(78.3) | | | |
| Knows how to read | | | | 1.045 | 0.969 - 1.127 | 0.911 |
| Yes | 206(73.3) | 48(23.3) | 158(76.7) | | | |
| No | 75(26.7) | 17(22.7) | 58(77.3) | | | |
| Religious practice | | | | 1.061 | 0.875 - 1.286 | 0.198 |
| Yes | 271(73.3) | 61(22.5) | 210(77.5) | | | |
| No | 10(26.7) | 4(40.0) | 6(60.0) | | | |

to be continued

Continuation of Table 3

| Independent Variables | Sample | Transition to worse frailty levels | | | | |
|---|---|---|---|---|---|---|
| | | Yes | No | | | |
| | n (%) | n (%) | n (%) | PR | 95%CI | *p*-value |
| Own income | | | | 1.032 | 0.939 - 1.135 | 0.939 |
| Yes | 250(89.0) | 58 | 192(76.8) | | | |
| No | 31(11.0) | 7 | 24(77.4) | | | |
| Monthly family income | | | | 1.004 | 0.934 - 1.079 | 0.315 |
| ≤ 1 minimum wage | 73(26.0) | 20 | 53(72.6) | | | |
| > 1 minimum wage | 208(74.0) | 45 | 163(78.4) | | | |

PR: Prevalence Ratio; CI: Confidence Interval.

Table 4 presents the bivariate analysis regarding the worsening of frailty and morbidity variables and use of health services. It was found that polypharmacy, self-rated health, weight loss and hospitalization in the last 12 months were associated with the transition to worse levels of frailty ($p<0.20$).

After the multiple analysis, the variables in which significant associations were observed in relation to the worsening of frailty ($p\leq0.05$) according to the EFS were identified: polypharmacy, negative self-perception of health and also hospitalization in the last 12 months (Table 5).

**Table 4.** Characterization of morbidities and use of health services among community-dwelling older people; and association between transition to worse levels of frailty in hypertensive older people, followed-up in the first wave (bivariate analysis). Montes Claros, MG, 2017.

| Independent Variables | | Transition to worse frailty levels | | | | |
|---|---|---|---|---|---|---|
| | | Yes | No | | | |
| | n (%) | n (%) | n (%) | PR | 95%CI | *p*-value |
| Diabetes Mellitus | | | | 1.015 | 0.944 - 1.092 | 0.488 |
| Yes | 77(27.4) | 20(26.0) | 57(74.0) | | | |
| No | 204(72.6) | 45(22.1) | 159(77.9) | | | |
| Heart disease | | | | 1.018 | 0.950 - 1.090 | 0.604 |
| Yes | 92(32.7) | 23(25.0) | 69(75.0) | | | |
| No | 189(67.3) | 42(22.2) | 147(77.8) | | | |
| Malignant Tumor/Cancer | | | | 1.060 | 0.943 - 1.192 | 0.096 |
| Yes | 28(10.0) | 10(35.7) | 18(64.3) | | | |
| No | 253(90.0) | 55(21.7) | 198(78.3) | | | |
| Arthritis/Rheumatism/Arthrosis | | | | 0.974 | 0.914 - 1.038 | 0.459 |
| Yes | 141(50.2) | 30(21.3) | 111(78.7) | | | |
| No | 140(49.8) | 35(25.0) | 105(75.0) | | | |
| Osteoporosis | | | | 1.015 | 0.950 - 1.084 | 0.725 |
| Yes | 109(38.8) | 24(22.0) | 85(78.0) | | | |
| No | 172(61.2) | 41(23.8) | 131(76.2) | | | |

to be continued

Continuation of Table 4

| Independent Variables | | Transition to worse frailty levels | | | | |
|---|---|---|---|---|---|---|
| | | Yes | No | | | |
| | n (%) | n (%) | n (%) | PR | 95%CI | *p*-value |
| Pulmonary Embolism/Effusion | | | | 1.135 | 0.937 - 1.374 | 0 .875 |
| Yes | 12(4.3) | 3(25.0) | 9(75.0) | | | |
| No | 269(95.7) | 62(23.0) | 207(77.0) | | | |
| CVA/ Stroke | | | | 1.126 | 0986 - 1.286 | 0.110 |
| Yes | 25(8.9) | 9(36.0) | 16(64.0) | | | |
| No | 256(91.1) | 56(21.9) | 200(78.1) | | | |
| Emphysema/COPD | | | | 0.966 | 0.862 - 1.081 | 0.371 |
| Yes | 20(7.1) | 3(15.0) | 17(85.0) | | | |
| No | 261(92.9) | 62(23.8) | 199(76.2) | | | |
| Asthma/Allergic Bronchitis | | | | 1.070 | 0.937 - 1.223 | 0.963 |
| Yes | 22(7.8) | 5(22.7) | 17(77.3) | | | |
| No | 259(92.2) | 60(23.2) | 199(76.8) | | | |
| Polypharmacy | | | | 1.095 | 1.020 - 1.177 | **0.003** |
| Yes | 96(34.2) | 32(33.3) | 64(66.7) | | | |
| No | 185(65.8) | 33(17.8) | 152(82.2) | | | |
| Self-perception of health | | | | 1.068 | 1.004 - 1.137 | **0.012** |
| Positive | 120(42.7) | 19(15.8) | 101(84.2) | | | |
| Negative | 161(57.3) | 46(28.6) | 115(71.4) | | | |
| Weight loss | | | | 1.153 | 1.040 - 1.279 | **0.002** |
| Yes | 44(15.7) | 18(40.9) | 26(59.1) | | | |
| No | 237(84.3) | 47(19.8) | 190(80.2) | | | |
| Has a caregiver | | | | 1.032 | 0.931 - 1.145 | 0.708 |
| Yes | 34(12.1) | 7(20.6) | 27(79.4) | | | |
| No | 247(87.9) | 58(23.5) | 189(76.5) | | | |
| Fall in the last 12 months | | | | 1.041 | 0.972 - 1.115 | **0.051** |
| Yes | 97(34.5) | 29(29.9) | 68(70.1) | | | |
| No | 184(65.5) | 36(19.6) | 148(80.4) | | | |
| Medical consultation in the last 12 months | | | | 1.004 | 0.888 - 1.135 | 0.148 |
| Yes | 261(92.9) | 63(24.1) | 198(75.9) | | | |
| No | 20(7.1) | 2(10.0) | 18(90.0) | | | |
| Hospitalization in the last 12 months | | | | 1.185 | 1.057 - 1.329 | <0.001 |
| Yes | 37(13.2) | 9(51.4) | 8(48.6) | | | |
| No | 244(86.8) | 6(18.9) | 98(81.1) | | | |

PR: Prevalence Ratio; CI: Confidence Interval.

**Table 5.** Factors associated with worsening frailty in older hypertensive patients (multiple analysis). Montes Claros, MG, 2013-2017.

| Independent variables | PR | 95%CI | *p*-value |
|---|---|---|---|
| Polypharmacy | | | |
| No | 1 | | |
| Yes | 1.099 | 1.011 - 1.194 | 0.026 |
| Self-perception of health | | | |
| Positive | 1 | | |
| Negative | 1.093 | 1.014 - 1.179 | 0.021 |
| Hospitalization in the last 12 months | | | |
| No | 1 | | |
| Yes | 1.254 | 1.119 - 1.407 | <0.001 |

PR: Prevalence Ratio; CI: Confidence Interval.



## DISCUSSION

This work showed the transition between different levels of frailty in the older and hypertensive community-dwelling population over an average period of 42 months between baseline and the first wave of the study. This allowed us to identify that there are factors significantly associated with the transition to worse levels of frailty status among older people with SAH.

There was an important reduction in frailty between the two assessment moments. Almost half of the older people monitored did not show changes in the level of frailty. About one fifth showed worsening and the others showed improvement in these levels. In a study carried out in Ribeirão Preto-SP, with older people in general, the mean frailty and frail category increased during follow-up[13]. In Minas Gerais, there was a worsening of the frailty status of the older people, from 33.8 to 36.8% in 42 months of follow-up12. In Australian older people, it was observed that the prevalence of frailty increased from 65.3% to 67.6% in 10 years of follow-up[17]. A study in San Antônio, Texas, pointed out that pre-frail individuals were more likely to regress their stage in relation to frail ones, but showed that the higher the frailty stage, the higher the mortality[18]. In another longitudinal study, in Triângulo Mineiro, it also showed worsening in the health conditions of the older people, with women being more frail than men[19].

These results suggest that there is an important variation between frailty levels over time, which reinforces the dynamic nature of the frailty process[12,20]. It is noteworthy that all studies used in the comparison of results were performed among older people in general and not specifically with hypertensive older people as in the present investigation. Comparison with studies among hypertensive older people was not possible because no other study with this scope was found. This finding is important and endorses the innovation of this investigation.

Regarding the positive variation of frailty observed in the present investigation, in which 36.7% of the older people showed improvement in frailty levels, some considerations are in order. As 54 older people died and it is possible that they had the worst levels of frailty, perhaps this explains this supposed improvement. A spontaneous improvement in frailty is possible, a reversal of bad levels and even rehabilitation of the older person considered frail, in this case care interventions are necessary[21]. Another positive action that can help improve levels of frailty is health education. Such actions are able to promote the empowerment of the older person and encourage adherence to a healthier lifestyle that would be enough to promote health in general. However, these interventions were not investigated in this study and, therefore, may serve as hypotheses for future investigations.

In this study, it was identified that 23.1% of the older people showed worsening frailty. An important fact is that the individuals in the present study are hypertensive, that is, they have a condition that facilitates the worsening of their stage; since frailty can be intensified by the presence of chronic diseases that provide loss of resistance to stressors[22].

The results of this study showed that older people who had high medication consumption, polypharmacy, negative self-perception of health and who had been hospitalized in the last 12 months showed a worsening of frailty. Polypharmacy refers to the daily consumption of five or more medications and is common in the older population. It may be associated with the presence of multiple chronic diseases[23]. In this study, polypharmacy was associated with worsening frailty. Consistent with other studies that identified the same result, but with an older population not specifically hypertensive[3,10,12,24-27]. Polypharmacy can be a predictor of worsening frailty[18]. Older people who have many morbidities and, consequently, who use many medications may be more likely to become frail[22], as consuming many different medications daily can harm their health and thus impact their autonomy.

Frailty and polypharmacy are associated, complex and modifiable conditions. Situations that deserve attention due to the risk of abusive and inappropriate use of medication[3]. It can expose the older person to vulnerability to stressful events, making it difficult for the body to return to homeostasis, which predisposes to a worsening of frailty[12]. Few studies address the use of medication and its risks in the older population of primary care[28]. Therefore, the present study makes an important contribution by demonstrating that hypertensive older people who use many medications have a tendency to worsen frailty over time. Such information can be used in the planning of actions aimed at the rational use of medicines associated with a holistic view of the older person, during home visits carried out by professionals from the Family Health Strategy, identifying situations in the environment in which they live in order to avoid indiscriminate prescription based on clinical symptoms.

Another factor associated with worsening frailty in hypertensive older people was negative self-perception of health. Self-perceived health is considered an important indicator to measure health conditions[3,10,12]. It serves as a basis for improving care conditions and access to health services[29]. Its assessment also showed a significant association with frailty in the non-hypertensive older population in others[3,10,12,24,26,30]. By considering physical, cognitive and emotional factors associated with well-being and satisfaction with life itself, this measure has the ability to robustly and consistently predict the worsening of frailty in older people[31].

One way to act on this indicator in order to mitigate its negative impact would be the creation of therapeutic workshops, educational groups, carrying out qualified listening with the multidisciplinary team. In addition to encouraging religious coping, which is the use of faith/religiosity in difficult times[32]. There is a beneficial impact on older people undergoing treatment for diseases, especially in situations of vulnerability[33]. It is also positive in the perception of quality of life in complex situations of frail individuals under palliative care[32]. Such interventions positively influence self-perception of health and related indicators, such as access to and quality of health services. Practices that should be encouraged by the multidisciplinary team in care[34].

Hospitalization in the last 12 months was also associated with the transition to worse levels of frailty among hypertensive older people. This relationship has already been demonstrated in the literature with older people who are not specifically hypertensive[3,12,22,25,26,34]. It is known that more frail older people may need to be hospitalized more, due to conditions inherent to the state of frailty. In the case of hypertensive older people, the possibility of hospitalization may be greater due to the possibility of cardiovascular complications. In addition, the act of hospitalization can bring harm related to the reduction of movements, loss of autonomy to perform usual activities and greater difficulty in locomotion[35]. All these factors can contribute to the worsening of frailty in hypertensive older people. In a longitudinal study[34] carried out with older people assessing functional capacity before and after hospitalization, it was found that approximately 28% of the older people had worse function 30 days after discharge compared to 15 days before hospitalization. Among

frail older people, the worsening of functionality after hospitalization was even greater.

It is worth mentioning that the studies used in the discussion of this work were carried out with older people in general, showing the scarcity or lack of work on the subject of this study in a specific population "Worsening frailty in hypertensive older people", which shows its importance.

As limitations of this study, the absence of longitudinal studies that estimate the worsening of frailty in an older and hypertensive population stands out, which made it difficult to compare data and discuss ideas. Another limitation was the failure to assess transitions between levels of frailty that eventually occurred at intervals shorter than the follow-up time of this investigation. In addition, some studied variables were self-reported. However, even in the face of these limitations, this work has a random sample, with a significant number of community-dwelling older people. A validated instrument was used among Brazilian older people, standardized and with measurable and comparable methods. In addition, this is a study that shows what actually influences the worsening of frailty among hypertensive older people over time. Its potential for directing efforts that can improve the management of frailty in hypertensive older people is also highlighted.

## CONCLUSION

The results of this work showed the dynamic nature of the frailty syndrome, which can vary over time. The prevalence of frailty decreased in the first wave of the study compared to the base year. Even so, an important contingent of hypertensive older people showed a worsening of their frailty status. The factors associated with this worsening were: polypharmacy, negative self-perception of health and hospitalization in the last 12 months.



This study may contribute to the planning and implementation of care actions for the older population, aimed at identifying, preventing, and even reversing frailty. Actions aimed at improving the indicator of self-perception of health, in addition to care with excessive use of medication and specific care for older people who need hospitalization, may ease the transition to worse levels of frailty.

The multidisciplinary team needs to have knowledge about frailty so that they can adequately manage hypertensive older people with frailty syndrome. It is these professionals who identify vulnerable groups and prioritize health care, being able to intervene positively in certain conditions. This favors the implementation of actions for better outcomes related to frailty, an important topic that should be part of the clinical evaluation protocols used by nursing professionals in primary health care, in the context of geriatrics and gerontology. This work provides information to assist in the implementation of such protocols. Qualified and individualized actions aimed at the identification and early intervention in the frailty syndrome can prevent the transition to worse levels and positively influence the prognosis of the older people facing the frailty syndrome and chronic diseases.

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