Chronic pain in older adults and direct and indirect associations with sociodemographic and health-related characteristics: a path analysis

Graziella Ciola[1]
Marcela Fernandes Silva[1]
Monica Sanches Yassuda[1,2]
Anita Liberalesso Neri[1]
Flávia Silva Arbex Borim[1,3]

Abstract

Objective: Identify the prevalence of chronic pain in individuals older than 70 years of age and identify relations between chronic pain and both sociodemographic and health-related characteristics to determine the role of chronic pain as a mediator between these variables in relation to self-rated health. *Methods*: A cross-sectional study was conducted with 419 individuals aged 72 years and older, between the years of 2016 and 2017. The participants were from the follow-up of the FIBRA Study, which included non-institutionalized older adults living in urban areas of the cities of Campinas and Ermelino Matarazzo in the state of São Paulo, Brazil. The mediating variable was chronic pain, which was assessed by the self-report of the presence of pain in the previous six months. The independent variables were sociodemographic characteristics, health-related behaviors, multimorbidity, depressive symptoms, insomnia and self-rated health. Direct and indirect relations were tested using path analysis. *Results*: A total of 57.0% of the sample reported chronic pain. The female gender, a high body mass index (BMI), multimorbidity, insomnia, and depressive symptoms were directly associated with chronic pain. Chronic pain figured as a mediator variable in the associations between self-rated health and gender, BMI, multimorbidity, and symptoms of insomnia. *Conclusion*: Data demonstrate a complex network of interactions between chronic pain and both sociodemographic and health-related characteristics. Such knowledge can benefit the management and care of the older adults affected with chronic pain.

Keywords: Chronic Pain. Self-Assessment. Health of the Elderly.

[1] Universidade Estadual de Campinas (Unicamp), Faculdade de Ciências Médicas, Programa de Pós-Graduação em Gerontologia. Campinas, SP, Brasil.

[2] Universidade de São Paulo (USP), Escola de Artes, Ciências e Humanidades. São Paulo, SP, Brasil

[3] Universidade de Brasília, Departamento de Saúde Coletiva, Faculdade de Ciências da Saúde. Brasília, DF, Brasil

Funding: Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) - Nº do processo: 2972/2014; Fundação de Amparo à Pesquisa do Estado de São Paulob (FAPESP) - Nº do processo: 2016/00084-8; e Conselho Nacional de Pesquisa (CNPq) - Nº do processo 424789/2016-7. Bolsa de Mestrado da G. Ciola pela CAPES e Bolsa de Pós-doutorado de F.S.A. Borim pela FAPESP.

The authors declare there are no conflicts of interest in relation to the present study.

Correspondence
Graziella Ciola
graciola@gmail.com

Received: March 6, 2020
Approved: November 9, 2020

http://dx.doi.org/10.1590/1981-22562020023.200065

INTRODUCTION

Self-rated health (SRH) is a subjective assessment measure of a comparative, evaluative nature based on personal and social criteria that reveals the impact of disease on the wellbeing of an individual. Studies report that SRH as being poor or very poor is associated with a lower socioeconomic status, physical inactivity, multimorbidity, depressive symptoms, polypharmacy, and falls in older adults[1,2]. SRH is considered an important measure for determining the general health of a population and is a strong predictor of negative outcomes, such as functional disability and death[2-4].

Chronic pain is highly prevalent in the older population[3,4] and is a determinant of self-rated health[5-7]. The burden of chronic pain can lead to social isolation, difficulties regarding mobility, and a reduction in quality of life, which may explain the strong association with SRH[8,9]. A study comparing SRH in different age groups and its association with chronic pain found that the effect of pain diminished with the increase in age and that pain had a greater influence on SRH than age *per se*[10].

In Brazil, few studies have been published with the aim of understanding the role of chronic pain as a mediating variable in the relation between SRH and sociodemographic, psychosocial, and health-related characteristics. Observational studies on chronic pain among older people in Brazil all have a cross-sectional design and only offer data on direct associations. These studies report the prevalence of chronic pain to range from 29.3% to 73.3%, with a greater frequency in the female sex[11,12].

Chronic pain can influence psychological, physiological, and social aspects of affected individuals. Thus, knowledge on interactions between chronic pain and both sociodemographic and health-related factors as well as the effect of these interactions on SRH could facilitate our understanding of the need for a multimodal or interdisciplinary approach to the management of chronic pain and the understanding of the complex network of interactions among different variables throughout the course of life.

Therefore, the aim of the present study was to identify the prevalence of chronic pain among individuals older than 70 years of age as well as the direct and indirect associations between chronic pain and both sociodemographic and health-related factors. A further aim was to propose an explanation for the association between chronic pain and self-rated health, highlighting potential targets of interventions, such as modifiable health-related variables, to ensure better management of chronic pain and the maintenance of health among affected older adults.

METHODS

A cross-sectional study was conducted using data from the *Fragilidade em Idosos Brasileiros* (FIBRA [Frailty among Older Brazilians]) study, which is a multicenter longitudinal study. All data used in the present study were from the second wave of the FIBRA study, from which the variable of interest (chronic pain) was collected.

The first wave of the FIBRA study occurred in 2008 and 2009 and involved probabilistic samples of individuals 65 years of age or older (n = 3,478) residing in seven Brazilian cities selected by convenience due to the proximity to universities with research groups in the field of aging. The seven cities were Campinas (state of São Paulo), Ermelino Matarazzo (district in the city of São Paulo), Belém (state of Pará), Parnaíba (state of Piauí), Campina Grande (state of Paraíba), Poços de Caldas (state of Minas Gerais), and Ivoti (state of Rio Grande do Sul)[13]. The follow-up of the FIBRA study (second wave) was conducted in 2016 and 2017 and exclusively involved the participants in the city of Campinas and district of Ermelino Matarazzo (state of São Paulo).

In the first wave, these two locations contributed 1,284 individuals 65 years of age or older (68.7% women and mean age of 72.6±5.8 years). At follow-up, 549 were located and interviewed at home (69.9% women and mean age of 72.2±5.2 years), 192 had deceased (59.9% women and mean age of 75.5±6.8), and 543 were not located (70.5% women and mean age of 72.0±5.6). Among the 549 older people with

records in the databank of the second wave, 130 were excluded due to cognitive impairment and for not answering the self-reported measures (Figure 1).

The score on the Mini Mental State Examination was considered for the selection of participants based on the cognitive criteria using the cutoff points adjusted for years of schooling established in the validation study conducted by Brucki et al.[14] (17 points for illiterate individuals and those with no formal schooling, 22 points for those with one to four years of schooling, 24 points for those with five to eight years, and 26 points for those with nine or more years of schooling).

The variables of interest were chronic pain (based on the answer to the following question: *Have you had any constant pain or pain that comes and goes in the last six months?* [yes or no]) and self-rated health (based on the answer to the following question: *Would you say your health is generally very good, good, fair, poor, or very poor?*, for which the responses were dichotomized as positive SRH [very good/good] or negative SRH [fair/poor/very poor])[15].

The following were independent variables: a) sociodemographic – sex (male and female, self-declared), age (measured in years from the date of birth to the date of the interview), and years of schooling (self-reported); b) physical activity – weekly frequency and daily duration of physical exercise based on answers to items selected from the adapted version of the *Minnesota Leisure-time Physical Activity Questionnaire (*MLTPAQ)[13,16] considered for the classification of the participants as active or inactive based on the recommendations of the American College of Sports Medicine (active =150 minutes per week of moderate activity or 120 minutes per week of vigorous activity);[17] c) body mass index (BMI), calculated as body weight (kg) divided by height (m) squared (kg/m^2) and using the cutoff points recommended by the Pan American Health Association[18] (recorded as a continuous variable); d) morbidities – number of affirmative answers to nine dichotomous items investigating whether any physician had performed a diagnosis of heart disease, systemic arterial hypertension, stroke, diabetes *mellitus*, cancer, arthritis or rheumatism, depression, lung disease, and osteoporosis (responses categorized as none/one disease and two/more diseases; e) depressive symptoms – evaluated using the 15 dichotomous items of the Geriatric Depression Scale (GDS-15) with a cutoff point of ≥ 6 points for the screening of depressive symptoms[19]; f) symptoms of insomnia – evaluated using four self-report questions with a dichotomous answer (yes or no) taking the previous 12 months as reference: *Does it take you a long time to fall asleep?*, *Do you remain awake most of the night?, Do you wake up in the middle of the night and can't get back to sleep?*, *Do you sleep badly at night?* An affirmative answer to at least one of these questions indicated symptoms of insomnia[20].

Descriptive analyses were performed for the characterization of the sample with measures of absolute and relative frequency for categorical variables as well as mean, median, and standard deviation values for quantitative variables. Percentage distributions with respective 95% confidence intervals were calculated.

To study the relations between the variables of interest according to a previous theoretical model (Figure 2)[8], structural equation analysis was used via path analysis. This type of analysis serves as an extension of the regression model and is used to determine relations among a set of variables. This resource enables an analysis of direct or indirect relations between independent and dependent variables. Straight arrows indicate a direct or indirect association, whereas elliptic arrows indicate covariance. After the adjustment of the indicators and significance tests, the final path analysis model is created, which either sustains or eliminates relations from the previous theoretical model. For the present study, the tests and acceptance values were the chi-square goodness-of-fit test > 0.05, chi-square ratio (X^2/GL) <2, standardized root mean square residual (SRMR) ≤0.10, root mean square error of approximation (RMSEA) ≤0.08, comparative fit index (CFI) ≥0.90, and Tucker-Lewis index (TLI) ≥0.90.[21]

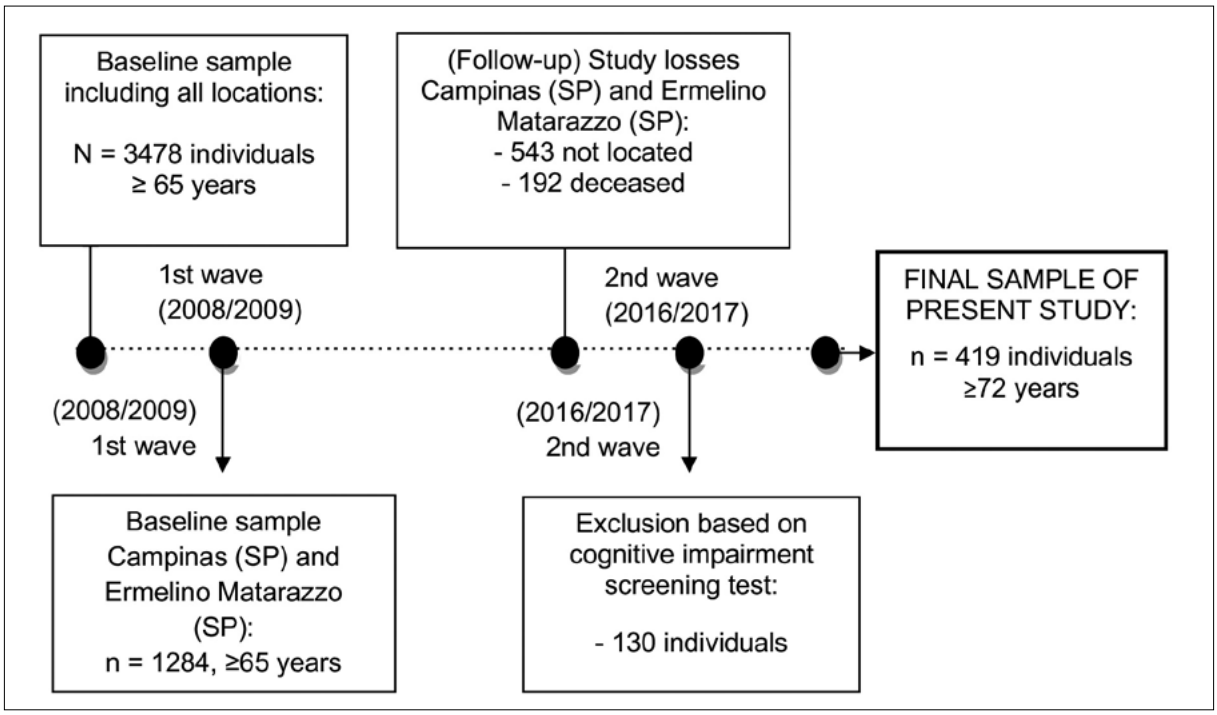

Figure 1. Flowchart of final sample of study based on sample of FIBRA study 2016/2017.

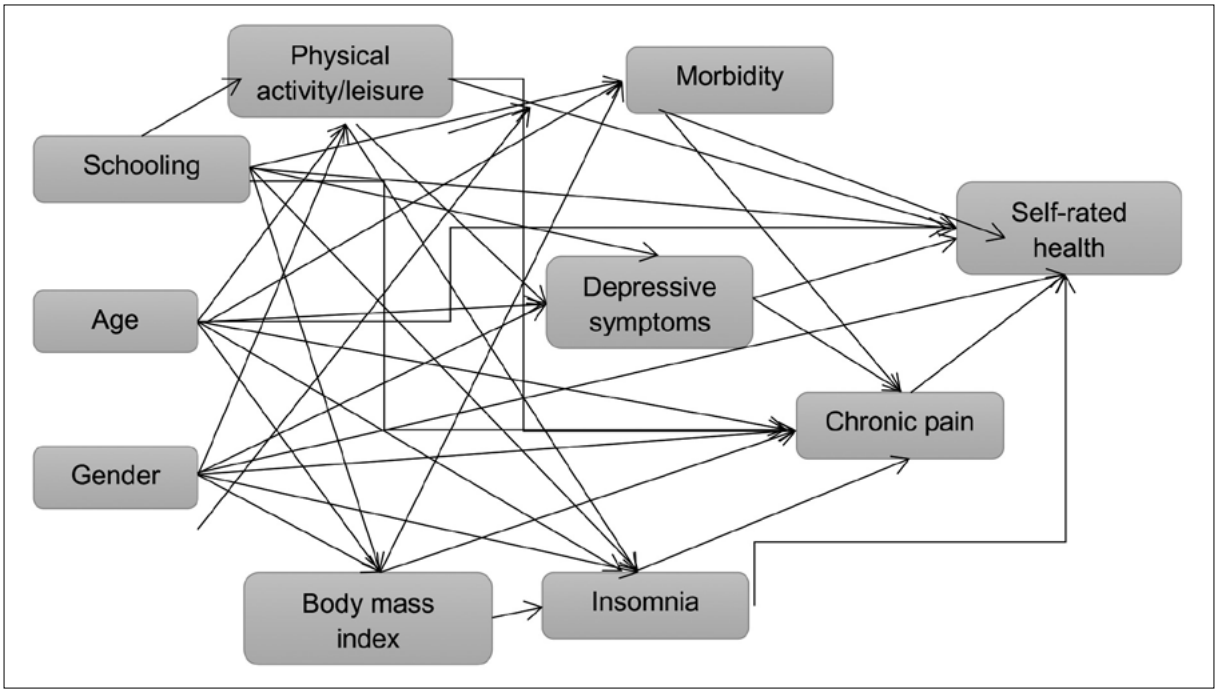

Figure 2. Hypothetical model of relations between chronic pain and sociodemographic variables and health conditions. São Paulo, Brazil, 2016/2017.

After the analysis of the goodness of fit of the data to the proposed paths, significance tests were performed for the path coefficients. Absolute values of t >1.96 indicate the path has a statistically significant coefficient[21].

All procedures were in accordance with the ethical precepts contained in the Declaration of Helsinki as well as the ethical norms stipulated by the Brazilian Board of Health governing research involving human subjects. The FIBRA study was approved under certificate numbers 1.332.651 and 2.847.829. Process 2016/00084-8 and *Conselho Nacional de Pesquisa* (CNPq [National Research Council]) process 424789/2016-7. The present study received approval from the Human Research Ethics Committee of the School of Medical Sciences of the State University of Campinas (certificate number: 3258919, April 11, 2019).

RESULTS

Four hundred nineteen older adults participated in the present study. Women accounted for 70.2% of the sample and the majority (60.9%) had between one and four years of schooling. Mean age was 80.3 ± 4.75 years and mean BMI was 21.27 ± 3.78 kg/m^2. A total of 74.5% of the participants were classified at inactive, 67.3% had two or more chronic diseases, 53.0% had symptoms of insomnia, and 18.8% had depressive symptoms. Regarding the variables of interest, 57.0% had chronic pain and 47.0% self-rated their health as fair/poor/very poor (Table 1).

After the third revision of the path analysis, acceptable values were obtained for all goodness-of-fit criteria (Table 2) and all path coefficients were significant (p<0.05). In the first revision, direct relations that did not present a significant difference in the estimate of the coefficients were excluded. In the second revision, covariances between depressive symptoms and multimorbidity as well as between depressive symptoms and insomnia were included. In the third and final revision, the bidirectional relation between chronic pain and depressive symptoms was included.

Figure 3 illustrates the results of the final path analysis. The following were the main findings for direct associations: the presence of chronic pain was associated with the female sex, a high BMI, multimorbidity, and symptoms of insomnia; negative SRH was associated with low schooling, depressive symptoms, and chronic pain. Depressive symptoms and chronic pain had a bidirectional association (Figure 3).

In the final path analysis model, chronic pain was an important mediating variable of the indirect associations between SRH and gender, BMI, multimorbidity, and symptoms of insomnia, whereas depressive symptoms constituted a mediating variable in the association between chronic pain and SRH (Figure 3).

The changes made to the final model following the prior theoretical model were the exclusion of the direct associations between age and physical activity, morbidity, insomnia, chronic pain, and SRH; between schooling and BMI, insomnia, morbidity, depressive symptoms, chronic pain, and SRH; between gender and physical activity, depressive symptoms, and BMI; between physical activity and insomnia, depressive symptoms, chronic pain, and SRH; between BMI and depressive symptoms and insomnia; between morbidity and SRH; and between insomnia and SRH.

Table 1. Characteristics of participants in study, São Paulo, Brazil, 2016/2017.

Variables	n (%)	95% CI	Mean (SD) Median
Age			
Mean (standard deviation)			80 (±4.75)
Median			80
Sex			
Male	139 (29.8)	25.8 - 34.1	
Female	327 (70.2)	65.8 – 74.1	
Schooling (years of study)			
≥ 9 or more	50 (11.3)	8.6 - 14.5	
5 to 8	66 (14.9)	11.8 – 18.5	
1 to 4	277 (60.9)	56.3 – 65.4	
Illiterate	57 (12.9)	10.0 – 16.3	
Physical activity			
Active	119 (25.5)	19.3 - 26.9	
Inactive	348 (74.5)	73.3 – 80.6	
Body mass index			
Mean (standard deviation)			21.27 (±3.78)
Median			21.01
First quartile			18.65
Third quartile			23.70
Chronic diseases			
0 to 1	131 (32.7)	28.2 - 37.4	
≥ 2	270 (67.3)	62.5 - 71.7	
Insomnia			
No	196 (47.0)	42.2 - 51.8	
Yes	221 (53.0)	48.1 – 57.7	
Depressive symptoms			
Absent	311 (81.2)	76.9 - 84.8	
Present	72 (18.8)	15.1 – 23.0	
Chronic pain			
No	180 (43.0)	38.2 - 47.7	
Yes	239 (57.0)	52.2 – 61.7	
Self-rated health			
Very good/good	222 (53.0)	48.1 - 57.7	
Fair/poor/very poor	197 (47.0)	42.2 – 51.8	

Table 2. Goodness-of-fit measures through path analysis. São Paulo, Brazil, 2016/2017.

Goodness-of-fit criteria	Initial model	After 1st revision	After 2nd revision	After 3rd revision
Chi-square goodness-of-fit test	<0.001	<0.001	<0.022	0.079
Chi-square ratio (?2/GL)	<0.001	<0.001	<0.001	<0.001
Tucker-Lewis index	0.818	0.675	0.818	0.902
Comparative fit index	0.827	0.775	0.888	0.928
Standardized root mean square residual	0.049	0.072	0.056	0.050
Root mean square error of approximation	0.158	0.070	0.052	0.042

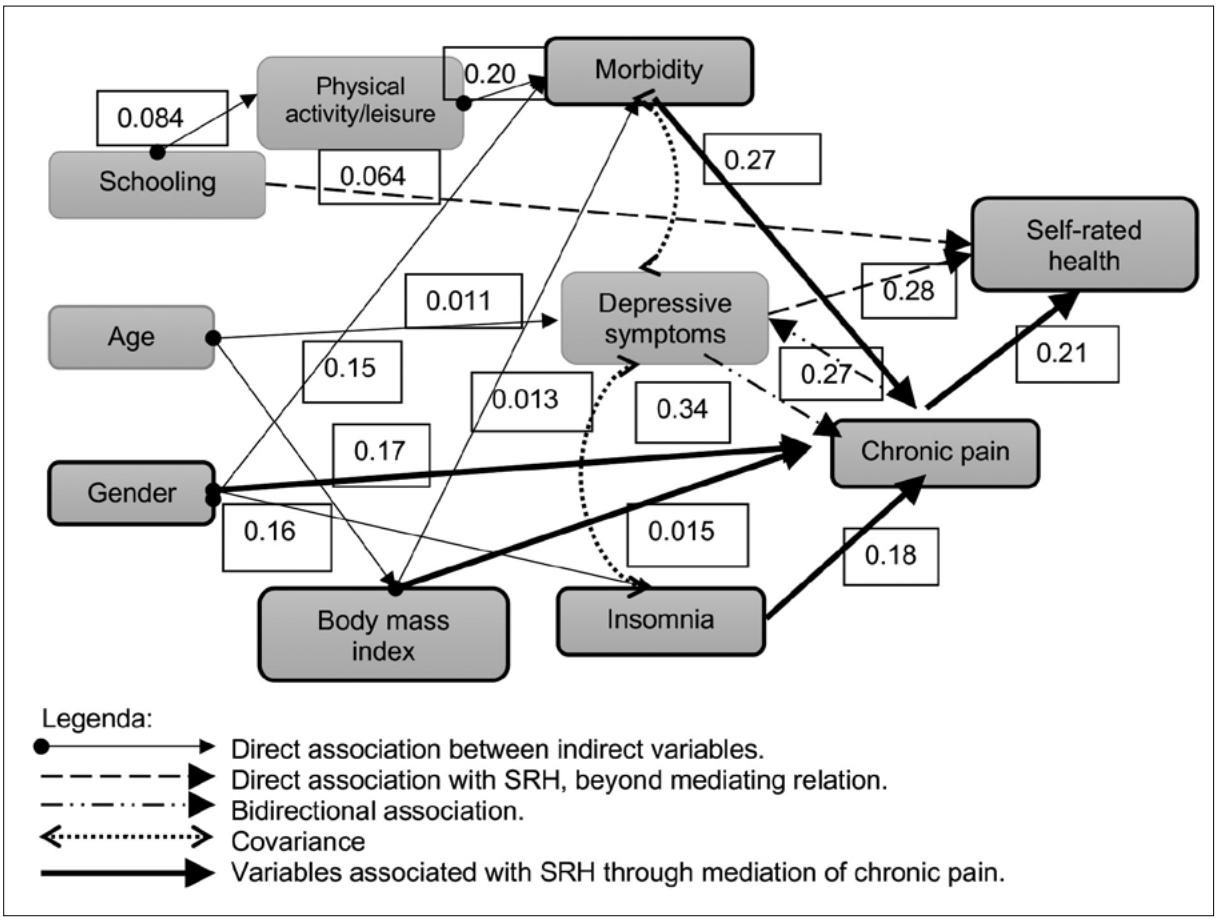

Figure 3. Final model of relations between chronic pain and sociodemographic variables and health conditions according to path analysis. São Paulo, Brazil, 2016/2017.

DISCUSSION

The main findings were that 57.0% of the sample reported having chronic pain, which was directly associated with sex, BMI, multimorbidity, symptoms of insomnia, and depressive symptoms. Chronic pain was also a mediating variable in the associations between SRH and sex, BMI, multimorbidity, and symptoms of insomnia.

Regarding the high prevalence of chronic pain (57.0%), a review study reported considerable variability in studies conducted in Brazil, ranging from 29.7% to 73.3%[11]. Among non-institutionalized older people, the prevalence ranged from 29.3% to 54.7%[22,23]. Van Hecke et al.[5] reported that, although age is not a causal factor of chronic pain, the advance in age is an important sociodemographic factor and is associated with the increase in prevalence. Larsson et al.[6] found that chronic pain was more prevalent among individuals 85 years of age or older compared to younger elderly individuals. In the present study, the prevalence of chronic pain was higher among women than men. According to previous studies, women have a greater likelihood of developing chronic pain over time[5,24,25].

BMI was directly associated with chronic pain and the latter was a mediating variable of the indirect association with SRH. Obesity can contribute to an increase in chronic pain in two ways: due to excessive load on the joints and due to the systemic proinflammatory state caused by excess weight. Moreover, pain contributes to sedentary behavior, leading to a greater likelihood of developing obesity[26]. The prevalence of pain is higher among obese individuals compared to those with a BMI in the ideal range[27]. After 12 months of follow-up, Larsson et al.[6] found that gender, BMI, and pain in more than one location were associated with the persistence of pain.

Besides being associated with chronic diseases, excess body fat can exert a negative impact on functional capacity, psychosocial aspects, and behavioral aspects and can indirectly affect SRH[1].

Multimorbidity was directly associated with chronic pain and the latter was also a mediating variable in the association between multimorbidity and SRH. In the study conducted by Xin Peng[28], individuals with more morbidities had greater pain intensity measured on a numerical pain rating scale and chronic pain was a mediating variable in the associations between multimorbidity and functional disability as well as between multimorbidity and impaired physical performance[28]. A possible explanation for the indirect association between multimorbidity and SRH is that multimorbidity is more associated with poorer SRH when mediated by modifiable symptoms, such as pain, pain intensity, depression, somatic complaints, and restrictions to physical activity, than to chronic disease *per se*.

In the present study, depressive symptoms were directly associated with chronic pain. In a review study involving predominantly retrospective studies, Velly and Mohit[24] found higher frequencies of depression and anxiety in patients with chronic pain, reporting a bidirectional association (greater severity of the psychological disorder related to greater pain severity). Santos et al.[25] also report that the perception of pain is worse in the presence of depression and anxiety. These findings are explained by the fact that both manifestations share the same brain activations and neurotransmitters[25].

Insomnia was directly associated with chronic pain and indirectly related to SRH. Sivertsen et al.[29] studied different measures of sleep disorders to identify the impact on pain and found an influence on tolerance to pain. Pain can alter the signaling of dopamine, which underpins the relation between sleep and waking. However, further studies are needed to explain how sleep disorders can alter the function and release of dopamine and affect pain[29]. Regarding the indirect association between insomnia and SRH, Jiménez-Trujillo et al.[9] state that insomnia exerts a negative impact on both the prognosis of chronic pain and SRH.

The present findings point to complex interactions between chronic pain and both sociodemographic and health-related variables, which suggests that there are numerous associated factors and the effects exert an influence on SRH. The review study by Chireh and D'Arcy[10] showed direct relations between chronic pain and depression, BMI, schooling, stress, and loneliness and the authors found that, in the absence of chronic pain, individuals older than 85 years of age have a greater likelihood of rating their health as good compared to adults (45-54 years), but this probability is inverted in the presence of pain (individuals older than 85 years of age report poorer SRH). The present study draws attention to the negative impact that chronic pain exerts on SRH and shows that a poor SRH prevails in the chain of events formed by other interactions.

As limitations of the present study, selection bias should be cited, since the sample was composed of privileged survivors because institutionalized or hospitalized older people were not included, which could represent a sample with a better health status. Although observational studies involving path analysis represent a configuration of possible causal relations by means of paths[21], the present study does not enable establishing causality between the variables. Thus, additional studies are needed for this type of understanding.

Further studies involving individuals 70 years of age or older are needed in Brazil, as such studies remain scarce and could offer signs, especially psychosocial signs, of resilience that differs from those found in younger cohorts[10,11]. Epidemiological investigations, such as cohort and intervention studies, should be conducted to understand the interactions of the causal chain of chronic pain and determine the results of interventions according to covariables, such as those cited in the present study. Moreover, pain intensity should be addressed in such studies to quantify the strength of the association according to the dose-response effect.

Chronic pain is a highly complex event affected by multiple factors that should be analyzed, especially as a mediator of negative outcomes, such as multimorbidity, functional disability, and negative SRH. This type of pain can lead to a cascade of

negative events in the older population due to the association with metabolic, psychosocial, and neurological changes as well as individual, contextual, and behavioral variables[30]. The strengths of the present study were the mean age of the sample (80.3 years), as few studies have been developed with this age group, which surpasses the life expectancy of the Brazilian population, and the study design both in terms of the analysis of the possible paths of chronic pain that lead to negative self-rated health as well as the age group and variables studied.

CONCLUSION

The results of the present study show the high prevalence of chronic pain in the sample (57%) as well as the network of interactions between chronic pain and both sociodemographic and health-related characteristics. The female sex, a high BMI, multimorbidity, symptoms of insomnia, and depressive symptoms were directly associated with chronic pain, which was a mediating variable of associations between self-rated health and gender, BMI, multimorbidity, and symptoms of insomnia. The understanding of the complex interactions between chronic pain and health status can benefit the management and care of older people affected by chronic pain. Chronic pain not only exerts a negative impact on self-rated health, it is an important mediating variable in the relation between self-rated health and health conditions.

Edited by: Maria Helena Rodrigues Galvão

REFERENCES

1. Borim FSA, Barros MBA, Neri AL. Autoavaliação da saúde em idosos: pesquisa de base populacional no Município de Campinas, São Paulo, Brasil. Cad Saúde Pública. 2012;28:769-80.
2. Borim FSA, Neri AL, Francisco PMSB, Barros MBA. Dimensions of self-rated health in older adults. Rev Saúde Pública. 2014;48:714-22.
3. Wu S, Wang R, Zhao Y, Ma X, Wu M, Yan X, et al. The relationship between self-rated health and objective health status: a population-based study. BMC Public Health. 2013;13(1):1-9.
4. Falconer J, Quesnel-Vallee A. Pathway from poor self-rated health to mortality: Explanatory power of disease diagnosis. Soc Sci Med. 2017;190:227-36.
5. van Hecke O, Torrance N, Smith BH. Chronic pain epidemiology and its clinical relevance. Br J Anaesth. 2013;111(1):13-8.
6. Larsson C, Hansson EE, Sundquist K, Jakobsson U. Chronic pain in older adults: prevalence, incidence, and risk factors. Scand J Rheumatol. 2017;46(4):317-25.
7. Nutzel A, Dahlhaus A, Fuchs A, Gensichen J, Konig HH, Riedel-Heller S, et al. Self-rated health in multimorbid older general practice patients: a cross-sectional study in Germany. BMC Fam Pract. 2014;15(1): 1-9.
8. Blyth FM, Noguchi N. Chronic musculoskeletal pain and its impact on older people. Best Pract Res Clin Rheumatol. 2017;31(2):160-8.
9. Jimenez-Trujillo I, Lopez-de-Andres A, Del Barrio JL, Hernandez-Barrera V, Valero-de-Bernabe M, Jimenez-Garcia R. Gender Differences in the Prevalence and Characteristics of Pain in Spain: Report from a Population-Based Study. Pain Med. 2019;20(12):2349-59.
10. Chireh B, D'Arcy C. Pain and self-rated health among middle-aged and older Canadians: an analysis of the Canadian community health survey-healthy aging. BMC Public Health. 2018;18(1):e1006.
11. Vasconcelos FH, de Araújo GC. Prevalence of chronic pain in Brazil: a descriptive study. BrJP. 2018;1(2):176-9.
12. de Carvalho RC, Maglioni CB, Machado GB, de Araújo JE, da Silva JRT, da Silva ML. Prevalence and characteristics of chronic pain in Brazil: a national internet-based survey study. BrJP. 2018;1(4):331-8.
13. Neri AL, Yassuda MS, Araujo LF, Eulalio MC, Cabral BE, Siqueira ME, et al. Methodology and social, demographic, cognitive, and frailty profiles of community-dwelling elderly from seven Brazilian cities: the FIBRA Study. Cad Saúde Pública. 2013;29(4):778-92.
14. Brucki SMD, Nitrini R, Caramelli P, Bertolucci PHF, Okamoto IH. Sugestões para o uso do mini-exame do estado mental no Brasil. Arq Neuropsiquiatr. 2003;61(3):777-81.
15. Medeiros SM, Silva LSR, Carneiro JA, Ramos GCF, Barbosa ATF, Caldeira AP. Factors associated with negative self-rated health among non-institutionalized elderly in Montes Claros, Brazil. Ciênc Saúde Colet. 2016;21(11):3377-86.

16. Lustosa LP, Pereira DS, Dias RC, Britto RR, Parentoni AN, Pereira LSM. Translation and cultural adaptation of the Minnesota Leisure Time Activities Questionnaire in community-dwelling older people. Geriatr Gerontol Aging. 2011;5(2):57-65.

17. Nelson ME, Rejeski WJ, Blair SN, Duncan PW, Judge JO, King AC, et al. Physical activity and public health in older adults: recommendation from the American College of Sports Medicine and the American Heart Association. Circulation. 2007;116(9):1094-105.

18. Pan-american Health Organization. Multicenter survey aging, health and wellbeing in Latin América and the Caribbean (SABE): preliminary report; 2001. Washington, DC: PAHO; 2001.

19. Almeida OP, Almeida SA. Reliability of the Brazilian version of the abbreviated form of Geriatric Depression Scale (GDS) short-form. Arq Neuropsiquiatr. 1999;57(2b):421-6.

20. Pan-american Health Organization . Multicenter survey aging, health and wellbeing in Latin América and the Caribbean (SABE): preliminary report; 2001. Washington, DC: PAHO; 2004. p.905-14.

21. Acock AC. Discovering Structural Equation Modeling: Using Stata. [New York]: Stata Press; 2013.

22. dos Santos FA, de Souza JB, Antes DL, d'Orsi E. Prevalence of chronic pain and its association with the sociodemographic situation and physical activity in leisure of elderly in Florianopolis, Santa Catarina: population-based study. Rev Bras Epidemiol. 2015;18(1):234-47.

23. Lini EV, Tomicki C, Giacomazzi RB, Dellani MP, Doring M, Portella MR. Prevalence of self-referred chronic pain and intercurrences in the health of the elderly. Rev Dor. 2016;17(4):279-82.

24. Velly AM, Mohit S. Epidemiology of pain and relation to psychiatric disorders. Prog Neuropsychopharmacol Biol Psychiatry. 2018;87(Pt B):159-67.

25. Santos KAdS, Cendoroglo MS, Santos FC. Anxiety disorder in elderly persons with chronic pain: frequency and associations. Rev Bras Geriatr Gerontol. 2017;20(1):91-8.

26. Arranz LI, Rafecas M, Alegre C. Effects of obesity on function and quality of life in chronic pain conditions. Curr Rheumatol Rep. 2014;16(1):1-9.

27. Li J, Chen J, Qin Q, Zhao D, Dong B, Ren Q, et al. Chronic pain and its association with obesity among older adults in China. Arch Gerontol Geriatr. 2018;76:12-8.

28. Peng X, Bao X, Xie Y, Zhang X, Huang J, Liu Y, et al. The mediating effect of pain on the association between multimorbidity and disability and impaired physical performance among community-dwelling older adults in southern China. Aging Clin Exp Res. 2019;32:1-8.

29. Sivertsen B, Lallukka T, Petrie KJ, Steingrimsdottir OA, Stubhaug A, Nielsen CS. Sleep and pain sensitivity in adults. Pain. 2015;156(8):1433-9.

30. Bonakdar RA. Integrative Pain Management. Med Clin North Am. 2017;101(5):987-1004.