





Cancer-Related Bone Pain: Patients' Satisfaction with Analgesic Pain Control

Andrew Tabu Kaggwa¹ , Protus Werunga Kituyi^{1,2} , Elijah Nzeki Muteti^{1,3} , Ramadhani Barry Ayumba^{1,3} 

¹School of Medicine, Moi University, Eldoret, Kenya

²Department of Surgery and Anesthesiology, Moi University, Eldoret, Kenya

³Department of Orthopedics and Rehabilitation Medicine, Moi University, Eldoret, Kenya

Correspondence to: Andrew Tabu Kaggwa; email: tab_oos@yahoo.com

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Abstract

Background: Management of cancer-related bone pain (CRBP) with analgesics poses a substantial challenge. This study aimed to determine the correlation between pain control satisfaction and prescribed analgesics. **Methods:** This 12-month descriptive prospective study included 96 adults who were consecutively sampled and followed up daily for 5 days. Eligible patients had histopathologically confirmed tumor, osseous lesion(s) on radiographs, and cognitive capacity to rank pain on the Numerical Rating Scale. Data were collected using questionnaires drafted from the Brief Pain Inventory. Self-assessed pain scores within the past 24 hours were reported on a scale of 0 (no pain) to 10 (worst pain). Pain control satisfaction was assessed as a single response question (satisfied, not sure, or dissatisfied). Associations were examined in multiple logistic regression models. Ethical approval and informed consent were obtained. **Results:** The median age was 57 (range, 19–90) years, and more males (52.1%) than females were recruited. The proportion of CRBP ranged from 83.3% to 86.5%, whereas that of moderate to

severe pain ranged from 57.3% to 69.8%. Overall, 70.8% were satisfied with their pain control. Patients prescribed opioids (adjusted odds ratio, 0.027; $p=0.041$) had an increased likelihood of pain control satisfaction. **Conclusion:** Although a high percentage of patients experienced moderate to severe CRBP, a majority were satisfied with their analgesic pain control. Prescription opioids were associated with higher satisfaction. Policies that sustain ready accessibility of analgesics, particularly opioids, should be implemented.

Keywords: Analgesics, Bone cancer pain, Satisfaction, Treatment outcomes

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Introduction

Bone malignancies include primary bone tumors that start in the bone as well as metastatic bone tumors, which occur when cancer infiltrates the bone. They are

usually associated with numerous skeletal-related events (SREs), including bone pain, pathological fractures, spinal cord compression, and hypercalcemia. Bone

malignancies are the most common causes of pain associated with cancer (1-3). Cancer-related bone pain (CRBP) is prevalent in 85% of advanced breast, prostate, lung, and kidney cancer patients (1,2), and its management with analgesics poses a substantial orthopedic challenge. If not adequately managed, it would adversely reduce the patients' quality of life (2,4). Quantifying CRBP in absolute terms remains challenging in clinical practice because most data tools focus only on pain's physical or sensory aspects. The assessment of physical pain is subjective, but it is the most effective method of quantifying pain intensity, given that it is not proportional or related to the severity of the underlying pathology. Pain is only influenced by the patient's perception of it (5,6). It goes without saying that CRBP, like any other kind of cancer pain, is frequently accompanied by psychosocial symptoms, i.e., depression, stress, anxiety, etc., that could considerably impair a patient's quality of life. However, this study does not examine the emotional or psychosocial component of CRBP.

Up to 90% of patients with bone malignancies are estimated to have varying degrees of CRBP (1,7), and its severity is usually moderate to severe (1). However, patients often receive suboptimal analgesic pain management despite the knowledge that pain is an essential determinant of cancer patients' quality of life (2,4).

The role of analgesics remains crucial in controlling CRBP (1,8,9), as they provide over 80% cancer pain relief if used effectively (10). Potent opioids are still the recommended first-line analgesics in managing moderate to severe CRBP (2). However, underutilization or prescription of opioids is a burden in the Sub-Saharan, where only less than 1% of the global morphine is consumed (11). The low morphine consumption has been significantly attributed to shortages of analgesics, especially opioids, under-prescription, inappropriate pain assessment, underutilization of guidelines, and misconceptions on their use (11). Analgesics must therefore be prescribed appropriately and administered as directed. The World

Health Organization (WHO) analgesic ladder remains the widely acknowledged standard in cancer pain treatment, assisting clinicians in clinical decision-making when selecting the potent analgesics. Appropriate cancer pain assessment using validated tools is thus crucial, as analgesic steps are recommended based on pain intensity.

A primary survey conducted at Moi Teaching and Referral Hospital by the principal researcher revealed that a sizable proportion of bone malignancy patients complained of some degree of pain despite being on different specific analgesics meant to control pain. It was, however, unclear whether patients were satisfied with their analgesic pain control. It was also impossible to gauge satisfaction outcomes and the management of CRBP with analgesics at MTRH with the rest of the world. The regional void of information on CRBP and satisfaction as a treatment outcome necessitated the need for this study. It is justifiable that this study will provide baseline data to help inform the development and strengthening of CRBP management protocols at the facility. It will also offer baseline data for future related research.

On further literature review, it was not clearly understood whether prescribed analgesics influence satisfaction with CRBP control. The concept that satisfaction with pain control is a vital indicator of analgesic effectiveness in CRBP treatment outcomes may suggest such a correlation. Conflicting information exists regarding the correlates of patients' pain control satisfaction. The amount of pain relief obtained by a patient (12), aspects of the patient-provider interaction, pain intensity, age, beliefs, and anxiety at treatment onset are predictive of satisfaction with pain control (13-17). Locally, no study that assessed patients' satisfaction with pain control based on the extent and nature of CRBP was found. This study also aimed to determine the relationship between satisfaction with pain control and prescribed analgesics in order to lend credibility or justify CRBP management protocol with analgesics as well as to ascertain whether pain management is satisfactory to the patient.

Methods

Study designs and settings

This descriptive prospective study was conducted at Moi Teaching and Referral Hospital in Eldoret town in western Kenya from March 2019 to March 2020. At least 600 cases of cancer are diagnosed at the hospital annually. In western Kenya, it serves as the most prominent cancer treatment center. The study was conducted in the hospital's wards and out-patients' clinics. Informed written consent and Institutional Research and Ethics Committee approval were sought.

Study population and eligibility

The study population included out- and in-patients diagnosed with either primary or metastatic bone malignancies. CRBP was defined as physical pain or discomfort localized in the region of the osseous lesion. The pain was either caused by the bone tumor or the administered anti-cancer therapy, that is, radiotherapy, chemotherapy, or surgery used to treat these bone malignancies. It included only physical pain, i.e., pain caused by either compression, infiltration, or inflammation of the affected bone, surrounding soft tissues, or nerves. Adult (≥ 18 years) patients who had a histopathologically confirmed tumor, osseous lesion(s) on radiographs, and a cognitive capacity to rate pain on the Numerical Rating Scale (NRS) were included. Patients who declined to consent, follow-up, or had non-CRBP were excluded. This was a census study, and preliminary screening of patients' files for study eligibility was done by the principal researcher at the nurse's station. The study recruited and followed up 102 patients who met the inclusion criteria using the consecutive sampling method. Only 96 patients were included in the final analysis, as shown in Figure 1.

Procedures

After confirming the patients' eligibility, the principal researcher thoroughly explained the study's objectives to the participants before obtaining their informed consent. Patients' prescribed analgesics and pain levels were assessed at baseline after a clinician review. Following that, daily follow-up assessments for 5 days were conducted to assess pain relief and pain control

satisfaction. Data on sociodemographics (i.e., age, sex, and level of education), medical history (i.e., tumor type), Eastern Cooperative Oncology Group [ECOG] performance status, anti-cancer treatment modalities, prescribed analgesics, and SREs were collected and used as independent variables. An interviewer-based questionnaire administered by the researcher was utilized for these data. Prescribed analgesics were those prescribed by a medical practitioner.

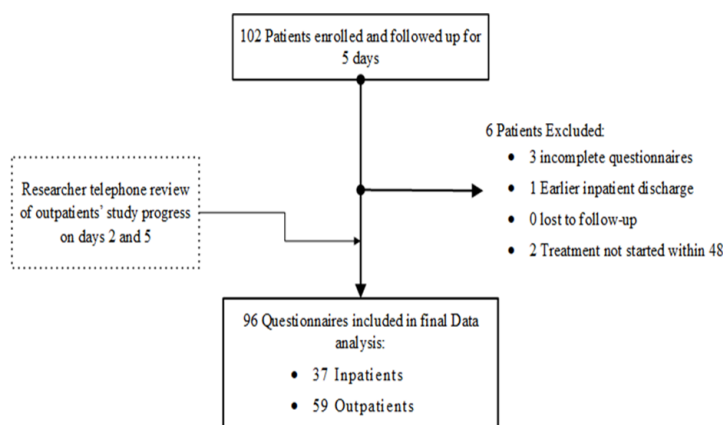


Figure 1. Number of participants enrolled into the study.

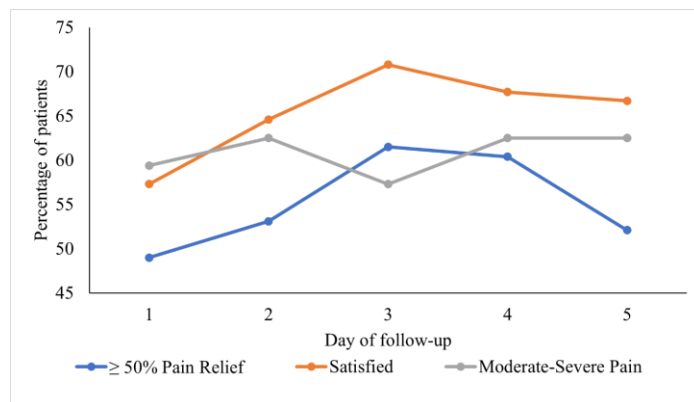


Figure 2. A summarized trend of pain and satisfaction assessment on follow-up

Baseline pain assessment utilized items 1 to 7 of the self-administered Brief Pain Inventory – Short Form (BPI-SF) questionnaire for patients' self-reported evaluation of pain. The pain was ranked on a 0 to 10 scale. CRBP intensity was categorized into mild (0–3), moderate (4–

6), and severe (7–10) for statistical analysis. The time spent with each patient was approximately 25 to 30 minutes. For patients who could not understand English, a translator was used. A Swahili version of the self-administered questionnaire was also available.

Follow-up pain assessment assessed a patient's daily self-reported average pain intensity score in 24 hours, pain relief, pain control satisfaction, and any modifications made in the analgesics prescribed. Patients and their caretakers were instructed on how to fill out the self-administered follow-up questionnaire. They were then given five leaflets of the follow-up questionnaire in a sealed envelope and were encouraged to fill each independently. Out-patients were contacted by telephone on days 2 and 5 of follow-up to check on their progress and document their responses. Telephone conversations lasted, on average, 15 minutes. Patients returned the questionnaires for record-keeping and recorded data concordance on the next review. On each follow-up day, a self-filled questionnaire was collected from the in-patients. The researcher noted modifications to analgesics in accordance with the treatment sheet but made no interventions in any patient's treatment plan or clinician's decision.

Study participation ended primarily on completing the follow-up period or when a patient had not started the prescribed medications within 48 hours of recruitment, was lost to follow-up, died, had earlier in-patient discharge, or had out-patient admission before completion of the follow-up period.

The dependent variables were moderate to severe CRBP and pain control satisfaction. The baseline average pain severity score of any given patient was calculated by adding the pain intensity scores of items 3, 4, 5, and 6 of the BPI-SF; then, the total score was divided by 4. Moderate to severe pain was categorized as an average pain severity score ≥ 4 .

On follow-up, satisfaction with pain control was evaluated as a single self-response question (satisfied, not sure, or dissatisfied). Satisfaction was assessed longitudinally on each day of follow-up. After follow-up, a patient's overall satisfaction level was regarded as a single response with the most correspondence, that is, three or more of the similar single response. In case a

patient had equivocal responses, their response was then regarded as "not sure." No prior specific period episodes of contact with the patient were considered in this evaluation.

Data analysis

Data were analyzed using SPSS (IBM Corp., Armonk, NY, USA). Descriptive statistics presented appropriately in graphs and charts were used to summarize patients with moderate to severe CRBP and those satisfied with analgesic pain control. Categorical variables, i.e., sex, and continuous variables, i.e., age, were summarized as frequencies, percentages, means, medians, standard deviation, and ranges.

The chi-square and Fisher's exact t-tests examined associations between categorical variables. Mann-Whitney U test was used to compare means of continuous variables. Variables with p -values < 0.05 were then entered into multiple logistic regression models. A p -value < 0.05 was regarded statistically significant in explaining the presence of the dependent factor investigated.

Results

Of the 102 patients enrolled and followed up, only 96 were included in the final statistical analysis. The median age was 57 (range, 19–90) years, and more males 50 (52.1%) than females 46 (47.9%) were recruited (Table 1). Most patients either attained a primary education level (33.3%) or no formal education (39.6%). Most patients, 63 (65.6%), had metastatic bone tumors. Cancers of prostate (38.1%), breast (34.4%), and gastrointestinal tumors (14.3%) were the most common metastatic bone tumors. In comparison, multiple myeloma (66.7%) and osteosarcoma (27.3%) were the most common primary bone tumors. Sixty-five patients (67.7%) had an ECOG functional status of 0–2. Regarding SREs, 35 (36.5%) patients had pathological fractures, whereas 20 (20.8%) patients had spinal cord compression. Sixty-one (63.5%) patients were on chemotherapy alone. Radiotherapy was offered to 4 (4.2%) patients, and 14 (14.6%) patients underwent surgery with or without chemotherapy.

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Table 1. Baseline characteristics of patients(n=96)

Age (years)	57 [44, 69.5]
Sex	
Male	50 (52.1)
Female	46 (47.9)
Education	
No formal education	38 (39.6)
Primary	32 (33.3)
Secondary	13 (13.5)
College	13 (13.5)
Tumor type	
Primary	33 (34.4)
Secondary	63 (65.6)
Eastern Cooperative Oncology Group performance status	
0–2	65 (67.7)
3–4	31 (32.3)
Pathological fracture	
Absent	61 (63.5)
Present	35 (36.5)
Spinal cord compression	
Absent	76 (79.2)
Present	20 (20.8)
Pain intensity	
Mild/no pain	29 (30.2)
Moderate/severe	67 (69.8)
Treatment modalities	
Chemotherapy	61 (63.5)
Symptomatic	17 (17.7)
Surgery with or without chemotherapy	14 (14.6)
Radiotherapy with or without chemotherapy	4 (4.2)
Prescribed analgesics	
None	34 (35.4)
Non-opioids	34 (35.4)
Opioids	28 (29.2)
Pain management index	
Inadequate	59 (61.5)

The proportion of satisfied patients ranged from 57.3% to 70.8%. A confirmatory multiple logistic regression analysis revealed that the type of prescribed analgesics ($p<0.05$) was significantly associated with pain control satisfaction. Patients prescribed opioids (adjusted odds ratio [AOR], 0.027; $p=0.041$) had an increased likelihood of having pain control satisfaction.

According to the BPI pain severity scores, 83 (86.5%) patients reported pain at the baseline assessment, with 67 (69.8%) patients having moderate to severe pain and 29 (30.2%) having mild to no pain. The follow-up pain proportion of CRBP ranged from 83.3% to 86.5%; that of moderate to severe pain ranged from 57.3% to 62.5%. A sum of 62 (64.6%) patients were prescribed analgesics at baseline (Table 2). Non-opioids were prescribed to 34 (35.4%) patients, whereas opioids were given to 28 (29.2%) patients. During follow-up, 20 (20.87%) patients were prescribed analgesics. Of those prescribed analgesics, 15 patients received opioids. At baseline, 59 (61.5%) patients received suboptimal pain management with analgesics.

Overall, 68 (70.8%) patients were satisfied with their pain control on analgesics, 14 (14.6%) were dissatisfied, and 14 (14.6%) were not sure (Table 3). Generally, pain control satisfaction slightly improved with pain relief.

Table 2. Most potent analgesics prescribed for different pain intensities at baseline (n=96)

Pain intensity	Prescribed analgesics			
	None	NSAID	Weak Opioid	Strong Opioid
None (0)	6 (6.3)	5 (5.2)	1 (1.0)	1 (1.0)
Mild (1–3)	9 (9.4)	3 (3.1)	1 (1.0)	3 (3.1)
Moderate (4–6)	17 (17.7)	22 (22.9)	1 (1.0)	10 (10.5)
Severe (7–10)	2 (2.1)	4 (4.2)	5 (5.2)	6 (6.3)

Values are presented as number (percentage).

Analgesics are categorized according to the World Health Organization's 1986 pain ladder.

NSAID, non-steroidal anti-inflammatory drug.

To test whether patients' age was a confounding factor for the perception of pain control satisfaction and therefore affected response to analgesic pain control satisfaction, the researchers used the 50th percentile to sub-group age in a binary categorical variable. At the bivariate level, pain intensity was significantly ($p<0.001$) associated with satisfaction level, but age was not (Table 4). At a multivariate level, using an exact logistic regression, pain intensity remained significantly associated (AOR=26.254; 95% confidence interval [CI], 4.32–∞) with satisfaction level, whereas age was held

constant (Table 5). However, age was not significantly associated (AOR=1.615; 95% CI, 0.55–4.91) with satisfaction level while pain intensity was held constant.

Table 3. Bivariate analysis for factors associated with pain control satisfaction

Variable	Satisfaction level		P-value
	Satisfied	Not satisfied	
Sex			
Male	31	19	0.047 ^c
Female	37	9	
Age(years)	56.5 [36.5,65]	65.5 [50.5,70]	0.022 ^m
Education			
None	24	14	0.670 ^f
Primary	24	8	
Secondary	10	3	
College/university	10	3	
Tumor type			
Primary	30	3	0.002 ^c
Secondary	38	25	
Eastern Cooperative Oncology Group performance status			
0–2	50	15	0.057 ^c
3–4	18	13	
Pathological fracture			
Absent	49	12	0.007 ^c
Present	19	16	
Spinal cord compression			
Absent	59	17	0.004 ^c
Present	9	11	
Pain intensity			
Mild/no pain	29	0	-
Moderate/severe	39	28	
Treatment modalities			
Chemotherapy	44	17	-
Symptomatic	7	10	
Surgery with or without chemotherapy	14	0	
Radiotherapy with or without chemotherapy	3	1	
Prescribed analgesics			
None	18	16	0.007 ^c
NSAID	25	9	
Opioid	25	3	
Pain Management Index			
Inadequate	31	28	-
Adequate	37	0	

Values are presented as median [interquartile range] or n.

NSAID, non-steroidal anti-inflammatory drug.

^c Chi-Square; ^f Fishers Exact Test; ^m Mann Whitney U test.

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Table 4. Bivariate analysis for sub-group age and pain intensity per satisfaction level

Variable	Satisfaction level		P-value
	Satisfied	Not satisfied	
Pain intensity			
No/mild pain	29	0	<0.001
Moderate/severe pain	39	28	
Age			
18–57 years	34	10	0.202
58–90 years	34	18	

Values are presented as n.

Table 5. Multivariate logistic analysis for factors associated with pain control satisfaction

Variable	AOR	P-value	95% CI
Sex			
Male	1		
Female	0.338	0.301	0.043–2.639
Age			
Covariate	1.052	0.205	0.972–1.137
Tumor type			
Primary	1		
Secondary	65.533	0.011	2.558–1678.496
Pathological fracture			
Absent	1		
Present	12.197	0.156	0.386–384.924
Spinal cord compression			
Absent	1		
Present	5.913	0.329	0.166–209.994
Prescribed analgesics			
None	1		
NSAIDs	0.587	0.628	0.068–5.043
Opioids	0.027	0.041	0.000–0.858

AOR, adjusted odds ratio; CI, confidence interval; NSAID, non-steroidal anti-inflammatory drug.

The researchers also conducted a separate analysis for age groups, finding a significant association (AOR=12.789; 95% CI, 1.87–∞) between pain intensity and satisfaction among those aged 18 to 57 years. In addition, the relationship between pain intensity and satisfaction level was significant (AOR=12.663; 95% CI, 1.84–∞) among those aged 58 to 90 years. Age was not identified as a significant confounder in pain

perception to affect response to analgesic pain control satisfaction

Discussion

The present study provided a sub-analysis of satisfaction outcomes from a larger dataset on the management of CRBP at Moi Teaching and Referral Hospital. Satisfaction with pain control varied slightly on each day of follow-up. One of the important findings was that

most patients (70.8%) were satisfied with pain control despite high proportions of reported unrelieved moderate to severe pain and inadequate pain management. The present researchers also noted that satisfaction relatively increased with pain relief and as the number of patients with pain relief $\geq 50\%$ increased. Further review of the literature provided some evidence to support these findings. Previous studies have also reported this absurdity of high proportions of satisfied patients with unrelieved moderate to severe pain (15,17). This is attributed to the fact that different patients have varying expectations and perceptions of pain relief when on a given treatment (12). Furthermore, given that pain relief is predictive of improved satisfaction (13), it could explain the notable improvement in patients' satisfaction as the number of patients with pain relief $\geq 50\%$ increased (Figure 2).

A few studies have shown no correlation between satisfaction and pain intensity (15), whereas others have reported a correlation with the patient's psychoemotional state (14) and age (16). On the contrary, this study found an association between pain control satisfaction and the most potent prescribed analgesics. Patients prescribed opioids were more likely to be satisfied with their pain control. Although the current researchers did not explore the relationship between satisfaction and pain relief, they can hypothesize that patients on morphine were more likely to achieve a more reasonable amount of pain relief than their counterparts. This argument can be supported by the findings of the multicenter research conducted by Davies et al. (18), which revealed that (76%) of cancer patients were satisfied with opioid-induced pain relief despite 60% reporting severe pain. To further back up this postulation, a previous study by Carlson et al. (19) also showed that satisfaction as a measure of pain management outcome is influenced by the effectiveness of pain medications and is somewhat independent of pain intensity and communication. However, this remains a subject of further investigation.

Study findings imply that analgesics remain critical in CRBP treatment outcomes, and that opioid-induced pain relief produces satisfactory analgesia outcomes for bone malignancy patients. However, this study observed an

under-prescription of opioids by the prescribing clinician in CRBP management at the hospital. The study could not establish whether the under-prescription was either due to the unavailability of opioids or institutional restrictions on opioid use. It could also be that the clinicians inappropriately assessed the CRBP of the patients and prescribed inappropriate analgesics.

In this study, the patient's age might not have been a significant confounder for response to pain control satisfaction. However, controversy does exist on age group differences in patients' satisfaction with pain management. The argument is mainly based on the fact that the different age groups perceive and respond to pain differently. Part of the literature has shown that an individual's age significantly influences pain severity and response to pain (16). In contrast, others report no significant age-related association with overall satisfaction. At the bivariate level, patients aged 18 to 57 years in this study had an increased likelihood of reporting higher satisfaction levels. This result counters Baker et al. (16), who demonstrated significantly lower satisfaction levels in this age group (<65 years). Although not assessed, the age-related differences could be due to the emotional or psychosocial effects of CRBP. As CRBP is frequently associated with psychological distress, this clarifies, at least in part, why it is essential to consider the emotional or psychosocial state of a patient when assessing pain-related demographic differences.

This study has some limitations. First, the WHO pain ladder as a tool used to guide clinicians in decision-making when prescribing analgesics does not consider aspects of drug dosages, administration of the prescribed medicines, and administration route. Such may have an impact on analgesics' effectiveness on pain control. Second, the NRS as a tool objectively quantifies physical pain, but does not factor in the emotional component of pain. It could affect a patient's perception of satisfaction with pain management.

Conclusion

Overall, 70.8% were satisfied with their analgesic pain control. Patients prescribed opioids had an increased likelihood of pain control satisfaction. However, it was

not fully understood why many patients showed satisfaction with pain control despite the relatively high percentages of reported moderate to severe pain. There was a noticeable increase in satisfaction levels with increase in pain relief, which postulates a relationship between satisfaction and pain relief. This suggests an in-depth study.

Organizational health policies that sustain and ensure ready accessibility of analgesics, particularly opioids, should be implemented, in order to facilitate low-cost and easy access to the best potent analgesics for CRBP management. The correlation between pain control satisfaction and prescribed analgesics supports this recommendation.

Lastly, the absurdity of high proportions of satisfied patients despite significant levels unrelieved moderate to severe pain and/or inadequate pain management requires further exploration at the multicenter level with long-term longitudinal assessments. In our study, the results suggested that age was not a significant cofounder for satisfaction. Nonetheless, it should be noted that there are age, sex, and type of pain-related differences. Therefore, further research on the unmeasured psychosocial-related pain in this study would better understand these differences. It may better explain the phenomenon of high proportions of satisfied patients despite significant levels of unrelieved pain. It will also aid the development and selection of more effective therapeutic medicines for the treatment of both physical and psychosocial CRBP.

Conflict of interest

None to disclose

Author contributions

All authors contributed equally to writing and editing the original draft.

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