# Functionality, psychosocial factors and quality of life in women with predominance of central sensitization

*Funcionalidade, fatores psicossociais e qualidade de vida em mulheres com predomínio de sensibilização central*

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## ABSTRACT

**BACKGROUND AND OBJECTIVES**: Chronic pain is a major reason for visits to healthcare professionals and has been seen as a public health problem. Many patients with chronic pain may develop predominance of central sensitization. Patients with central sensitization must be assessed through biopsychosocial model. This study aimed at evaluating physical and psychosocial impairment in women with chronic pain with predominance of central sensitization.

**METHODS**: A cross-sectional study was conducted in women with chronic musculoskeletal pain and central sensitization prevalence. Fifty-seven musculoskeletal pain patients were screened. Women with chronic, widespread and neuropathic pain and with pain in more than three sites, including trunk, upper and lower limbs were also included. Central sensitization was defined by mechanism-based pain classification. Eighteen patients were enrolled and completed questionnaires on sociodemographic characteristics, pain intensity, functionality, quality of life, kinesiophobia and catastrophizing. Descriptive statistics and correlation analyses were provided.

**RESULTS**: All participants have pain seven days a week and 88.9% of them were classified as severe pain. It was observed high levels of catastrophizing and kinesiophobia. There was a strong correlation between catastrophizing and kinesiophobia (Rho=0.864, p<0.01). The mental component of quality of life questionnaire showed moderate negative correlation with catastrophizing (Rho=-0.611, p<0.01) and kinesiophobia (Rho=-0.646, p<0.01). There was a moderate correlation of pain intensity and catastrophizing (Rho=0.628, p<0.01) and kinesiophobia (Rho=0.581, p=0.01). No correlation was observed between age, physical component of quality of life questionnaire, functionality, and pain duration.

**CONCLUSION**: Quality of life and pain intensity were more remarkably affected by psychosocial factors than functionality in women with chronic musculoskeletal pain with central sensitization predominance.

**Keywords**: Central nervous system sensitization, Chronic pain, Musculoskeletal pain, Psychology.

## RESUMO

**JUSTIFICATIVA E OBJETIVOS**: Dor crônica é o principal motivo para consultas de profissionais de saúde e tem sido considerada como um problema de saúde pública. Vários pacientes com dor crônica devem desenvolver o predomínio de sensibilização central. Pacientes com sensibilização central devem ser avaliados através do modelo biopsicossocial. O objetivo deste estudo foi avaliar o comprometimento físico e psicossocial de mulheres com dor crônica que apresentam predomínio de sensibilização central.

**MÉTODOS**: Um estudo transversal foi conduzido com mulheres com dor crônica que apresentam predomínio de sensibilização central. Cinquenta e sete pacientes com dores musculoesqueléticas participaram da triagem. Mulheres com dor crônica de natureza neuropática e com dor localizada em mais de três locais, incluindo tronco, membro superior e inferior também foram incluídas. Sensibilização central foi definida pela classificação da dor baseada em seu mecanismo. Dezoito pacientes foram identificados e preencheram um questionário com características sócio-demográficas, intensidade de dor, funcionalidade, qualidade de vida, cinesiofobia e catastrofização. Foi realizada a análise estatística descritiva e a correlação entre as variáveis.

**RESULTADOS**: Todos as participantes apresentavam dor sete vezes por semana e 88,9% foram classificadas como dor intensa. Foi observado elevado nível de catastrofização e cinesiofobia. Houve uma forte correlação entre catastrofização e cinesiofobia (Rho=0,864, p<0,01). O componente mental do questionário de qualidade de vida evidenciou moderada correlação com catastrofização (Rho=-0,611, p<0,01) e cinesiofobia (Rho=-0,646, p<0,01). Houve moderada correlação entre a intensidade de dor e a catastrofização (Rho=0,628, p<0,01) e cinesiofobia (Rho=0,581, p=0,01). Nenhuma correlação entre idade, componente físico da qualidade de vida, funcionalidade e duração da dor foi observada.

**CONCLUSÃO**: A qualidade de vida e a intensidade da dor estiveram mais relacionadas com os fatores psicossociais do que a funcionalidade em mulheres com dor musculoesquelética crônica com predomínio de sensibilização central.

**Descritores**: Dor crônica, Dor musculoesquelética, Psicologia, Sensibilização do sistema nervosa central.

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## INTRODUCTION

Chronic pain affects approximately 40% of the adult population, more than heart disease, cancer and diabetes combined. It is one of the main causes for visits to health professionals, use of drugs and disability, as well as an important factor in reducing quality of life and individual's productivity. There is little difference between the prevalence of chronic pain in developed countries (37.7%) and developing countries (38.9%), and these values tend to increase with increasing age regardless of the country's level of development[1]. Given the high prevalence and persistence of symptoms[2] and the high cost imposed on the healthcare system[3], chronic pain has been seen as a major public healthcare problem[4].

Chronic pain may be associated with an organic condition where the source of pain can be identified; however, under different conditions, it occurs without identifying any underlying disease or without a specific diagnose[5]. Once any tissue damage has been excluded, chronic pain has been explained by the central nervous system sensitization mechanism. Central sensitization leads to a cascade of events such as referred pain, hyperalgesia, allodynia, and changes in pain modulating centers[6]. These sensitization responses are modulated by neurophysiological, environmental, and cognitive factors[7]. Central sensitization represents a "malfunctioning of descending anti-nociceptive mechanisms"[8]. Changes in pain perception are often seen in conditions called central sensitization syndrome which includes chronic low back pain, fibromyalgia, chronic fatigue syndrome, headaches, temporomandibular joint dysfunction, chronic widespread pain etc.[9,10]. In general musculoskeletal pain patients show a remarkable number of participants with central sensitization predominance pain and women are the most affected gender[11].

Chronic pain can be understood by the fear-avoidance model in which physiological, behavioral, and cognitive aspects are responsible for the development and maintenance of chronic pain behavior. In this model, the fear of movement may lead to restriction of daily life activity and then disability. A number of events may occur between fear of movement and the onset of disability; the beginning of this process usually occurs by a negative evaluation of pain leading to catastrophic thoughts that are considered kinesiophobic behavior precursors. Another psychosocial factor contributing to this process is the hypervigilance, where subjects with fear related to pain are less capable of removing the focus from pain which hinders the performance and focus on other tasks[12]. Pain intensity, disability, and catastrophizing may be considered negative predictors of the quality of life in individuals with chronic pain[13,14]. Ogunlana[14] assessed the quality of life in patients with chronic low back pain and identified as a predictive negative factor among physical components of the quality of life questionnaire an increased level of disability and duration of pain while the negative factor of the mental component was an increased level disability.

The assessment of patients with chronic pain due to their biopsychosocial characteristic must be able to evaluate the biological, cognitive, and behavioral domains of pain[12,15]. Assessments of these domains in patients with chronic pain have been investigated, but there are no studies in women with chronic pain classified with central sensitization the evaluation and correlation of pain biopsychosocial components. Maladaptive psychosocial factors are part of the criteria to identify patients with central sensitization predominance[16], however these factors have been not broadly investigated in this population.

The aim of this study was to assess the functionality, psychosocial factors and quality of life in women with chronic musculoskeletal pain classified with central sensitization and to verify the correlation between them.

## METHODS

This was a cross-sectional study. Eighteen women (above 18 years old) with central sensitization were screened from a total of 57 patients with musculoskeletal disorders in the outpatient physiotherapy department of Hospital Universitário Gaffrée e Guinle, Rio de Janeiro between April and June of 2015. The study included women with chronic pain (pain that persists for more than three months)[17] who had widespread pain (pain in three or more predefined sites involving trunk and upper and lower limbs)[18], with the presence of neuropathic pain (according to the questionnaire *Douleur Neuropathique* - DN4)[19], and a predominance of central sensitization (mechanisms-based pain classification)[16]. Exclusion criteria were subjects unable to understand or read Portuguese or those with pain from an oncological process, fractures or recent surgeries. The study flowchart is presented in figure 1.

Subjects who fulfilled the study's eligibility criteria answered during the admission interview a questionnaire with socio-demographic characteristics (age, education level), pain features (pain duration, pain frequency and pain location) and lifestyle factors (physical activity and quality of sleep), in addition to other self-administered tools to evaluate pain intensity, functionality, psychosocial factors (catastrophizing and kinesiophobia), and quality of life.

*Pain intensity* – Pain intensity was assessed by Numeric Pain Rating Scale (NPRS). They pointed out at a 10 cm ruler the value corresponding to their self-perception of pain intensity at that time, where zero (0) represented "no pain" and 10 "the worst pain possible"[20]. Patients were grouped according to the classification proposed by Jones et al.[21] in which zero (0) represents "no pain", 1 - 3 "mild pain", 4 - 6 "moderate pain" and 7 - 10 "severe pain".

*Functionality* – Subjects' functionality was assessed using the Patient-Specific Functional Scale (PSFS)[22], where individual's functional ability can be assessed in different musculoskeletal conditions[23]. The PSFS showed good clinimetric properties for Brazilian patients with shoulder pain[24] and low back pain[23]. Patients were asked to identify up to three important activities that they are unable to do or are having difficulty with as a result of their injury or problem. Subsequently, they were asked to point a value that best described their current level of ability on each activity assessed on a scale ranging from 0 to 10 points, where "0" refers to "unable to perform activity" and "10" refers to "able to perform activity at the same level as before injury". Total score is the sum of scores activity / number of activities, and total score ranges from zero to 30 and the higher the values obtained, the higher the functionality of the individual.

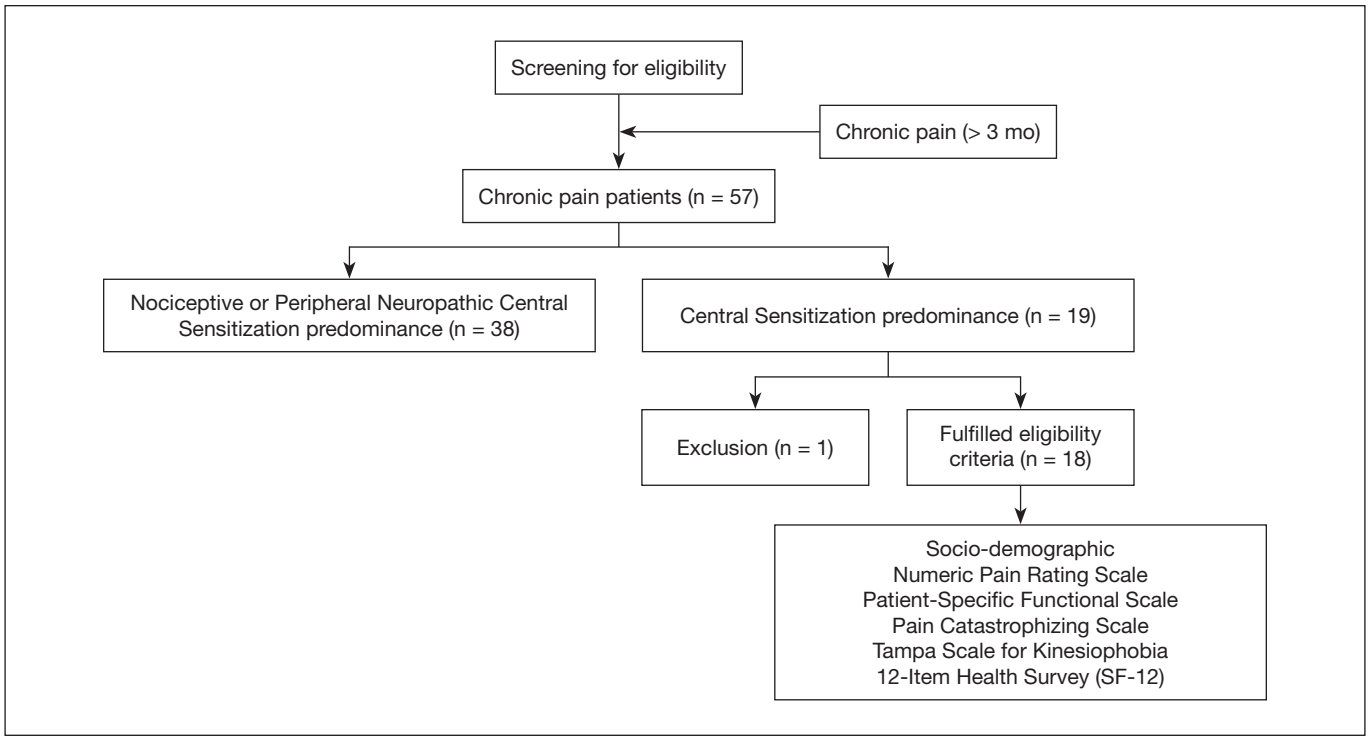


**Figure 1**. Study flowchart

*Catastrophizing* – The catastrophizing index was evaluated by the Brazilian Portuguese version of the Pain Catastrophizing Scale (BP-PCS)[25]. This scale is a self-administered questionnaire that consists of 13 items and is divided into three domains: helplessness, magnification, and rumination[26]. Items are rated on a 5-point Likert-type scale: (0) not at all, (1) to a slight degree, (2) to a moderate degree, (3) to a great degree, and (4) all the time. The domains scores are given by the sum of the corresponding items: magnification 6, 7, and 13; rumination 8 – 11; and helplessness 1– 5 and 12. Total score is computed by the sum of all items and ranges from zero to 52 points. Pain catastrophizing was classified as low when subjects got scores lower than 20 points; medium with values between 20 and 29, and high with values equal or higher than 30[27].

*Kinesiophobia* – Kinesiophobia was assessed by the Brazilian version of the Tampa Scale for Kinesiophobia (TSK)[28], which has similar properties as the original version[29]. This scale contains 17 questions addressing pain and symptoms severity, and each question scores from 1 to 4 points where (1) entirely disagree, (2) partially disagree, (3) partially agree, and (4) entirely agree. Total final score is the sum of all questions scores with the inversion of scores values for questions 4, 8, 12, and 16. Final score ranges from 17 to 68 points and the higher the score, the higher the kinesiophobia degree. Scores obtained in the TSK were grouped into three tertiles, obtaining three subgroups. The first tertile comprised score values between 17-33 points, in which patients were classified as low score for kinesiophobia; the second tertile between 34 to 41, in which patients were classified as moderate score; and the third tertile with values above 42 points, in which patients were classified as high score[30].

*Quality of life* – Quality of life of patients was evaluated by the 12-Item Health Survey (SF-12) composed of 12 items with the best correlation with each SF-36 domain[31]. The SF-12 assesses eight dimensions of influence on quality of life and the domains are grouped into two components: physical (physical component summary - PCS) and mental (mental component summary - MCS). The PCS is composed of domains physical function, physical aspect, pain, and general health while the MCS comprises vitality, social function, emotional aspect, and mental health. Total score ranges from zero to 100 and scores of physical and mental components are expressed as a percentage of total score, with higher scores associated with a better level of quality of life. PCS and MCS scores were assessed using SF-12 Health Survey Scoring database[32].

This study was conducted according to Resolution No. 466/12, of the National Health Council following the Helsinki Declaration of 1975 and it's amendment. It was approved by ethics committee on research of Augusto Motta University Center (CAAE: 43237015.8.0000.5235). Informed consent was obtained from all participants included in this study.

**Statistical analysis**

The software SPSS 16.0 (SPSS Inc. Chicago, IL, USA) was used to perform statistical analysis. Qualitative data are presented as absolute and relative frequency (%) while quantitative data are presented as mean ± standard deviation or median and 95% confidence interval. Shapiro-Wilk test was applied to verify the normal distribution of data. Variables were correlated using Pearson's or Spearman's correlation according to the normality of data distribution. Correlation coefficients were arbitrarily defined as very

high when value was above 0.9, as high with values between 0.7-0.89, as moderate between 0.5-0.69, as low between 0.3-0.49, and as mild below 0.29. Level of significance (p-value) was 5%.

## RESULTS

The study sample was composed by 18 women with chronic pain who had central sensitization and mean age was 64.1±9.9 years. There were heterogeneous kinds of chronic pain, consisting of individuals with pain in different parts of the body, such as shoulders, knees, cervical, and lumbar spine. All patients reported feeling pain seven days a week. Severe pain was observed in 16 subjects (88.9%), moderate in 2 subjects (11.1%), and mild pain was not reported. Most subjects (88.9%) had a bad sleep quality, but no subject reported interference of chronic pain in sleep quality. Demographic characteristics of the study subjects are shown in table 1.

**Table 1.** Demographic characteristics of the study sample

| | Values |
|---|---|
| Age, years | 64.1±9.9 |
| Pain intensity, n (%) | |
| Mild | - |
| Moderate | 2 (11.1) |
| Severe | 16 (88.9) |
| Levels of education, n (%) | |
| Incomplete basic | 9 (50) |
| Complete basic | 5 (27.7) |
| Incomplete high school | - |
| Complete high school | 2 (11.1) |
| Complete college | 1 (5.5) |
| Sleep quality, n (%) | |
| Good | 2 (11.1) |
| Poor | 10 (55.6) |
| Very poor | 6 (33.3) |
| Physical activity level n (%) | |
| Inactive | 13 (72,2) |
| Insufficient (less than 150 min/week) | 5 (27,8) |
| Recommended (more than 150min/week) | - |

Low levels of catastrophizing and high kinesiophobia index were observed in most participants. Central trends of measured variables (kinesiophobia, catastrophizing, quality of life, functionality, and pain intensity) are presented in table 2**.**

**Table 2.** Functionality, psychosocial factors and quality of life of women with central sensitization pain predominance

| Variables | Values |
|---|---|
| Catastrophizing - BP-PCS | 25.0±13.9 |
| Low, n (%) | 8 (44.4) |
| Medium, n (%) | 4 (22.2) |
| High, n (%) | 6 (33.3) |
| Kinesiophobia - TSK | 42.7± 8.4 |
| Low, n (%) | 3 (16.7) |
| Moderate, n (%) | 4 (22.2) |
| High, n (%) | 11 (61.1) |
| Quality of life - SF-12 | |
| Total, mean (±SD) | 75.3±12.7 |
| Physical Component, mean (±SD) | 31.4± 8.2 |
| Mental Component, mean (±SD) | 43.9±11.6 |
| Functionality - PSFS | 2.6±2.0 |
| Pain intensity - NPRS | 8.5±1.6 |
| Mild, n (%) | - |
| Moderate, n (%) | 2 (11.1) |
| Severe, n (%) | 16 (88.9) |

PSFS = patient-specific functional scale; NPRS = numeric pain rating scale.

Psychosocial factors (catastrophizing and kinesiophobia) were significantly correlated with quality of life and pain intensity. There was no significant correlation of variables age, pain duration, and SF-12 physical component. Table 3 summarizes correlations between measured variables.

## DISCUSSION

Women with chronic musculoskeletal pain and prevalence of central sensitization presented a low level of functionality, psychosocial impairment, and reduced quality of life. Psychosocial factors revealed a moderate correlation with high pain intensity.

**Table 3.** Correlation between variables: catastrophizing, kinesiophobia, quality of life, time of pain, and pain intensity

| | Kinesiophobia | SF-12 Total | SF-12 Physical | SF-12 Mental | Functionality[d] | Pain duration | Pain intensity |
|---|---|---|---|---|---|---|---|
| Catastrophizing[a] | .864** | - .481* | .116 | - .611** | - .059 | .411 | .628** |
| Kinesiophobia[b] | | - .584* | .005 | - .646** | - .344 | .336 | .581* |
| SF-12 total | | | .457 | .774** | .429 | - .083 | - .510* |
| SF-12 physical | | | | - .209 | .268 | .078 | - .143 |
| SF-12 mental | | | | | .351 | - .132 | - .483* |
| Functionality | | | | | | .419 | - .273 |
| Pain duration | | | | | | | .348 |

Pearson's correlation was performed between catastrophizing, kinesiophobia, quality of life (Total SF-12, physical SF-12, and mental SF-12), and age; Spearman correlation was performed between physical SF-12, time of pain, functionality and pain intensity; a: Catastrophizing measured by Brazilian Portuguese Pain Catastrophizing Scale (BP-PCS); b: Kinesiophobia measured by Tampa Scale for Kinesiophobia (TSK); c: Pain intensity measured by Numeric Pain Rating Scale; d: Functionality measured by Patients-Specific Functionality Scale (PSFS); *p<0.05; ¨ p<0.01.

The physical component of quality of life evidenced a more pronounced decrease. Although the mental component of quality of life was less affected, it was notably affected by psychosocial factors. The physical component of quality of life did not show any relationship with the variables studied.

In our study, a moderate correlation was shown between catastrophizing and pain intensity. Similar results were observed with chronic[33,34] and subacute pain[35]. Moreover, our findings have shown high indexes of kinesiophobia and these indexes were related to pain intensity. Similar results were found by Lundberg et al.[36], when evaluating chronic back pain. These findings suggest that the intensity of pain could contribute to fear of movement and fear of a new injury. Zale et al.[37] evaluated in a meta-analysis the association between kinesiophobia and disability in subjects with acute and chronic pain that had different diagnoses. The authors observed a weak association between kinesiophobia and pain intensity. A similar result, with a weak association between these variables, was observed in an assessment of patients with acute and chronic low back pain[38]. The difference between these studies and the present study may be explained by the different characteristics of the samples studied. While our study assessed exclusively subjects with central sensitization, the other two studies evaluated subjects with both acute and chronic pain.

In current study, we observed high levels of catastrophizing, as well as a close relationship with kinesiophobia and the mental component of quality of life. Previous studies have shown that pain catastrophizing is associated with high levels of pain and disability, and a worse evolution of the treatment[39,40]. Several conditions have central sensitization such as low back pain[13], rheumatoid arthritis[41], osteoarthritis[42] and fibromyalgia[43], showing high levels of catastrophizing, which may be related to reduced endogenous inhibition of pain in central sensitization, associated to the development, maintenance, and worsening of persistent pain[44].

Catastrophizing showed high correlation with kinesiophobia in the present study, as previously documented by Vlaeyen et al.[45]. The correlation between psychological factors can be explained by the fear-avoidance model in which catastrophic thoughts about pain are interpreted as fear and are seen as an injury risk signal[46]. The fear that some movement could trigger a new lesion favors safety behaviors, leading to avoidance behavior of physical movements, followed by disability, disuse, and depression[47]. These factors can affect the experience of pain and lead to the development of chronic pain and disability[12] in patients with central sensitization[48,49]. Picavet, Vlaeyen and Schouten[50] when evaluating patients with chronic low back pain, found a low correlation (r=0.35) between catastrophizing and kinesiophobia though high levels of catastrophizing and kinesiophobia were predictive factors in worsening low back pain and disability of the subjects.

In our study, there was a higher reduction of the physical component of the SF-12 compared to the mental component, but there was no significant correlation between the physical component and any other variable. Similar findings were reported by Ogunlana evaluating patients with chronic low back pain, in which there was a greater reduction of the physical component of quality of life when compared to the mental component[14]. The reduction in quality of life noticed in patients with chronic low back pain can also be observed in subjects with chronic pain when compared to healthy individuals[13]. Chronic low back pain can deeply affect functional activities of the individual in society, leading to restriction of participation, and reduced quality of life. Moderate correlation between the SF-12 and total pain intensity was shown in our study, corroborating previous studies assessing chronic low back pain[13,14,51]. In a review conducted by Horn et al.[52] reported two papers with high correlation between the functionality and the physical component of quality of life and a low correlation between functionality and the mental component. However, Guclu et al.[53] evaluating subjects with chronic back pain found a weak correlation between the physical domains of quality of life and kinesiophobia in addition to weak to moderate correlation with pain intensity.

Besides the association with pain intensity, we observed a moderate negative association between quality of life and psychosocial factors (catastrophizing and kinesiophobia). Lame et al.[13], studying a heterogeneous group of chronic pain found a strong correlation between catastrophizing and all domains of quality of life, with a greater association with the mental component. According to the authors, patients with high catastrophizing index have lower quality of life compared to those with low levels of catastrophizing, corroborating the main findings of the present study. Studies have shown that quality of life is more associated with the functional and psychological state of the patient than with the physically disabled itself[13, 51].

There was no significant correlation in the current study between functionality and any other variable tested, however, conflicting results have been reported in the literature when correlations are proposed between functionality and psychosocial factors. A weak association between pain intensity and kinesiophobia was noticed by Guclu et al.[53] when evaluating patients with chronic low back pain. Preuper et al.[54], in a multicenter study, evaluated the relationship between psychosocial impairment and self-reported disability in patients with chronic non-specific low back pain. The values of the associations varied between 6 centers studied and was not observed a strong association between these variables. However, conflicting results were observed by Camacho et al.[55] who associated psychosocial factors with self-reported disability and the performance tests. The Patient-specific Functionality Scale, although developed to evaluate the functional condition of patients with various musculoskeletal disorders, is currently validated and reliable to evaluate a small number of conditions such as injury to the knee, low back and cervical spine. When used in conditions that their properties have not been established, the results may be less significant[52]. As our study sample was composed of individuals with different musculoskeletal conditions, this fact may explain the lack of correlation found between functionality with other tested variables.

Changes in sleep quality were self-reported by subjects in this study in which over 80% of subjects reported poor quality sleep. Campbell et al.[56] evaluating patients with osteoarthritis found an association between quality of sleep and central sensitization. These findings were justified by the interaction between the neu-

ral system where brain structures associated with the generation and maintenance of sleep are involved in pain modulation[57,58]. Sleep disorders have been observed in most subjects with chronic pain[59]. Buenaver et al.[60] analyzing the relationship between sleep disorder and catastrophizing in subjects with chronic pain reported that negative thoughts about the pain had an effect on self-reported sleep disorder. Nevertheless, in the current study there was no correlation between sleep quality and catastrophizing. In a review conducted by Finan, Goodin and Smith[58] were analyzed studies which associated sleep disorders both to increased risk of chronic pain in healthy individuals and the worst prognosis of chronic musculoskeletal pain.

Some limitations should be considered when interpreting data obtained in this study. The main limitation of this study was the sample size and the fact that it was composed exclusively of women. Although our results are consistent with other studies they may have been affected by the sample size. Furthermore, the sample composition by subjects with central sensitization does not allow the application of these results in conditions of acute or subacute pain. Results obtained by the questionnaires may have been influenced by the fact that they are self-applied and most subjects had low education level. Despite of the study limitations, the current study evidenced that central sensitization patients are highly affected by psychosocial factors. Thus, the management of psychosocial factors should be emphasized in patients with central sensitization, since some chronic pain patients do not develop central sensitization predominance[11].

## CONCLUSION

Psychosocial factors were highly prevalent in women with chronic musculoskeletal pain who had central sensitization predominance. Pain intensity and quality of life were negatively influenced by psychosocial factors. The psychosocial component has an important role in chronic pain patients with central sensitization predominance.

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