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RESEARCH ARTICLE

Chronic pain can compromise sleep and quality of life in the older.

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ABSTRACT

Background: Age-related changes often disrupt sleep patterns, impacting overall health and quality of life, potentially leading to various health issues and societal challenges due to associated comorbidities and sleep deficiencies.
Aim: Test the association of chronic pain with the quality of sleep and health-related quality of life of older.
Methods: Clinical, anthropometric data, Pittsburgh Sleep Quality Index; Visual analogue scale; cognitive impairment; World Health Organization Quality of Life-OLD and functional mobility was verified. The means between the groups were compared using the Student's t test for independent samples, Spearman correlation coefficient (ρ) to test the associations and one-way analysis of variance to compare the means between the three age groups.
Results: Were involved 131 older, predominantly female (87%), average age 68 ± 7 years. There was a moderate (ρ = 0.590) and significant (p <0.01) positive correlation between Pittsburgh Sleep Quality Index scores and chronic pain intensity and a negative moderate (ρ = - 0.57) and significant (p <0.01) correlation between quality of life and chronic pain.
Conclusion: Older people with chronic pain have worse quality of sleep and worse quality of life when compared to older without chronic pain.

Keywords: Older, Sleep, Chronic Pain, Quality of Life, Functional Mobility

Introduction

Pain is a physical and emotional sign of bodily harm that largely interferes with a subject's behavior, while sleep, which is influenced by behavior, is something necessary to maintain homeostasis and optimize the functions of different physiological systems. Humans need sleep to survive, so chronic deficiencies in the systems that regulate sleep can negatively impact health and quality of life.[1,2] The aging process generates quantitative and qualitative interferences in sleep, causing a reduction in the ability to sleep well that may be associated with comorbidities and not only with age. These changes can cause several diseases and cause social and economic problems.[1-3]

Chronic pain and poor sleep quality are biopsychosocial changes that are often associated with human aging and have a two-way correlation, that is, pain impairs sleep quality and sleep deprivation increases pain.[1,4] These changes correspond to public health problems that have a significant functional and social impact on aging, increasing the morbidity and mortality of the older and negatively influencing their quality of life.[4,5]

Pain heightens cortical vigilance and can modify sleep patterns, alongside inducing discomfort, disheartenment, reliance on functionality, and disrupting everyday activities.[6] The link between inadequate sleep and persistent pain could pertain to alterations in the central nervous system's function, particularly within the thalamus. This area is intricately connected to both the perception of pain and the regulation of the sleep-wake cycle.[7-9]

Chronic pain prevails significantly among individuals aged 60 and above, with rates ranging from 51% to 67%.[9-10] It continues to be a primary concern for older individuals, often reported across medical facilities and outpatient settings.[11,12] Yet, numerous elderly individuals and their families perceive pain as an inherent aspect of aging. Consequently, they tend to overlook discussing this issue, aiming to reduce the necessity for procedures, medications, and potential treatment side effects.[12-14] Therefore, investigating the correlation between chronic pain and the quality of sleep as well as the health-related quality of life (HRQoL) among older individuals can provide valuable insights for healthcare services. This information can aid in planning care strategies focused on prevention, early diagnosis, and appropriate treatment. The current study aimed to validate the hypothesis suggesting an interconnection between chronic pain, sleep quality, and HRQoL among older adults within the community.

Materials and methods

Study design

This study is designed as a cross-sectional quantitative investigation to explore the correlation between chronic pain, quality of sleep, and HRQoL (Health-Related Quality of Life) among older individuals. It's part of a registered clinical trial (RBR-3cqzfy on ensaiosclinicos.gov.br) focusing on evaluating the impact of a home exercise program on sleep quality and HRQoL among older community members. The study's structure and execution followed the guidelines outlined by the Reporting of Observational Studies in Epidemiology (STROBE).

Data collection occurred between July and December 2021, following approval by the Ethics Committee at Escola Bahiana de Medicina e Saúde Pública – EBMSP (protocol number 39072514.6.0000.5544). As inclusion criteria, individuals from the local community, of both genders, over the age of 60, and who exhibited poor sleep quality according to the Pittsburgh Sleep Quality Index (PSQI), were involved in this study. Elderly individuals who exhibited any cognitive impairment identified through the Mini-Mental State Examination (MMSE) were excluded.[15]

Individual interviews were conducted to gather sociodemographic and anthropometric data, self-reported health conditions, presence of multimorbidity (≥ 2 chronic diseases), and a history of chronic pain. Functional mobility was assessed, and evaluation instruments employed included MMSE15, Visual Analogue Scale (VAS)[16], Pittsburgh Sleep Quality Index (PSQI)[17], WHOQoL-OLD[18], and the Timed Up and Go test (TUG).[19]

Instruments

The assessment instruments used in this study were employed in a prior study conducted by our group.[20] These instruments encompass anthropometric measurements, sleep quality assessment, chronic pain evaluation, quality of life assessment, cognitive impairment assessment, and functional mobility evaluation.

Statistical analysis

The data underwent various normality testing methods, including histogram analysis, mean and median evaluation, standard deviation calculation, skewness and kurtosis assessment, and confirmation through the Kolmogorov-Smirnov normality test. Prior to correlation analysis, checks for a linear relationship between variables and homoscedasticity were performed. Descriptive analysis involved absolute and percentage frequencies for categorical variables and measures of central tendency and dispersion for numerical ones. Differences between participants with and without a history of chronic pain were assessed using Student's t-test for numerical variables and Pearson's chi-square test for categorical variables.

Given that the variables didn't meet all parametric test criteria, Spearman's correlation coefficient (ρ) was used to analyze chronic pain intensity levels' association with global PSQI scores and WHOQOL-OLD global scores. These correlations were presented using Box Plots. The Spearman correlation coefficient was also used to analyze the correlation between the number of chronic diseases and sleep quality as well as quality of life.

To compare sleep quality, quality of life, and functional mobility among three age groups of older adults (60 to 69, 70 to 79, and ≥ 80) with chronic pain, One-Way ANOVA was employed.

To compare the means of each PSQI component and each facet of the Whoqol-Old among elderly individuals with and without chronic pain, Student's t-test for independent samples was used, and the magnitude of the difference between the groups was verified through the effect size calculated by Cohen's methodology (Cohen's d), which represents how much two means experienced in terms of standard deviations.18 Bootstrapping procedures (1000 re-samplings; 95% CI BCa) were performed to obtain greater reliability of the results, to correct deviations from normality of the sample distribution and differences between group sizes.[17]

The significance level was set at $\alpha \leq 0.05$ for decision criteria. All statistical analyses were conducted using the Statistical Package for the Social Sciences® (SPSS), version 21, on the Windows® platform.

Results

Initially, one hundred and ninety-one potential participants were recruited from the community. However, 28 refused to participate in the study and 32 did not meet the eligibility criteria, being evaluated 131 older people. It sounds like Figure 1 illustrates the participant flow throughout the study.

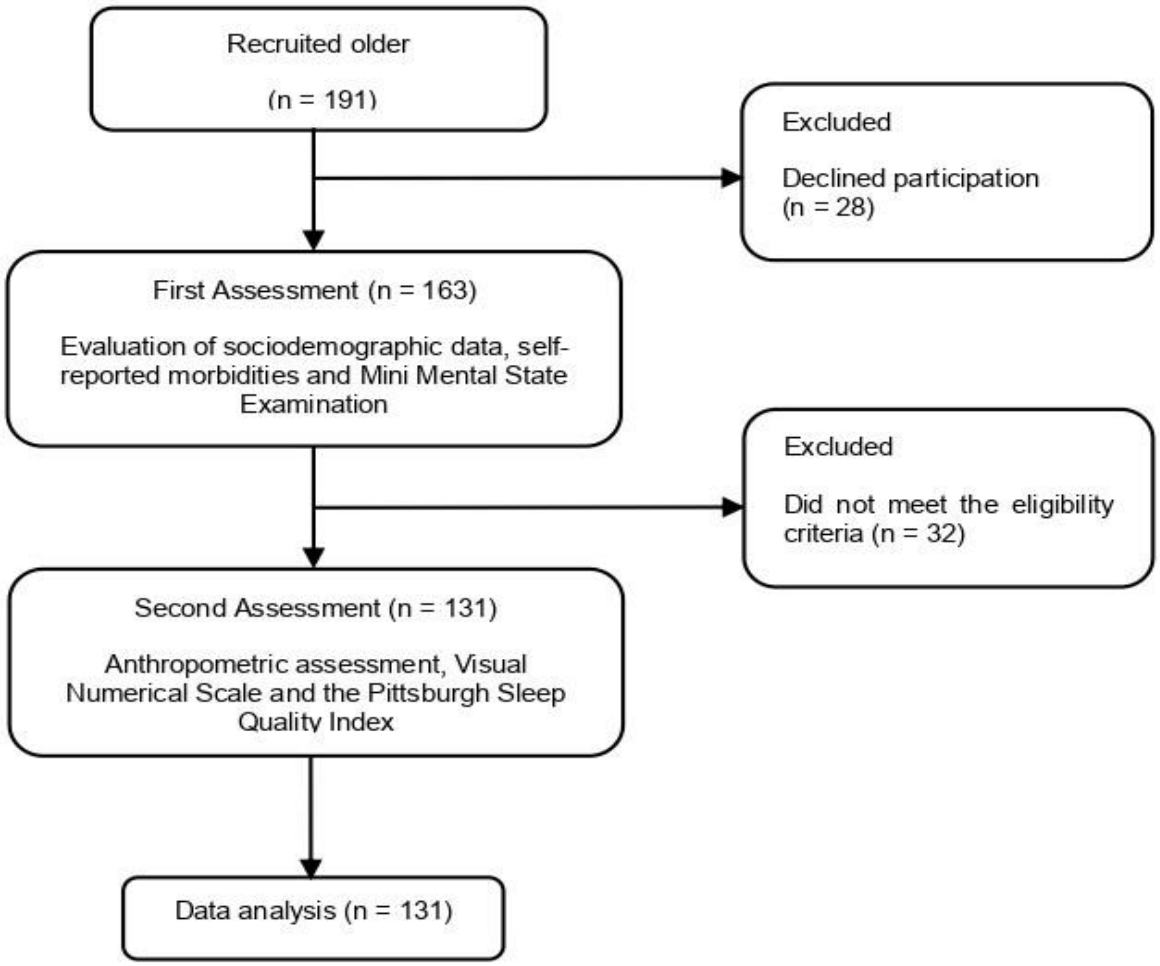

Figure 1 – Study flowchart

The sample is predominantly composed of women (87%), with an average age of 68 ± 7 years, with low education (86.3% with three or less years of study), low per capita income (84.8% ≤ 2 MW) and, mostly, living with family members (67.9%). Regarding the clinical characteristics, it turns out that 51 elderlies (39%) have chronic pain and, among these older with chronic pain, 12 (23.6%) reported mild pain, 31 (60.8%) reported moderate pain and 8 (15.6%) reported severe pain. Chronic diseases were identified in 70 elderly people (53.4%). The main ones observed were anxiety (58.8%), arthrosis (37.4%), systemic arterial hypertension (33.6%) and diabetes (26%). The prevalence of multimorbidity (≥ 2 morbidities) was 40.5%.

Table I displays a comparison of sociodemographic and clinical characteristics between two groups: those with and without a history of chronic disease. The analysis indicates a statistically significant difference solely in terms of chronic disease and the TUG test. Older individuals with a history of chronic pain tend to have a higher incidence of chronic diseases and exhibit lower functional mobility compared to those without a history of chronic pain.

Table 1 - Sociodemographic and clinical characteristics of the older.

Variables	History of chronic pain (n=54)	No history of chronic pain (n=80)	p
Gender female	45 (88.3%)	69 (86.3%)	ns
Age	70 ± 7	69.9 ± 7	ns
Education ≤ 3 years of study	45 (88.4%)	68 (85%)	ns
Per capita monthly income (≤ 2 MW)	44 (86.4%)	71 (88.8%)	ns
Household arrangement (lives with family members)	35 (64.9%)	54 (70.2%)	ns
BMI	27.2 ± 4.5	27.3 ± 4.1	ns
Chronic disease	40 (78.5%)	30 (37.5%)	< 0.01
TUG in seconds	9.0 ± 2.0	7.9 ± 1.9	< 0.01

ns, not significant; BMI, body mass index; TUG, Timed Up and Go test; MW, minimum wage at the time of the survey (in reais) = R$ 788.00. Results as presented mean (standard deviation) or N (%)

Figure 2 illustrates the correlation between the overall PSQI score, a measure of sleep quality, and the intensity of chronic pain measured via the visual analog scale. The data reveals a moderate ($\rho = 0.590$) and significant ($p < 0.01$) positive correlation between sleep quality and chronic pain intensity. This indicates that as the intensity of pain increases, there is a corresponding decline in sleep quality, as reflected by the increase in the PSQI score.

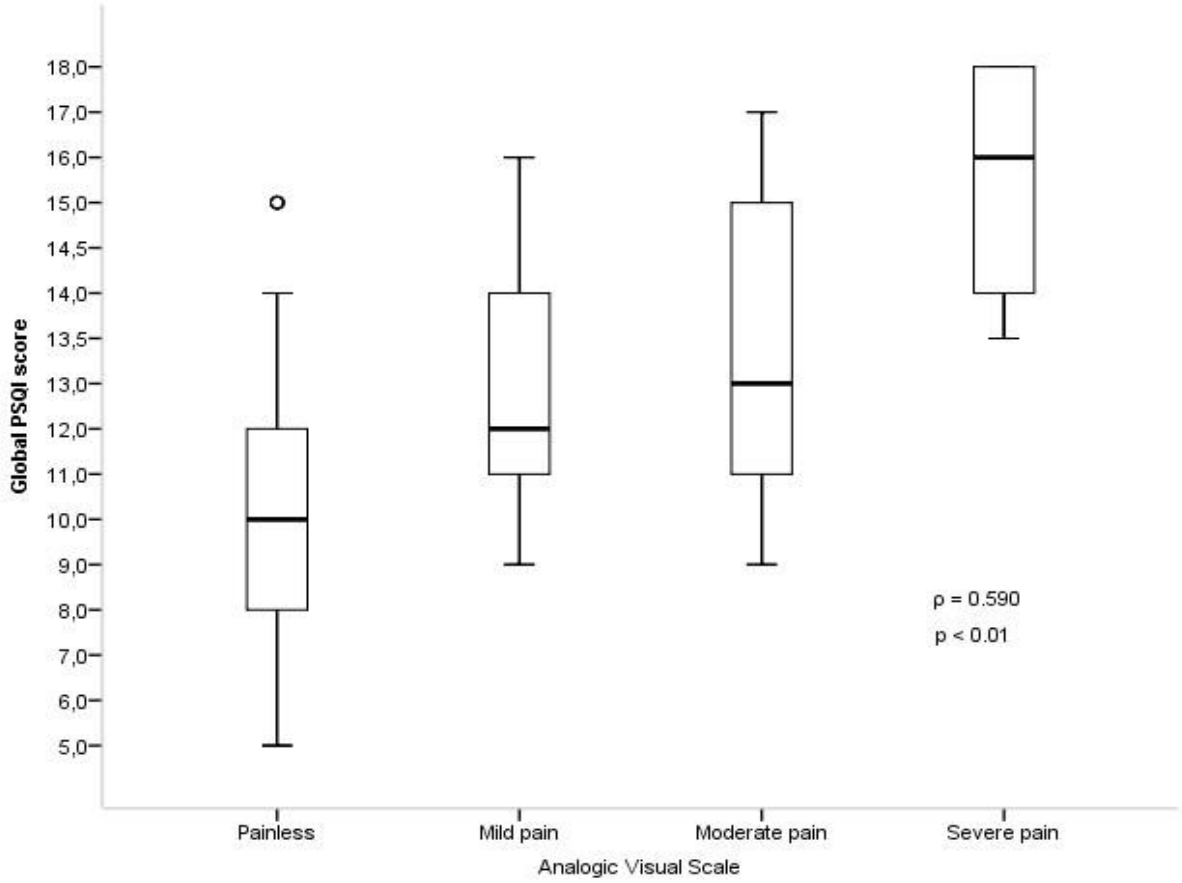

Figure 2 - Correlation of the global PSQI score with the intensity of chronic pain.

In the analysis of correlation between the number of self-reported chronic diseases and sleep quality, it was identified positive, moderate (ρ = 0.42) and statistically significant (p <0.01) correlation, whereas in the correlation of the number of chronic diseases with quality of life, it was identified a negative, strong (ρ = -0.78) and statistically significant (p <0.01) correlation. It demonstrates that the greater the number of chronic diseases, the worse the quality of sleep and the quality of life of the older.

The correlation between quality of life, using the WHOQOL-OLD global score, and pain intensity, using the visual analog scale, is shown in Figure 3, showing a moderate negative correlation (ρ = - 0.57) and statistically significant difference (p <0.01) between quality of life and intensity of chronic pain. And the increase in pain intensity is associated with a reduction in the WHOQOL-OLD score.

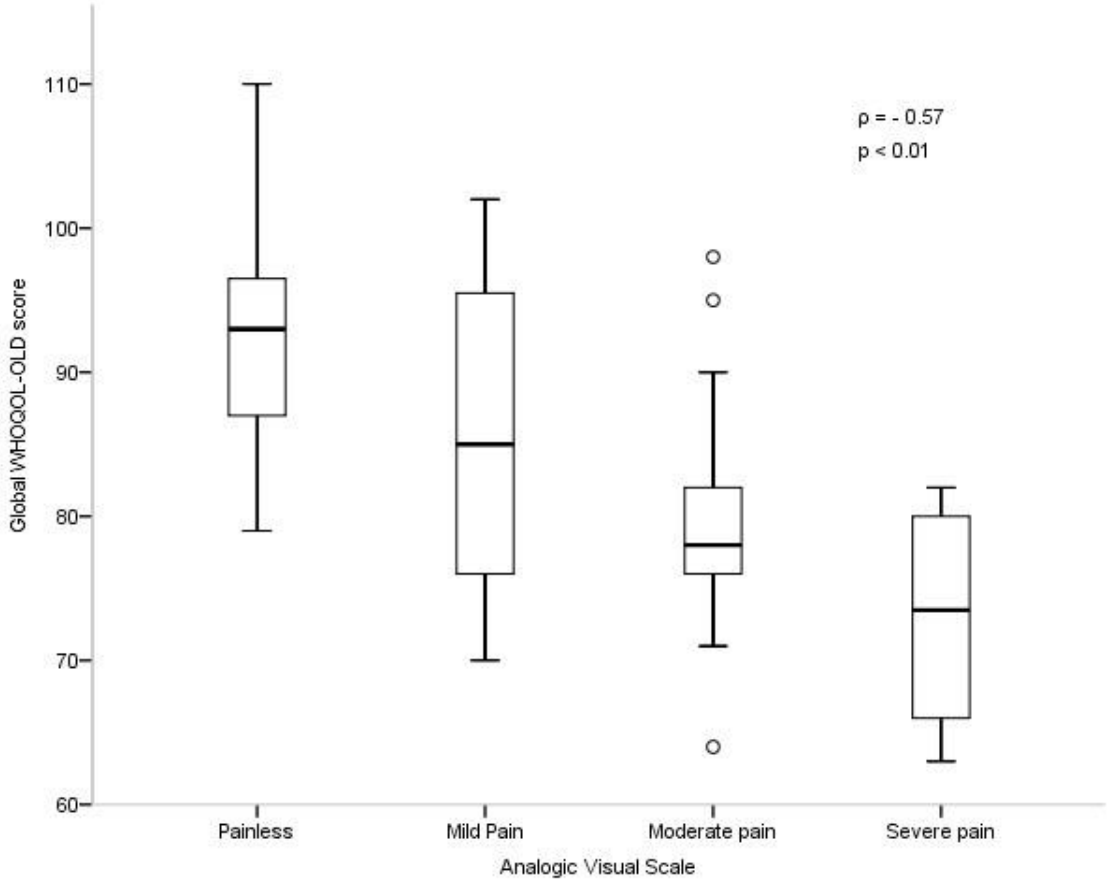

Figure 3 - Correlation of the WHOQOL-OLD global score with the intensity of chronic pain.

In table II, when dividing the older with a history of chronic pain into three age groups (60 to 69, 70 to 79 and ≥ 80) and making a comparative analysis of sleep quality, quality of life, number of morbidities and mobility between the three, it appears that the older with history of chronic pain, the worse their sleep quality, quality of life and functional mobility, but the number of morbidities does not change significantly with age. Table III presents a comparison between older individuals with and without a history of chronic pain concerning the components of the PSQI. The analysis demonstrates that older individuals experiencing chronic pain exhibit poorer sleep quality compared to those without chronic pain. This difference proves statistically significant across all components evaluated in the PSQI assessment.

Table 2-Sleep quality, quality of life, comorbidities and functional mobility between older with a history of chronic pain.

Variables	**60 to 69 years (n=26)**	**70 to 79 years (n=18)**	**≥ 80 years (n=10)**	**p**
PSQI	11.19 ± 1.9	12.73 ± 1.5	13.83 ± 1.1	< 0.01
WHOQOL-OLD	84.04 ± 9.8	80.9 ± 8.3	73.5 ± 5.1	< 0.03
Number of comorbidities	18 (69.6%)	13 (72.5%)	7 (70%)	ns
TUG (seconds)	8.53 ± 1.7	10.35 ± 2.1	12.01 ± 1.6	< 0.01

ns, not significant; PSQI, Pittsburgh Sleep Quality Score; WHOQOL-OLD, World Health Organization Quality of Life Group-old; TUG, Timed Up and Go test. Results as presented mean (standard deviation) or N (%).

Table 3 - PSQI components among the older with and without chronic pain.

Components	History of chronic pain (n=54)	No history of chronic pain (n=80)	p
Subjective sleep quality	1.08 ± 0.9	2.07 ± 0.8	< 0.01
Sleep latency	1.27 ± 0.9	2.15 ± 0.9	< 0.01
Sleep duration	1.69 ± 0.8	2.24 ± 0.7	< 0.01
Usual sleep efficiency	1.79 ± 0.8	2.0 ± 0.9	0.04
Sleep disorders	1.99 ± 0.8	2.39 ± 0.7	0.01
Use of sleeping medication	0.26 ± 0.2	0.54 ± 0.6	0.01
Dysfunction during the day	1.47 ± 0.7	1.8 ± 0.6	0.01
Global score	9.57 ± 2.7	12.7 ± 2.7	< 0.01

PSQI, Pittsburgh Sleep Quality Score. Results as presented mean (standard deviation) or N (%).

As shown in Table III, elderly individuals with a history of chronic pain reported significantly worse sleep quality across all components of the Pittsburgh Sleep Quality Index (PSQI) when compared to those without chronic pain ($p < 0.05$ for all components), with all mean differences showing a medium effect size (Cohen's $d > 0.5$).

When compared, the older with and without a history of chronic pain in relation to quality of life, through the WHOQoL-OLD facets, it appears that the older with chronic pain had a worse quality of life when compared to the older without chronic pain, with $p < 0.05$ in all facets, as shown in table IV.

Table 4 - WHOQOL-OLD facets between the older with and without chronic pain.

Facets	History of chronic pain (n = 54)	No history of chronic pain (n = 77)	p
Sensory functioning	15.2 ± 3.6	16.7 ± 2.1	< 0.01
Autonomy	12.9 ± 3.3	15.2 ± 1.9	< 0.01
Past, present, and future activities	14.6 ± 3.2	15.7 ± 1.8	0.01
Social participation	14.5 ± 3	15.9 ± 1.8	< 0.01
Death and dying	12.1 ± 4.9	14.9 ± 2	< 0.01
Intimacy	14.5 ± 3.4	15.6 ± 1.8	0.02
Global score	84 ± 16	94.1 ± 8.2	< 0.01

WHOQOL-OLD, World Health Organization Quality of Life Group-old. Results as presented mean (standard deviation) or N (%).

Discussion

The study revealed that older individuals experiencing chronic pain exhibit inferior sleep quality and overall life quality in comparison to those without chronic pain. Moreover, it highlighted a positive, moderate, and significant correlation between pain intensity and PSQI scores. Additionally, it uncovered a negative, moderate, and significant correlation between pain intensity and quality of life. This indicates that higher pain intensity is associated with poorer sleep quality and decreased overall quality of life among older individuals.

In the sample of the present study there was a predominance of females (87%), reflecting the greater longevity of women, an aspect already highlighted in the literature.[14,21] The feminization of old age can be attributed to various factors. Women tend to have a lower mortality rate from external causes, such as accidents or injuries. Additionally, they often exhibit lower prevalence in smoking and alcohol consumption compared to men. Furthermore, women are typically more proactive in self-care practices, contributing to their longevity and representation among the elderly population.[21,22] However, epidemiological studies have shown that chronic pain disorders have a considerably higher prevalence in women than in men.[23,24] The reasons why this gender difference appears are not yet fully elucidated. However, epidemiological studies suggest some hypotheses: women are the ones who most seek health services and are more willing than men to report pain;[25] biological factors related to the action of estrogen and progesterone;[25,26] cognitive and emotional characteristics such as stress, depression and catastrophization (believing that something is worse than it really is), have also been referred to as factors that contribute to different pain reactions between the two genders.[27]

The sample involved had a mean age of 70 ± 8 years, converging with population-based studies, reinforcing the external validity of the present study.[26-28] The majority of the older have a low level of education (69.4% with three or less years of study), reflecting the country's socioeconomic inequality. Additionally, a low per capita income was identified (84.8% ≤ 2 minimum wages), as found in studies of epidemiological profile conducted in Brazilian cities and a strong and negative correlation between the number of chronic diseases and quality of life, demonstrating that the greater the number of chronic diseases, the worse the quality of life of the older, corroborating with previous studies [26,27,29,30].

Regarding the main outcome of this study, when analyzing the association of chronic pain with sleep quality, our results demonstrate that the increase in pain intensity is associated with worsening sleep quality and that the older with chronic pain had sleep quality worse when compared to the older without chronic pain. This corroborates with other studies, which collectively have accepted the idea that the relationship between pain and sleep is bidirectional, with pain interrupting sleep and sleep deprivation or disturbance increasing pain, one influencing the other and making it difficult to dissociation in clinical practice.[31-34] However, some of the more recent studies have shown a direction of the association between sleep and pain, the results of which suggest that sleep disorders are more significant predictors of pain than in the opposite direction.[35-38] Therefore, the so-called bidirectional association seems to be stronger in the sense that sleep interferes with pain than the opposite mechanism.

In the present study, we found that, among the older who have a history of chronic pain, sleep quality, quality of life and functional mobility worsened with advancing age, in line with previous studies. These studies have shown that pain or physical discomfort in the older leads to changes in sleep patterns that tend to progress with age, since with advancing age there may be an increase in the number of diseases and a gradual decline in the functions of organic systems, which can reduce physical capacity and emotional suffering with depressive symptoms, accelerating the aging process and interfering with the quality of sleep and quality of life of the older.[39-42]

There was a positive correlation between the number of chronic diseases and scores of PSQI and a strong negative correlation between the number of chronic diseases and HRQoL, and the higher the number of self-reported chronic diseases, the worse the quality of sleep and the quality of life of the older. Sleep disorders can negatively impact chronic diseases, as there is an association of poor sleep with psychosocial symptoms such as depression and anxiety, in addition to causing an increased response to physiological stress and contributing to the systemic inflammatory process, enabling the development or worsening of diseases and the intensification of pain, declining quality of life.[43,44]

In the present study, we identified that there is a moderate negative correlation between quality of life and pain intensity and that the older with chronic pain had a worse quality of life than the older without chronic pain. Cross-sectional studies reported a negative correlation between chronic pain and aspects of quality of life.[45-47] Such relationships were found both in chronic pain cohorts and in population-based studies.[48,49] In addition, systematic reviews confirmed evidence of a link between pain and poor quality of

life.[49,50] One of the systematic reviews reported a lack of evidence for a relationship between quality of life and pain intensity; however, this study found a negative relationship between quality of life and pain intensity.[50] Thus, quality of life aspects were negatively associated with the presence and intensity of pain in the older population.

The results of the present study strengthen the hypothesis that sleep quality and pain have a two-way and reciprocal relationship, which allows us to discuss some clinical implementations. Health professionals who participate in the treatment of patients with chronic pain and / or chronic illness, in addition to using interventions that alleviate symptoms, should also pay attention to the assessment and treatment of sleep disorders, since only secondary attention is often given to these disorders.[51] Therefore, the findings of the present study are in line with previous study and, recommendations by suggesting that sleep assessment should be routinely addressed in the management of patients with chronic pain and / or chronic disease in terms of assessment, monitoring and definition of therapeutic strategies.[52-54] Therefore, a multidisciplinary approach is often necessary to obtain more comprehensive results regarding the care of the older.

Study Limitations

Certainly, a primary limitation of this study pertains to its utilization of a cross-sectional design. This approach doesn't facilitate the exploration of temporal associations between variables. Consequently, interpretations regarding the relationships observed between chronic pain, quality of sleep, and quality of life among older individuals should be approached with caution due to the inability to establish causal or temporal sequences of events. Absolutely, the bidirectional relationship among the studied variables indicates a reciprocal influence.[55] However, the study's design doesn't permit causal inference. Reliance on self-reported measures represents another limitation, introducing the potential for measurement errors, recall biases, and the desire to present oneself favorably, possibly leading to an overestimation of issues. To overcome these limitations, future research endeavors should consider employing objective methods such as polysomnography.[56] Additionally, longitudinal studies assessing variables at multiple time points over an extended duration are imperative. These methodologies would better capture and elucidate the causal relationships between the variables under investigation.

Conclusion

The results of this study corroborate with our hypothesis that the older with a history of chronic pain have worse quality of sleep and quality of life when compared to the older without a history of chronic pain and that there is a correlation between chronic pain and quality of sleep and quality of life, and the greater the intensity of pain, the worse the quality of sleep and life of the older. It was also identified that the greater the number of chronic diseases, the worse the quality of sleep and quality of life and that, the older the older with chronic pain, the worse their quality of sleep, functional mobility and quality of life.

Conflict of Interest:

The authors declare no conflict of interest.

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