

Exploratory study of the factors affecting quality of life in patients with chronic musculoskeletal pain

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Abstract

Background

A therapeutic target for patients with chronic musculoskeletal pain is the improvement of quality of life (QOL). A multidisciplinary approach to pain management is implemented at the Pain Management Center, Hoshi General Hospital, Japan. We consistently evaluate not only biological pain factors but also pain levels, psychosocial factors associated with pain, and QOL using questionnaires. The study aim was to explore the factors affecting QOL in patients with chronic musculoskeletal pain.

Methods

Subjects were 166 patients attending checkups at our pain management center from April 2015 to March 2020 who had valid questionnaire responses. We evaluated age, scores on the Brief Pain Inventory (BPI), Pain Catastrophizing Scale, Pain Disability Assessment Scale (PDAS), Hospital Anxiety and Depression Scale, Pain Self-Efficacy Questionnaire (PSEQ), EuroQol Five Dimensions Questionnaire, and Athens Insomnia Scale (AIS). Descriptive statistics were calculated for the 166 patients' scores. Pearson's product-moment coefficient correlations were calculated to examine associations among the variables. Subsequent multiple regression analysis, in which QOL was the dependent variable, resulted in a coefficient of determination (R^2) of 0.58, indicating strong relationships among the variables ($p < 0.01$).

Results

The standardized regression (beta) coefficients showed significant associations ($p < 0.05$) among BPI, PDAS, PSEQ, and AIS scores and QOL (EuroQol Five Dimensions Questionnaire scores). However, Hospital Anxiety and Depression Scale and Pain Catastrophizing Scale scores were not strongly associated with QOL.

Conclusions

QOL in patients with chronic musculoskeletal pain was strongly related to BPI, PDAS, PSEQ, and AIS scores. We should focus on these factors to improve QOL.

Background

Chronic musculoskeletal pain is a common problem worldwide that results in a decline in people's quality of life (QOL) and impacts normal social life. An important therapeutic target for patients with chronic musculoskeletal pain is the improvement of QOL [1]. A multidisciplinary approach to pain management has been implemented for patients with chronic musculoskeletal pain at the Pain Management Center, Hoshi General Hospital, Japan. We always evaluate and address not only the biological factors of pain

but also pain levels, psychosocial factors associated with pain, and QOL (using questionnaires) before providing treatments. We assume that patients with chronic musculoskeletal pain engage in repeated doctor shopping and/or enter a vicious cycle of chronic pain. Therefore, we hypothesized that the improvement of QOL in patients with chronic musculoskeletal pain is associated with specific patient characteristics; namely, pain severity and pain-related psychosocial factors. However, it is unclear which factors are associated with QOL in patients with chronic musculoskeletal pain. The purpose of this study was to explore the factors that affect QOL (such as pain levels and pain-related psychosocial factors) in patients with chronic musculoskeletal pain [1–8].

Materials And Methods

Patients

Subjects were 166 patients (57 men, 109 women) with chronic musculoskeletal pain who had valid questionnaire responses. The sample was drawn from 190 patients who received checkups at our pain management center in the 5 years from April 2015 to March 2020.

Multidisciplinary approach to pain management

Our medical care team at the pain management center at Hoshi General Hospital consists of orthopedic surgeons, psychiatrists, nurses, physical therapists, occupational therapists, clinical psychologists, pharmacists, and nutritionists. The center was established in April 2015 and is technically supported by the Department of Pain Medicine at Fukushima Medical University School of Medicine. The roles of each of the seven specialists have been described in detail in a previous report [6–7].

The inclusion criteria for implementation of the multidisciplinary approach to pain management were 1) patients who find it difficult to work or attend school because of chronic musculoskeletal pain; 2) patients who are confined to daily life at home but wish to return to work or school; 3) patients who accepted our treatment policy; and 4) patients who are able to pay the hospital expenses for our treatment. The exclusion criteria were 1) patients who would have difficulty participating in our treatments; 2) older adults who are unable to answer the questionnaires; and 3) patients with dementia or intellectual disabilities.

Our multidisciplinary approach to pain management involves pain education, exercise therapy, and psychotherapy. Our exercise therapy and psychotherapy are based on cognitive behavioral therapy. Specific details of the program are as follows: 1) Pain education is provided in lecture form by various specialists. The lectures cover pain mechanisms by an orthopedic surgeon, exercise and pacing by a physical therapist, assertiveness and relaxation training by a psychologist, side effects of drugs by a pharmacist, and daily life habits associated with nutrition by a nutritionist. 2) Exercise therapy with cognitive behavioral therapy comprises physical fitness and individual training, including aerobic exercise and/or stretching by physical therapists; namely, walking, underwater exercise, and strengthening and stretching of muscles. 3) Psychotherapy with cognitive behavioral therapy is used to develop patients'

assertiveness. Psychologists also provide relaxation training and role-playing exercises to increase healthy behaviors and reduce pain behaviors.

The purpose of patient education is to help patients return to functional daily life by acquiring new daily habits and coping methods for their pain. A characteristic of our program is that family members or significant others also participate in some of the educational lectures and psychotherapy sessions [8]. Our previous reports [6, 7] detail the results of the preliminary study of our 3-week inpatient multidisciplinary pain management program.

Evaluation of pain and associated factors

We evaluated patients with chronic musculoskeletal pain before they underwent inpatient program and collected the following data: 1) age; 2) pain severity assessed using the Brief Pain Inventory (BPI);⁹ 3) pain-related psychosocial factors assessed using several scales, namely (a) the Pain Catastrophizing Scale (PCS) to evaluate levels of rumination, magnification, and helplessness [10, 11], (b) the Pain Disability Assessment Scale (PDAS) [12], (c) the Hospital Anxiety and Depression Scale (HADS) to assess anxiety and depression [13, 14], (d) the Pain Self-Efficacy Questionnaire (PSEQ) [15, 16], and (e) the Athens Insomnia Scale (AIS) [17]; and 3) QOL assessed using several scales, namely the EuroQol Five Dimensions Questionnaire (EQ-5D) [18, 19]. Japanese validation studies of the PCS [11], PDAS [12], HADS [14], PSEQ [16], AIS [17], and EQ-5D [19] have been conducted. Our investigators comprised nine medical staff members: seven specialists (an orthopedic surgeon, a psychiatrist, a nurse, a physical therapist, a clinical psychologist, a pharmacist, and a nutritionist) to collect the data and two technicians to analyze patient data.

Data acquisition was performed at patients' initial visits.

Statistical analysis

Statistical analyses were performed as follows. First, descriptive statistics were calculated after entering the scores of the 166 patients. The data distribution for each measure was analyzed using the Shapiro-Wilk test of normality. Multiple regression analysis using the forced entry method was performed to determine which variables were associated with QOL. QOL was the dependent variable, and the other measures were the independent variables. We considered p -values less than 0.05 to be statistically significant in the variance analyses. Statistical analyses were performed using IBM SPSS version 25 (IBM Corp., Armonk, NY, USA).

Results

We calculated the means and standard deviations of scores of each measure for the 166 patients with valid responses. Descriptive statistics and results of the paired t-tests to examine sex differences are shown in Table 1. There was a significant sex difference for PSEQ scores only.

Next, we examined the correlations between the independent variables and between each independent variable and QOL (i.e., the dependent variable) before performing a multiple regression analysis. We used Pearson's product-moment coefficient because the data were normally distributed. The correlations between each independent variable (except age) and QOL (as measured by the EQ-5D) ranged from 0.3 to 0.7 (Table 2). Therefore, we performed a forced entry multiple regression analysis to examine the associations between QOL and all measures as explanatory variables (Fig. 1).

The dependent variable in the multiple regression analysis was QOL. The analysis produced a coefficient of determination (R^2) of 0.58 (Figure 1). This result indicated that there were strong relationships between the variables (variance analysis: $p < 0.01$). The independent variables, dependent variable, and standardized partial regression coefficients are shown in Table 2. The standardized (beta) regression coefficients showed significant associations ($p < 0.05$) between the independent variables of BPI, PDAS, PSEQ, and AIS scores and the dependent variable, QOL (EQ-5D score) (Fig. 1). However, the associations between HADS (anxiety and depression) and PCS (rumination, magnification, and helplessness) scores and QOL were weak (Fig. 1).

Discussion

This study demonstrated that QOL (measured with the EQ-5D) is closely related to pain levels (measured with the BPI), self-efficacy (measured with the PSEQ), pain disability (measured with the PDAS), and sleep disorders (measured with the AIS).

The pathology of chronic musculoskeletal pain is characterized by a complex combination of biological and psychosocial components. The causal relationship between pain and pain-related factors is less clear in longer-term musculoskeletal pain. Furthermore, pain behavior and psychosocial factors related to pain may become more interlinked. The International Association for the Study of Pain has reported that changes in physical and psychosocial factors from chronic musculoskeletal pain include muscle weakness and deconditioning associated with a reduction in daily activity, malnutrition, somniphobia, drug dependence, dependence on family, isolation from family or society, a decline in job performance (e.g., presenteeism and absenteeism), and economic burden. These factors may prolong pain duration and reduce the effects of treatment. The International Association for the Study of Pain recommends evaluating various aspects of patients' pain for a multidisciplinary treatment approach. A multidisciplinary approach has been used in the USA and Europe since Bonica highlighted the necessity of such an approach in the 1950s [20]. Interventions using a multidisciplinary approach for patients with chronic musculoskeletal pain include patient education, exercise therapy and psychotherapy based on patient-centered cognitive behavioral therapy, and pain-coping training, which is delivered by professional teams. Professional teams consist of health professionals, such as orthopedic surgeons, psychiatrists, anesthesiologists, physicians, neurologists, dentists, nurses, physical therapists, occupational therapists, clinical psychologists, pharmacists, nutritionists, and social workers. Each professional considers the patient's pathology after evaluation and following discussions in an open conference. However, little is known about which factors affect QOL in patients with chronic musculoskeletal pain.

Previous studies have assessed the interaction between QOL and chronic pain (Table 3). Damush et al. found that physical function was not associated with QOL in older adult women [21]. Pereira et al. evaluated the variables, such as psychological morbidity, illness representations, pain, and coping, that contribute to QOL and analyzed the moderating effect of illness-focused and wellness-focused coping on the relationship between pain interference and QOL in patients with chronic pain. They concluded that 1) the use of wellness-focused coping and being active were associated with better physical QOL, and psychological morbidity contributed to mental QOL; 2) illness-focused and wellness-focused coping moderated the relationship between pain interference and physical QOL but not mental QOL; and 3) because pain interference is positively related to psychological morbidity, and psychological morbidity is negatively related to QOL, the evaluation and promotion of patient coping strategies that are focused on well-being to improve QOL are vital [22]. In a Greek study, Rapti et al. showed using univariate analysis that individuals who had experienced chronic pain and depression showed lower health-related QOL and found a substantial negative correlation between QOL and pain and depression scores using regression analysis [23]. Leadley et al. concluded in their review that 1) there is strong evidence of a correlation between pain severity and QOL, 2) there is some evidence that chronic pain treatment can reduce pain and simultaneously improve QOL, and 3) prevention and treatment of chronic pain may be an important contributor to increasing a healthy lifespan [24]. Keilani et al. reported that physical and psychological dimensions of QOL notably affect both pain perception and sleep quality, and thus, modify the association between pain perception and sleep quality [25]. Other studies have indicated a high prevalence of chronic back pain and a substantial burden on QOL [26].

Thus, previous findings have suggested that various physical and psychological factors are related to QOL. Importantly, chronic musculoskeletal pain is associated with both physical and mental well-being, and chronic musculoskeletal pain is associated with poor QOL. These findings are consistent with the results of a 2001 national survey in Spain using the Health Assessment Questionnaire and the Short Form Health Survey-12, which found that musculoskeletal diseases significantly reduce both QOL and function [27]. Chronic back pain is associated with similar mental health impairments but with greater physical impairment [28]. Chronic pain is often linked to disruptions in daily activities, disability, unemployment, psychological effects, and drug abuse [29]. A case-control analysis of insurance claims data in the USA showed that patients with chronic lower back pain had greater comorbidity burdens than those of the control group and experienced substantially higher frequencies of musculoskeletal pain, neuropathic pain, depression, anxiety, and sleep disorders [30]. The present findings indicate similar comorbidity patterns among patients with chronic musculoskeletal pain.

There are few exploratory studies on psychosocial factors associated with improvements in QOL. Previous studies have indicated that the following factors are associated with QOL: 1) pain catastrophizing and social participation, 2) pain and depression scores (a negative association), 3) depression, anxiety, and mobility in daily activities associated with chronic musculoskeletal pain, and 4) pain perception and sleep quality (Table 3). However, the present study sought to identify the determinants of chronic musculoskeletal pain and examine the association between chronic musculoskeletal pain and QOL. We examined the associations between QOL and pain levels, self-efficacy,

pain disability, and sleep disorders. Therefore, there are some differences between the results of this exploratory study and previous study findings on the psychosocial factors associated with QOL. We found that QOL was strongly associated with pain levels, self-efficacy, pain disability, and sleep disorders, and weakly associated with PCS (rumination, magnification, and helplessness) and HADS (anxiety and depression) scores. Our multiple regression analysis explored the factors that had stronger associations with QOL for patients with chronic musculoskeletal pain in our hospital. These data on the psychosocial factors associated with QOL may help to raise awareness among medical staff who use multidisciplinary approaches to pain management. Moreover, they may inform health policymakers on the need for prevention, early diagnosis, proper pain management, and rehabilitation policies to minimize the burdens associated with chronic musculoskeletal pain.

Limitations

There are several important study limitations. First, we did not analyze differences in pain region and/or type of pain in detail because we restricted the sample to patients with chronic musculoskeletal pain who had valid questionnaire responses who attended checkups at our pain management center. Second, we did not analyze the association between physical function and QOL in this study. Third, we cannot determine how the therapeutic effect of multidisciplinary pain treatment affected the factors associated with QOL because we evaluated these factors before treatment. Future studies should assess the factors that affect QOL after multidisciplinary pain treatment.

Conclusions

QOL in patients with chronic musculoskeletal pain is closely related to BPI, PDAS, PSEQ, and AIS scores. We should pay more attention to these factors to improve QOL.

List Of Abbreviations

QOL, quality of life; BPI, Brief Pain Inventory; PCS, Pain Catastrophizing Scale; PDAS, Pain Disability Assessment Scale; HADS, Hospital Anxiety and Depression Scale; PSEQ, Pain Self-Efficacy Questionnaire; AIS, Athens Insomnia Scale; EQ-5D, EuroQol Five Dimensions Questionnaire.

Declarations

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Authors' contributions

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data, took part in drafting the article or revising it critically for important intellectual content, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

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Availability of data and materials

The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

Ethics approval and consent to participate

The current study was approved by the ethics committees of the participating institutions: Fukushima Medical University (Reference number: 2429) and Hoshi General Hospital (Reference number: 27-3). Written informed consent was obtained from all patients before they participated in the study.

Consent for publication

Not applicable.

Competing interests

The authors declare that there are no conflicts of interest regarding the publication of this article.

Authors Detail

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Tables

Table 1 Descriptive statistics and paired t-test results: sex comparison

		Women (n = 109)		Men (n = 57)		Total (n = 166)		p
		Mean	SD	Mean	SD	Mean	SD	
Age		52.6	15.8	48.2	15.8	51.1	15.9	0.13
EQ-5D		0.536	0.179	0.551	0.154	0.541	0.171	0.81
BPI		22.8	8.6	21.7	8.2	22.4	8.5	0.45
PDAS		26.9	15.1	25.7	11.9	26.5	14.1	0.10
HADS	Anxiety	8.9	4.8	8.6	4.5	8.8	4.7	0.13
	Depression	9.2	4.8	9.3	4.9	9.2	4.8	0.20
PCS	Rumination	14.3	4.8	14.8	4.2	14.4	4.6	0.12
	Magnification	6.4	3.6	6.4	3.4	6.4	3.5	0.16
	Helplessness	12.4	6.6	12.1	5.5	12.3	6.2	0.10
PSEQ		26.2	14.8	22.0	12.6	24.8	14.2	0.01
AIS		8.8	5.8	9.2	4.2	8.9	5.3	0.33

We calculated the mean and standard deviation for each measure for the 166 patients with valid questionnaires. Data are descriptive statistics and paired t-test results. The mean scores (except for the HADS) were over the cutoff value, which indicated that the means and standard deviations for each measure (e.g., pain severity, pain-related factors, and QOL) were abnormal. However, HADS depression scores were at normal levels. Shapiro-Wilk tests of normality confirmed that all data were normally distributed. The t-test showed that only PSEQ scores differed between men and women.

Abbreviations: SD, standard deviation; EQ-5D, EuroQol Five Dimensions Questionnaire; BPI, Brief Pain Inventory; PDAS, Pain Disability Assessment Scale; HADS, Hospital Anxiety and Depression Scale; PCS, Pain Catastrophizing Scale; PSEQ, Pain Self-Efficacy Questionnaire; AIS, Athens Insomnia Scale.

Table 2 Pearson's correlation coefficients of each measure

	QOL (EQ-5D score)	Age	BPI	PDAS	HADS		PCS			PSEQ	AIS	
					Anxiety	Depression	Rumination	Magnification	Helplessness			
QOL (EQ-5D score)	1	—	—	—	—	—	—	—	—	—	—	
Age	-0.010	1	—	—	—	—	—	—	—	—	—	
BPI	-0.489**	0.051	1	—	—	—	—	—	—	—	—	
PDAS	-0.582**	0.043	0.402**	1	—	—	—	—	—	—	—	
HADS	Anxiety	-0.509**	-0.097	0.288**	0.498**	1	—	—	—	—	—	
	Depression	-0.584**	0.065	0.381**	0.522**	0.744**	1	—	—	—	—	
PCS	Rumination	-0.385**	-0.012	0.254**	0.439**	0.518**	0.559**	1	—	—	—	
	Magnification	-0.489**	-0.056	0.316**	0.492**	0.683**	0.626**	0.668**	1	—	—	
	Helplessness	-0.481**	0.030	0.322**	0.465**	0.589**	0.583**	0.635**	0.728**	1	—	
PSEQ		0.621**	0.023	-0.332	-0.249	-0.251	-0.384	-0.070	-0.257	-0.246	1	—
AIS		-0.505**	-0.085	0.295**	0.446**	0.602**	0.595**	0.510**	0.594**	0.466**	-0.253	1

**p < 0.01

Abbreviations: QOL, quality of life; BPI, Brief Pain Inventory; PCS, Pain Catastrophizing Scale; PDAS, Pain Disability Assessment Scale; HADS, Hospital Anxiety and Depression Scale; PSEQ, Pain Self-Efficacy Questionnaire; EQ-5D, EuroQol Five Dimensions Questionnaire; AIS, Athens Insomnia Scale.

Table 3 Factors associated with QOL in previous studies

First Author ^{Citation} Number (year)	Summary of factors associated with QOL
Damush TM ²¹ (1999)	Physical function was not associated with QOL in older adult women.
Pereira MG ²² (2021)	Pain interference was positively related to psychological morbidity, and psychological morbidity was negatively related to QOL. Thus, it is extremely important to evaluate and promote patient coping strategies that are focused on wellbeing to improve QOL in patients with chronic pain.
Rapti E ²³ (2019)	Individuals with chronic pain and depression had lower health-related QOL, and there was a substantial negative correlation between QOL and pain and depression scores.
Leadley RM ²⁴ (2014)	Prevention and treatment of chronic pain may be an important contributor to increasing a healthy lifespan.
Keilani M ²⁵ (2018)	Physical and psychological dimensions of QOL had a notable effect on both pain perception and sleep quality. Therefore, QOL modifies the association between pain perception and sleep quality.

Abbreviations: QOL, quality of life.

Figures

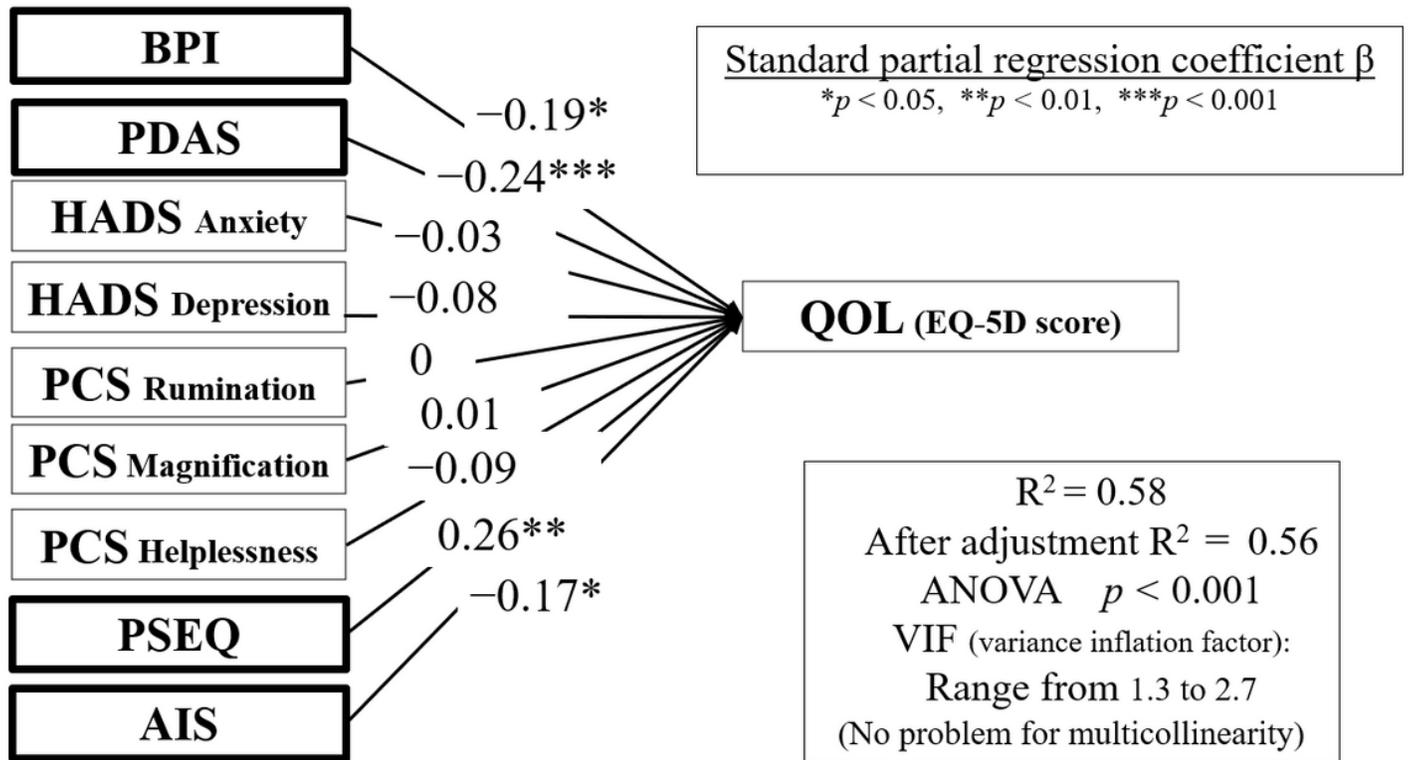


Figure 1

Standardized regression (beta) coefficients showing associations between each independent variable and the dependent variable (EQ-5D score). There were significant associations ($p < 0.05$) between BPI, PDAS, PSEQ, and AIS scores and QOL (EQ-5D scores). However, HADS and PCS scores were not strongly associated with QOL. List of Abbreviations: BPI, Brief Pain Inventory; PCS, Pain Catastrophizing Scale; PDAS, Pain Disability Assessment Scale; HADS, Hospital Anxiety and Depression Scale; PSEQ, Pain Self-Efficacy Questionnaire; EQ-5D, EuroQol Five Dimensions Questionnaire; AIS, Athens Insomnia Scale; ANOVA, analysis of variance.