ORIGINAL ARTICLE

Depressive symptoms in the elderly and its relationship with chronic pain, chronic diseases, sleep quality and physical activity level

Sintomas depressivos em idosos e sua relação com dor crônica, doenças crônicas, qualidade do sono e nível de atividade física

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ABSTRACT

BACKGROUND AND OBJECTIVES: Depressive symptoms are often experienced by the elderly, being a public health problem. The objective of this study was to verify the relation between depressive symptoms and the presence and intensity of chronic pain with sleep quality and physical activity level.
METHODS: Research with 385 aged residents in a municipality of Santa Catarina. The Morais adapted questionnaire, the numerical visual pain scale, and the International Physical Activity Questionnaire were used to assess the level and volume of physical activity, the Pittsburgh Sleep Quality Index, and the Geriatric Depression Scale. Data analysis by the Mann-Whitney U test, Chi-square (X^2) and Spearman's correlation.
RESULTS: Of the 385 aged evaluated, 30.6% had depressive symptoms. Older people who had depressive symptoms complained more of pain, poor sleep quality and had less physical activity (p=0.001). The X^2 values between chronic pain, sleep quality and physical activity level with presence and absence of depression symptoms were 25.078, 27.707 and 9.009, respectively (p<0.05), and the correlation between depressive symptoms and sleep quality was 0.423 (p<0.05).
CONCLUSION: Elderly people with depressive symptoms had a higher intensity of pain, worse quality of sleep and lower intensity of physical activity. There was an association between the presence of chronic pain, level of physical activity and quality of sleep with depression symptoms and moderate correlation between depression symptoms and sleep quality
Keywords: Chronic pain, Depressive symptoms, Elderly, Exercise, Sleep disorders.

RESUMO

JUSTIFICATIVA E OBJETIVOS: Os sintomas depressivos são frequentemente vivenciados pelos idosos, constituindo-se um problema de saúde pública. O objetivo deste estudo foi verificar a relação entre sintomas depressivos e a presença e intensidade da dor crônica com a qualidade do sono e o nível de atividade física.
MÉTODOS: Pesquisa com 385 idosos residentes em um município catarinense. Utilizou-se o questionário adaptado de Morais, escala visual numérica da dor, questionário Internacional de Atividade Física para avaliação do nível e volume de atividade física, escala de avaliação do índice de qualidade do sono de Pittsburgh e escala de depressão geriátrica. A análise dos dados pelos testes U de Mann-Whitney, Qui-quadrado (X^2) e correlação de Spearman.
RESULTADOS: Dos 385 idosos avaliados, 30,6% apresentaram sintomas depressivos. Idosos que apresentaram sintomas depressivos possuíam maior queixa de dor, pior qualidade do sono e menor volume de prática de atividades físicas (p=0,001). Os valores do X^2 entre dor crônica, qualidade do sono e nível de atividade física com presença e ausência de sintomas depressivos foram 25,078, 27,707 e 9,009, respectivamente (p<0,05) e a correlação entre sintomas depressivos e qualidade do sono foi de 0,423 (p<0,05).
CONCLUSÃO: Idosos com sintomas depressivos apresentaram maior intensidade da dor, pior qualidade do sono e menor intensidade de atividade física. Houve associação entre a presença de dor crônica, nível de atividade física e qualidade do sono com sintomas depressivos e correlação moderada entre sintomas depressivos e qualidade do sono.
Descritores: Dor crônica, Exercício, Idoso, Sintomas depressivos, Transtornos do sono.

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INTRODUCTION

The aging of the population is a worldwide phenomenon. Demographers forecast that in the year 2020 there shall be some 1.2 billion senior citizens in the world, including 34 million Brazilians aged over 60. A series of factors, including better control of chronic diseases, the improvement of the quality of life (QoL), the reduction of birth and fecundity rates, among others, have together helped to raise the life expectancy of the population[1].
Brazil can now be considered "a young country with grey hair." Every year, 650 new senior citizens enter the Brazilian population, most of which with some kind of chronic disease and some with limitations of movement. In less than 40 years, Brazil shall move

away from a scenario with a mortality rate typical of a younger population, to a new picture with illnesses that are typical of countries with an older population, characterized by complex and multiple diseases that last for years. The result will be the need for constant care, continuous use of medication, and regular medical tests, which puts a significant financial burden on the health system and poses a challenge to researchers, working to establish new strategies to tackle this problem[2].

Depression is one of the most common chronic diseases among senior citizens, now being one of the world's main public health problems, affecting some 350 million people throughout the world. Depression is also a major cause of disability that triggers other diseases. Due to its importance, and to the increase in its prevalence, depression has been chosen as the campaign theme for World Health Day in 2017, by the World Health Organization (WHO)[3].

A systematic review showed that the prevalence of depression is found in 7.7% of senior citizens seeking primary health care, 10.4% of those living in communities, and 14.4% of those who are in a hospital environment[4]. Also, depression is more common among senior citizens who have incapacitating physical problems[5]. According to the research carried out by Wannmacher[6], these symptoms reduce the QoL and increase mortality. The WHO[7] estimates that in 2020, ischaemic heart disease and depression will be the two main causes of death and disability.

Depressive symptoms (DS) in senior citizens are related to a greater difficulty in the treatment of comorbidities, worse prognosis, and also a worse QoL, and they should be thoroughly investigated to provide early treatment and improve the general well-being of this population, already frail by the several diseases that affect this segment of the population. Therefore, it becomes relevant to identify the DS and relate them to other variables, so that one may intervene with preventive measures, thereby preventing the evolution of this clinical situation to full depression.

In face of this scenario, the objective of this study was to check the relationship between DS in senior citizens, and the presence and intensity of chronic pain with the quality of sleep and level of physical activity (LPA). Also, if there is an association between chronic pain, quality of sleep, and LPA with DS, and the connection between DS and the number of chronic illnesses, the sleep quality index, the volume of physical activity, and pain intensity.

METHODS

This study is quantitative, transversal and populational in nature and was conducted in a city of the state of Santa Catarina, from June to August 2016. This study had the participation of senior citizens of both genders, resident in the urban area of that city.

The state of Santa Catarina has a dynamic that is reflected in its high growth and literacy rates, high employment, and high per capita income, significantly higher than the national mean, thereby ensuring a better QoL for the resident population. However, there are contrasts regarding the social and economic development of the cities in this State. The economy in the city surveyed is strongly linked to agribusiness, agriculture, metal mechanics industries, and many small businesses. This city has a diversified culture, with a strong influence of the German and Italian colonization, blended in with

the local characteristics. Many of the descendants of the colonists settled in this city and made up the young, adult and mainly the aged population of the city[8].

To calculate the sample size, we considered the population of 13,606 senior citizens, aged 60 or over, of both genders, resident in the city. The study sample was generated using the sampling software Microsoft Excel®, considering a confidence interval of 95% and a margin of error of 5%, with a total sample size of 385 senior citizens. The inclusion criteria used in this study were: age of 60 or over; living in the urban part of the city, and also having good cognition according to the Mini-Study of Mental Health (MEEM)[9], according to the level of schooling as forecast based on the test score. The main criteria for exclusion were: absence from their place of residence in two separate visits; being bed-ridden or in wheelchairs.

Data collection was organized based on the census map of the city, with a total of 38 sectors. Ten census sectors were selected by lot. The maps of these sectors were printed so that the researchers could plan the data collection based on the streets in each neighborhood. At every two houses, the first was selected. When the place selected was a building, everyone over 60 was interviewed. Vacant areas and commercial establishments were excluded and, when selected by lot, we moved to the next household, and so on successively, in all streets, until the sample size was reached.

The instruments used for data collection were the adapted questionnaire of Morais[10] to identify personal data, and whether the senior citizen had chronic pain or not. Next, the visual numeric scale (VNS) was used to measure the intensity of pain in the senior citizen[11]. The Pittsburgh Sleep Quality Questionnaire (PSQI) was used to assess sleep quality[12]. The International Physical Activity Questionnaire (IPAQ – short version) was used to check the level of physical activities among the senior citizens[13], and finally, to identify DS, the Geriatric Depression Scale (GDS) with 15 questions[14] was used. Fourteen students were trained in advance to apply the data collection instruments – two master's students, one Medical undergraduate student, and 11 Physiotherapy students – all of whom were part of the research group to which the study was allocated. The training lasted 20 hours. Five hours to study the instruments, 5 to apply the pilot test with 15 senior citizens, to check the suitability of the collection instruments, five to check the results of the pilot test and make any necessary adjustments to start the official data collection, and 6 hours to organize the whole dynamics of the data collection process.

The data was collected in the 10 census sectors. Each data collector recorded the data collected on the map he/she received in advance. The research team met every Friday to enter the information in the database and to evaluate its progress, to check the streets covered and plan for the following week. The data collection was carried out in the morning, afternoon or evening, every day of the week. When there was a resident senior citizen in the house selected, but he/she was not present at the moment of the visit, the senior citizen was approached another time, on another day, according to his/her personal availability suggested by the person who was present in the house. Each senior citizen found in his/her house was informed about the purpose of the study, objectives, methods, expected benefits, possible risks, and possible inconvenience, as well as the way in which the data would be collected and used later on. All participants signed a Free and Informed Consent Form (FICT).

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Next, the MEEM was applied and used as an inclusion criterion, as it sorts out the subjects based on the preservation of cognition of the senior citizens. The interpretation of the MEEM was based on the following scores: 17 points for illiterates or people who have less than four years of formal education; 24 points for people with four or more years of education[9]. The senior citizens who reached these cut-off points were kept in the study, while the others were excluded, on the grounds of not having a satisfactory cognition level.

Afterward, the questionnaire for senior citizens general data – adapted from Moraes[10], was applied. This instrument consists of personal information and questions about the presence of pain and self-reported chronic diseases.

Then, the VNS was applied, which helps to measure the intensity of pain experienced by the patient, on a scale from zero to 10. The senior citizen classified his/her pain by intensity where from zero to three corresponds to "mild pain;" four to seven, "moderate pain;" and eight or higher, "severe pain"[11].

To assess the physical activity, we applied the IPAQ, short version, which the main objective is to estimate the energy consumed when performing a physical activity, whether moderate or vigorous, but always taking into account the daily tasks, leisure, and work, among others[13]. Barbosa et al.[15] showed that the IPAQ assesses different aspects, including work, household chores, and leisure, also estimating the time taken for the execution of these activities, characterizing the level of activity (active or sedentary).

According to the result obtained, the IPAQ was divided and defined based on different categories as follows[16]:

• Insufficiently active (A and B): people who take up to 150 minutes of physical exercise activities per week;

• Active (Active A-B and very active): people who take more than 150 minutes of physical exercise per week.

The next step was the application of the PSQI, a questionnaire designed to assess the quality of sleep in the most recent month. This questionnaire has 19 questions, grouped in seven components, with weights distributed on a scale from zero to three. The scores of these components are added to produce a global score, varying from zero to 21. Scores from zero to four indicate good sleep quality, while scores from five to ten show poor sleep quality and scores over ten show evidence of sleep disorders[12].

Finally, to check the presence of depression symptoms, we used the GDS short version, with 15 questions[14]. The final score can reach a maximum of 15 points, and scores where the sum is 4 points or less represent lack of DS, while five or more points suggest the presence of DS[17,18].

The Project that gave rise to this study was analyzed and accepted by the Human Research Ethics Committee, of the Higher Education Institution, with opinion No. 2.047.037. This study assured that the ethical principles are in compliance with the Ruling 466/12 of the National Health Council.

Statistical Analysis

For data analysis, we used an Excel spreadsheet to store the data. The analysis was performed by the SPSS statistical software, version 20.0. Initially, we run the descriptive statistics, and the quantitative variables were analyzed by measurements of dispersion and central tendency (mean and standard deviation). The analysis of the qualitative variables was based on relative and absolute frequency. The normality of data such as pain, sleep, physical activity, and DS was checked based on the Kolmogorov-Smirnov test. Since it did not show a normal distribution, the comparison of medians and the interquartile range was analyzed using the U Mann-Whitney test in senior citizens with presence and absence of DS, as well as in the groups with and without chronic pain. To check the association between chronic pain, sleep quality and level of physical activity (LPA) with presence and absence of DS, the Chi-Square test (χ^2) was performed. The correlation between variables was obtained by the Spearman correlation test, using a level of significance of $p < 0.05$.

RESULTS

Of the 385 senior citizens interviewed, 259 were women. The mean age observed was 71.12±7.46 years. In all, 118 patients with DS were identified (30.6%), and it was also observed that among all senior citizens with DS, most were women (86 senior citizens, 72.9%).

Regarding chronic pain, 224 senior citizens reported the presence of pain; 74.5% were women. When we looked at the rating of pain with the VNS, we obtained a mean of 3.46±3.49. The greatest frequency was concentrated in the case of moderate pain (with scores between four and seven points on the pain scale), or 28.1% of patients. This was followed by intense pain (a score between eight and ten) and finally mild pain (scores between one and three). In the case of female senior citizens, there was a prevalence of intense pain, which was recorded in 82.4% of the group.

We also observed 331 patients with chronic pain (86%). Regarding the number of diseases, the senior citizens reported between 1 and 6 chronic diseases. Most of the senior citizens had up to 3 self-reported diseases (79%) (Table 1).

Table 1. General characteristics of senior citizens regarding gender, the presence of diseases and chronic pain, pain intensity, sleep quality, and depressive symptoms (n=385)

Variables		Results
Gender	Male (n/%)	126 (32.7)
	Female (n/%)	259 (67.3)
Chronic disease	Present (n/%)	331 (86)
	Absent (n/%)	54 (14)
Chronic pain	Present (n/%)	224 (58.2)
	Absent (n/%)	161 (41.8)
Pain (VNS)	Intensity of pain (mean±SD)	3.46±3.5
	No pain (n/%)	164 (42.6)
	Mild (n/%)	39 (10.1)
	Moderate (n/%)	108 (28.1)
	Intense (n/%)	74 (19.2)
PSQI	Sleep Classification Index (mean±SD)	5.57±3.2
	Good sleep quality (n/%)	167 (43.4)
	Poor sleep quality (n/%)	194 (50.4)
	Sleep disorders (n/%)	24 (6.2)
GDS	GDS Score (mean±SD)	3.64±2.5
	Lack of depressive symptoms (n/%)	267 (69.4)
	Depressive symptoms (n/%)	118 (30.6)

VNS = visual numeric scale for pain; PSQI = Pittsburgh Sleep Quality Questionnaire; GDS = Geriatric Depression Scale.

Comparing the medians of variables such as pain, sleep quality, and volume of physical activity among senior citizens with the presence or absence of DS, the results show that senior citizens with DS had more complaints of pain, poorer sleep quality, and also less practice of physical exercise (p=0.001), as shown in table 2 below.

Table 3 shows the data regarding the medians of sleep quality, the volume of physical activity and DS in senior citizens with and without chronic pain, showing results that are statistically significant between the groups.

Table 4 shows chronic pain, sleep quality, and level of physical activity among senior citizens with and without DS. The results suggest a statistically significant relationship between the presence of DS and the presence of chronic pain, worse sleep quality, and a lower level of physical activity.

Table 2. Comparison of means for pain intensity, sleep quality, and volume of physical activity, in senior citizens with the presence and absence of depressive symptoms

Variables	Lack of depressive symptoms n=267 Mean±SD	Depressive symptoms n=118 Mean±SD	p-value
VNS	0.0 (0.0-6.0)	5.0 (1.75-8.0)	0.001†
PSQI	4.0 (3.0-7.0)	7.0 (5.0-10.0)	0.001†
IPAQ	190.0 (100.0-280.0)	130.0 (75.0-210.0)	0.001†

VNS = visual numeric scale for pain. PSQI = Pittsburgh Sleep Quality Questionnaire; IPAQ = International Physical Activity Questionnaire; GDS = Geriatric Depression Scale; p = Statistics using the U Mann-Whitney test. † Statistical significance of p<0.05.

Table 3. Comparison of medians for sleep quality, the volume of physical activity, and depressive symptoms, among senior citizens with and without chronic pain

Variables	No chronic pain n=161 me (IQR)	With chronic pain n=224 me (IQR)	p-value
PSQI	4.0 (2.5-6.0)	6.5 (4.0-9.0)	0.001†
IPAQ	200 (120-300)	150 (76.25-240)	0.001†
GDS	3.0 (1.0-4.0)	4.0 (2.0-6.0)	0.001†

me = median. IQR: interquartile range (P_{25}-P_{75}); PSQI = Pittsburgh Sleep Quality Questionnaire; IPAQ = International Physical Activity Questionnaire; GDS = Geriatric Depression Scale; p = Statistic using the Mann-Whitney U Test. † Statistical Significance at p<0.05.

DISCUSSION

One of the main results of this study was the relationship between DS and the presence and intensity of chronic pain. In addition, the senior citizens who reported chronic pain were 3.36 times as likely to have DS, as shown by the X^2 test. A study with 172 senior citizens at a Basic Health Centre in the city of Londrina, State of Paraná, Brazil showed that 62.21% of these patients had chronic pain, and 56.1% had DS[19]. According to a study conducted by Pinheiro et al.[20], there is a high prevalence of DS and anxiety in patients with chronic pain, as also a significant connection between these psychiatric symptoms and some types and intensity of pain. Melancholy intensifies a painful experience or reduces the pain threshold[21,22]. A cycle is therefore established, in which one disorder makes the other worse. A depressed patient is less active and restricts his/her social coexistence, which could intensify the situations of pain and worsen the DS, and so on in endless succession[23].

The results of the present study have also shown that senior citizens with DS have shown a significantly higher intensity of pain and higher GDS scores in the presence of chronic pain.

One study that assessed the relationship between pain and depression, in a population of senior citizens, based on information regarding senior citizens who received home services in 11 European countries between 2001 and 2003, showed that of the total sample, 2380 people had pain (59.9% of the sample). Depression was diagnosed in 11.3% of the 1596 participants who reported no pain and in 19.5% of the participants who had pain (p<0.001). Comparing by gender, we see that women with pain were much more likely to show DS. Among women, the association between pain and DS became gradually more significant, with increases in pain intensity, pain frequency, and the number of painful sites[24].

Many neurotransmitters that act upon the central nervous system (CNS) are also related to the suppression of pain, including serotonin and NADr[25], which are reduced in patients with DS and chronic pain[26]. A population-based prospective cohort study, with four follow-up measurements over 13 years, conducted in Amsterdam with 1528 interviewees (mean age of 67.9±8.1 years), seeking to investigate the effect of age and of the aging process on the association between pain and DS, showed that pain and DS were associated throughout the 13 years of monitoring. The somatic and

Table 4. Association between chronic pain, quality of sleep, and level of physical activity in senior citizens with and without depressive symptoms

Variables		ADS n (%)	DS n (%)	Total n (%)	X² Statistic Z/p
Chronic pain	Presence	133 (49.8)	91 (77.1)	224 (58.2)	25.078/0.001†
	Absence	134 (50.2)	27 (22.9)	161 (41.8)	
Sleep quality	Good quality	139 (52.1)	28 (23.7)	166 (43.4)	27.707/0.001†
	Poor quality	116 (43.4)	78 (66.1)	194 (50.4)	
	Sleep Disorder	12 (4.5)	12 (10.2)	24 (6.2)	
Level of physical activity	SED	19 (7.1)	11 (9.3)	30 (7.8)	9.009/0.011†
	IA	93 (34.8)	58 (49.2)	151 (39.2)	
	AVA	155 (58.1)	49 (41.5)	204 (53)	
	Total	267 (100)	118 (100)	385 (100)	

ADS = absence of depression symptoms (zero to 4 points). DS = depressive symptoms (5 or more points). X² Statistic: Chi-square test. Z = Result of the Chi-square test. † Statistical significance p<0.05. SED = sedentary; IA = insufficiently active; AVA = Active or very active.

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psychological characteristics could explain 40% of the covariance between pain and DS, over time. When we deal with people who suffer from pain and depression, the interventions used should be similar for all senior citizens, covering somatic and psychological factors, regardless of the interviewee's age or degree of frailness[27].

In this direction, interventions that could make senior citizens aware of the need for healthy eating habits, together with regular physical exercise, activities in the open air, and getting some sun at appropriate times, favour an increase in the presence of serotonin and could reduce this cycle: more DS, more chronic pain, and vice versa. The study has shown a weak correlation between the number of diseases, the presence of DS, and the frequency of self-reported chronic diseases. According to the study by Duarte and Rego[28], of the 1,120 senior citizens who attended a geriatric outpatient center in the city of Salvador, State of Bahia, 91% had between 1 and 5 chronic diseases, and 23.4% of all the people assessed were diagnosed as having DS, this situation was more common among women. Another fact observed was that there was a positive association between the number of comorbidities and situations of depression, when there were more than 3 chronic diseases.

The studies by Teng, Humes and Demetrio[29] and Martínez et al.[22] reached the conclusion that DS is related to many diseases, and that the presence of DS helps to worsen the symptoms of chronic diseases, the QoL indexes, treatment compliance, and also brings greater morbimortality among patients. A cross-sectional study with adults aged between 20 and 59, in the city of Florianópolis, showed an occurrence of 16.2% of depressive patients, this being more common among women and older people. This study also showed that the occurrence of DS was higher among those subjects with a higher number of chronic diseases[30].

Another result showed by this study was the moderate connection between DS and sleep quality, and also that senior citizens with DS obtained significantly worse scores than those without DS. According to the Manual for Diagnosis and Statistics of Mental Disorders, 5th version, changes in sleep are just one of the symptoms that are part of the criteria to identify depression (DSM-V-tr, 2014). A significant number of depressed patients complain about a general deterioration of their sleep, both in qualitative and quantitative terms[31]. This non-reparative sleep leads to irritability, difficulty to concentrate, and daytime fatigue. Moreover, changes in sleep patterns could also be an indicator of the likelihood to develop DS[32].

A study described that, among the factors that cause sleep disorders, were the presence of pain (33.1%)[33]. Indeed, pain interferes with sleep quality among senior citizens, but, even though it occurs mostly in aged people, it is not in itself a cause of sleep disorders – these alterations are normally associated to other comorbidities and worse QoL scores among senior citizens, as well as DS.

When the senior citizen's sleep pattern is interrupted, it can reduce the motivation and willingness to participate in social and recreational activities, thereby harming the performance of daily activities and creating situations of dependence and reduction of well-being[34]. Thus, health professionals should intervene with actions to promote health, actions that reduce or prevent sleep-related problems. Among the strategies, we could highlight physical exercises, relaxation techniques, integrative and complementary practices, conversation groups, and therapy and support groups[19].

When we looked at the association between the LPA and the degree of DS, we observed that the group of insufficiently active senior citizens had a higher prevalence of DS (49.2%). In the case of senior citizens without DS, 58.1% are active and very active. When comparing the volume of physical activity, senior citizens with DS showed significantly lower volumes of physical exercise, compared to those without DS.

One review that evaluated the benefits of physical activity in depressed patients, conducted by Guimarães and Caldas[35] found 15 studies in seven different countries (the U.S., the Netherlands, Brazil, England, Japan, Colombia, and Finland), reaching the conclusion that physical activity reduces DS among senior citizens.

Among the most-accepted explanations for the benefits that physical exercises bring to the treatment of DS are the increase in the release of catecholamines such as serotonin, noradrenaline and dopamine[36] and also endorphins, that promote a general feeling of well-being, relieving DS and producing a feeling of content and of willingness to do things[37].

Encouraging a healthy lifestyle, with the regular practice of physical exercises, reduces the risk of development of diseases in this population[38]. The promotion of physical activities together with better living conditions could, indeed, have a positive impact on the improvement of the QoL in the general population. Within this context, the health care team needs to plan actions, not only to treat the clinical conditions that occur in this phase of life but also to implement interventions to prevent, maintain and promote the physical and psychological health of senior citizens so that they can enjoy life with longevity.

CONCLUSION

Based on the results obtained in this study, there is a connection between DS and the presence and intensity of pain, sleep quality, and the LPA. It was also observed that senior citizens with chronic pain showed worse scores for sleep quality, physical activities, and increased DS. There was also a relationship between the presence of chronic pain, low LPA and poor sleep quality among senior citizens with DS.

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