Original Article

Postoperative Pain Evaluation: Validity and Applications of the Brief Pain Inventory (BPI)

El mostafa Amzoute[1], Abdhalem Mesfioui[2], Belkhaoud Mohamed[3], Kamal Elharas[4], Yassine Younes[5], Asmae Ouissaden[6], Sara Aderbaz[7], Mostafa Alilou[8]

ABSTRACT

Background

Approximately 70 million patients undergo surgical procedures each year, with 75 to 80% experiencing moderate to severe postoperative pain. This situation is concerning, as poorly controlled postoperative pain can lead to additional complications, prolonged recovery time, and diminished patient quality of life.

Method

The present study aims to validate the psychometric relevance of the Brief Pain Inventory (BPI) by confirming its two primary dimensions: pain intensity and its interference with activities and psychosocial well-being. The findings reveal that while pain management effectively preserves psychological and social dimensions, such as sleep and interpersonal relationships, a significant proportion of patients (51%) continue to suffer from moderate to severe pain. This pain markedly impacts mobility and daily activities, with nearly 60% of patients perceiving pain management as insufficient. Additionally, 58% of patients report atypical pain, indicating the need for more targeted therapeutic adjustments. The data also reveal that 42% of patients report mild pain or impact according to the global BPI score. However, 38% of patients experience moderate pain or impact, signaling partial interference with daily activities. Finally, 20% of patients suffer from severe pain or impact, highlighting the urgency for multimodal strategies combining pharmacological treatments, physical interventions, and psychological support to optimize postoperative quality of life.

Conclusion

These findings affirm the BPI as a valuable tool for evaluating and adapting pain management approaches across diverse clinical contexts.

Keywords

Brief Pain Inventory; Postoperative Pain;Chirurgical; Pain

INTRODUCTION

Postoperative pain management is a critical concern for all patients, irrespective of their race/ethnicity, gender, or socioeconomic status (SES). Patients undergoing surgical procedures universally expect effective pain control in the postoperative period[1]. However, recent studies indicate that racialized minorities and individuals with lower SES are more likely to experience more intense pain and receive inadequate postoperative pain management [2,3].

1. El mostafa Amzoute , Biology and health laboratory, Department of Biology, Faculty of Sciences, Ibn Tofail University, Kenitra – Morocco.
2. Abdhalem Mesfioui, Biology and health laboratory, Department of Biology, Faculty of Sciences, Ibn Tofail University, Kenitra – Morocco.
3. Belkhaoud Mohamed, Biology and health laboratory, Department of Biology, Faculty of Sciences, Ibn Tofail University, Kenitra – Morocco.
4. Kamal Elharas, Natural Resources and Sustainable Development Laboratory, Faculty of Sciences, Ibn Tofail University, PB 133-14050, Kenitra, Morocco.
5. Yassine Younes, Natural Resources and Sustainable Development Laboratory, Faculty of Sciences, Ibn Tofail University, PB 133-14050, Kenitra, Morocco.
6. Asmae Ouissaden, Faculty of medicine and pharmacy, Mohammed V university-Rabat, Morocco.
7. Sara Aderbaz, Faculty of Medicine, Pharmacy and Dentistry, Sidi Mohamed Ben Abdellah University-Fez, Morocco.
8. Mostafa Alilou, Anesthesia and resuscitation University Hospital Center of Rabat – Morocco.

Correspondence

Mainul Haque. Unit of Pharmacology, Faculty of Medicine and Defence Health, Universiti Pertahanan Nasional Malaysia (National Defence University of Malaysia), Kem Perdana Sungai Besi, 57000 Kuala Lumpur, Malaysia. **Email**: runurono@gmail.com, mainul@upnm.edu.my. Cell Phone: +60109265543

DOI: https://doi.org/10.3329/bjms.v24i2.81542

Healthcare disparities refer to differences in the quality and outcomes of healthcare services that cannot be attributed to factors such as access, medical needs, patient preferences, or intervention relevance[4]. These disparities often result from a complex interplay of personal factors (e.g., race, SES), provider-related factors (e.g., implicit biases, discrimination), and societal factors (e.g., systemic racism, institutional culture).

The objective of this study is to evaluate the intensity of postoperative pain and its impact on recovery among patients treated at the El Idrissi Provincial Hospital in Kenitra, Morocco.

MATERIALS AND METHODS

Study Context and Participants

This study was conducted at the El Idrissi Provincial Hospital over a four-year period (2020 to 2023). It included a sample of 1,040 adult patients (≥18 years) who underwent surgical procedures at the hospital. Participants were recruited through consecutive sampling based on the following inclusion criteria: postoperative hospitalization, ability to communicate and complete questionnaires independently, and provision of signed informed consent. Exclusion criteria included a history of major cognitive or psychiatric disorders and inability to understand French or Arabic.

Measurement Instrument: Brief Pain Inventory (BPI)

Translation and Cultural Adaptation

The Brief Pain Inventory (BPI) was meticulously translated from English into Arabic through a multi-step process to ensure both semantic accuracy and cultural relevance. Initially, two independent professional translators, experienced in psychometric tool translation, conducted forward translations. These versions were compared to identify and resolve discrepancies, maintaining linguistic precision and appropriateness for the target population. An expert panel then reviewed the translations, creating a consensus version that preserved the original meaning of the items while addressing specific cultural and linguistic nuances. This consensus version underwent back-translation into English by an independent translator unfamiliar with the original text, a step designed to verify the fidelity of the translation and ensure alignment with the source material. Finally, a multidisciplinary expert committee, including clinicians, epidemiologists, and psychologists, evaluated the translated version. Adjustments were implemented to enhance its cultural and linguistic validity while ensuring its suitability and relevance for the studied population.

Validation of the Translated Questionnaire

a. Pilot Study

A pilot study was conducted with 50 participants representative of the target population to assess the clarity and comprehensibility of the items. Feedback from participants prompted minor adjustments, improving readability and the questionnaire's contextual relevance.

b. Statistical Analysis

Data were analyzed using statistical software. Descriptive statistics were used to characterize the sample and BPI responses. Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were performed to validate the questionnaire's factorial structure. Internal consistency was assessed using Cronbach's alpha.

c. Pain Intensity and Impact Categorization

Proportions of patients reporting mild, moderate, or severe pain or impact were calculated and compared using chi-square tests for categorical variables.

This rigorous process ensured that the translated BPI is both reliable and valid for assessing pain intensity and its impact in the target population, while accounting for cultural and linguistic specificities.

Procedure

Participants completed the BPI 48 hours postoperatively, a critical period when pain and its impact are most pronounced. The questionnaire was administered under the supervision of a healthcare professional to ensure clear instructions and address any potential misunderstandings.

Ethical Considerations:

The study received approval from the local ethics committee in accordance with the Declaration of Helsinki. All participants were provided with a detailed explanation of the study's objectives and procedures and gave written informed consent before inclusion. Data confidentiality was strictly maintained, and participants could withdraw from the study at any time without affecting their medical care.

RESULTS AND DISCUSSION

Factor Analysis of the Brief Pain Inventory (BPI)

KMO Index and Bartlett's Test for the BPI Questionnaire

Preliminary analysis confirmed the suitability of the data for factor analysis. The Kaiser-Meyer-Olkin (KMO) index was 0.85, which is considered very good, indicating strong correlations among items and justifying the use of principal component analysis. Additionally, Bartlett's test of sphericity yielded a chi-square value of $\chi^2(105) = 450.32$, significant at $p < 0.001$, showing that the correlations among items are not identity matrices and supporting the appropriateness of exploratory component analysis (ECA). These findings validate the suitability of the Brief Pain Inventory (BPI) for analyzing pain intensity and its impact in the studied population, reinforcing its reliability for postoperative pain assessment.

Table 1: KMO Index and Bartlett's Test of Sphericity for the BPI Questionnaire

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0,850
Bartlett's Test of Sphericity	Approx. Chi-Square	450,32
	df	105
	Sig.	< 0,001

Exploratory Principal Component Analysis of the BPI Questionnaire

The exploratory PCA revealed two major factors accounting for a significant portion of the variance in patient responses. These factors reflect essential dimensions of the pain experience.

The first factor, with an initial eigenvalue of 1.494, accounts for 13.58% of the total variance before rotation, while the second factor, with an eigenvalue of 1.221, explains 11.10%. Together, they represent 59.59% of the cumulative variance. This indicates that the two primary factors capture a substantial portion of the information contained in the questionnaire responses.

This analysis demonstrates that pain is not merely a sensory perception; it also significantly affects patients' activities and well-being. This dual dimension, effectively captured by the two identified factors, allows for a more nuanced and comprehensive assessment of pain, which is crucial for improving the quality of care. The Brief Pain Inventory, with its validated factorial structure, proves to be a relevant and reliable tool for assessing pain intensity and impact in clinical and research settings.

Table 2: Results of the Exploratory Principal Component Analysis of the BPI Questionnaire

Components	Initial eigenvalues			Sum of charge extraction squared			Sum of charge rotation squared		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1,494	13,577	48,481	1,494	13,577	48,481	2,302	20,927	44,34
2	**1,221**	**11,104**	**59,585**	**1,221**	**11,104**	**59,585**	**1,677**	**15,245**	**59,585**
3	0,904	08,220	67,805						
4	0,717	06,521	74,326						
5	0,637	05,790	80,116						
6	0,589	05,354	85,470						
7	0,555	05,050	90,520						
8	0,373	03,395	93,915						
9	0,356	03,236	97,151						
10	0,225	02,004	99,155						
11	0,102	00,845	100,00						

Varimax Rotation of the BPI Questionnaire

The results of the Varimax rotation applied to the items of the Brief Pain Inventory (BPI) questionnaire reveal a clear factorial structure distributed across two main dimensions: Pain Interference and Pain Intensity. The Varimax rotation simplified the relationships between items and factors, highlighting a distinct separation between these two dimensions, which are essential for a comprehensive evaluation of pain.

The first dimension, Pain Interference, includes items that reflect the impact of pain on various aspects of daily life. The items "enjoyment of life" (0.85), "mood" (0.80), "sleep" (0.73), "work" (0.70), "relationships with others" (0.67), "general activity" (0.62), and "ability to walk" (0.54) load heavily on this factor. This indicates that these aspects of life are particularly affected by the pain experienced by patients.

The second dimension, Pain Intensity, comprises items measuring the perceived severity of pain. The items "average pain" (-0.91), "worst pain" (-0.80), "least pain" (-0.71), and "current pain" (-0.60) are strongly associated with this factor.

The BPI has undergone multiple translations and cultural adaptations, demonstrating its ability to account for sociocultural specificities. Its use across various regions worldwide, from Asia to Europe, underscores its potential to transcend linguistic and cultural barriers[5].

Table 3: Results of the Varimax Rotation of the BPI Questionnaire

Pain Items	Factor 1	Factor 2	Dimension
Enjoyment of life	0,85		Pain Interference
Mood	0,80		
Sleep	0,73		
Work	0,70		
Relationships with others	0,67		
General activity	0,62		
Ability to walk	0,54		
Average pain		-0,91	Pain Intensity
Worst pain		-0,80	
Least pain		-0,71	
Current pain		-0,60	

Reliability Test of the BPI Questionnaire

The reliability test results for the Brief Pain Inventory (BPI), measured using Cronbach's alpha, indicate excellent internal consistency. With an alpha value of 0.85 across 11 items, these results demonstrate that the various questions in the questionnaire are strongly correlated and effectively measure a common construct: the experience of pain and its impact on patients' daily lives.

Table 4: Results of the Reliability Test for the BPI Questionnaire

Cronbach's Alpha	Cronbach's Alpha based on standardized items	N of Items
0,85	0,857	11

Analysis of the Dimensions of the BPI Questionnaire

Dimension I: "Pain Intensity"

a. Analysis of Perceived Maximum Pain Levels Over the Last 24 Hours

The results of the Brief Pain Inventory (BPI) regarding the most intense pain experienced over the last 24 hours reveal significant variability in patients' pain experiences, providing critical insights into the impact of pain on quality of life and the need for therapeutic adjustments. Among the respondents, approximately 16% reported very mild or no pain, suggesting that these individuals likely benefit from adequate pain control or are not significantly affected by severe painful conditions. However, this relatively low proportion highlights that the majority of patients experience more significant levels of pain, warranting closer attention (Table 5).

A substantial 51% of patients categorized their pain as moderate to intense, representing the largest group in the study. This finding underscores the importance of active pain management for a significant portion of the population. As noted by Lovich-Sapola et al.[6] moderate to intense pain can severely affect daily activities such as mobility, sleep, and mood. These patients may require additional therapeutic interventions or a reassessment of their analgesic treatment to improve their overall quality of life.

Of particular concern is the 33% of patients who reported very intense to extremely intense pain. Such high

levels of pain can be debilitating, leading to significant emotional distress and substantially impacting both the physical and psychological well-being of patients[7]. This highlights the challenges in achieving effective pain management for a notable subset of individuals, emphasizing the need for more personalized and comprehensive strategies.

Overall, the distribution of pain levels reveals persistent issues in postoperative pain management. While some patients appear to have their pain adequately controlled, the majority suffer from moderate to severe pain, which can negatively affect their quality of life. These findings underscore the critical role of pain management in patient care and highlight the necessity for more tailored therapeutic approaches to address the diverse needs of patients experiencing varying degrees of postoperative pain[8].

b. Analysis of Minimum Pain Intensity Over the Last 24 Hours According to the Brief Pain Inventory (BPI)

The results for question BPI4, addressing the least intense pain experienced over the past 24 hours, reveal a distribution different from that of the most intense pain (question BPI3). Here, 25% of patients reported having no pain at some point during the day, which is an encouraging sign for pain management in certain patients. This high percentage suggests that several patients experience pain-free moments due to effective treatments or natural pain reduction (Table 5).

However, a significant majority of patients continue to experience some level of pain, even at its lowest intensity. Eighteen percent of patients reported moderate pain, and approximately 11% fell into the moderate-to-intense pain category, indicating that, for some patients, even the least intense pain remains relatively disruptive. About 8% of patients reported very mild pain, while 10% described it as mild, demonstrating that some individuals achieve partial pain control but are not entirely relieved.

Notably, no patients reported very intense, extremely intense, or "the most horrible pain imaginable," suggesting that even those who experience severe pain during the day find some relief at certain times. This can be interpreted as a positive indication of the partial effectiveness of treatments or temporary pain-free periods throughout the day[9].

c. Analysis of General Pain Results (BPI5 and BPI6) According to the Brief Pain Inventory (BPI)

The results for questions BPI5 and BPI6 on general pain reveal notable differences in patients' perceptions of pain. These questions evaluate a subjective average of pain intensity, providing an overall perspective of the pain experience over a certain period (Table 5).

For the first occurrence of general pain (BPI5), responses demonstrate significant variability in pain intensity among patients. The majority of patients fall within the moderate-to-intense pain categories, with approximately 53% distributed across these levels. Among them, 15% report intense pain, and 7% indicate extremely intense pain. These results highlight the high prevalence of severe pain in this population, suggesting that most patients experience significant discomfort.

In the group reporting milder pain, 21% of patients note mild to very mild pain, while a very small proportion (1%) reports no pain at all. This low percentage of patients with no pain or mild pain indicates that many individuals suffer from chronic or persistent pain that is not fully controlled by the current treatments.

For the second occurrence of general pain (BPI6), measured six hours after the first evaluation, a slightly different distribution is observed. Notably, 19% of patients report no pain, representing a significant increase from the first occurrence (BPI5). This suggests that treatments administered during this period provided some relief.

However, approximately 60% of patients remain in the moderate-to-intense pain categories, with a peak of 20% in the moderate-to-intense category. Notably, for BPI6, only 5% of patients report intense to very intense pain, a remarkable decrease from the 28% recorded for BPI5. Furthermore, no patients reported experiencing extremely intense pain or the most horrible pain for the second occurrence.

These findings indicate a partial but encouraging improvement in pain management between the two assessments, with a reduction in the proportion of patients experiencing severe pain. However, the persistent presence of moderate-to-intense pain in a majority of patients highlights the need for continued optimization of therapeutic strategies.

Table 5: Distribution of Responses to BPI3, BPI4, BPI5, BPI6 Questions

Response	BPI3	BPI4	BPI5	BPI6
No pain	08 a	25 d	01 a	19 e
Very mild pain	05 a	08 b	09 a	09 c
Mild pain	03 a	10 bc	11 a	10 c
Mild to moderate pain	08 a	09 b	13 b	12 cd
Moderate pain	11 ab	18 c	11 a	15 de
Moderate to intense pain	10 ab	11 bc	14 b	20 e
Slightly intense pain	10 ab	08 b	10 a	10 c
Intense pain	12 ab	11 bc	15 b	03 b
Very intense pain	15 b	00 a	06 a	01 b
Extremely intense pain	10 ab	00 a	07 a	01 b
The most horrible pain imaginable	08 a	00 a	03 a	00 a
Total	**100**	**100**	**100**	**100**

Means in the same column with the same letter do not differ significantly at the 5% threshold.

d. Analysis of the Locations of the Most Intense Pain in Patients According to the Brief Pain Inventory (BPI)

The results regarding the locations of the most intense pain reveal a diverse and significant distribution of affected body regions among patients, highlighting areas requiring special attention in postoperative pain management. This distribution aids in understanding the origins of pain, whether related to specific surgical interventions, prolonged positioning, or musculoskeletal complications, and helps adjust therapeutic strategies to meet individual patient needs (Table 6).

Pain in the head and face, as well as in the posterior legs, was reported by 12% of patients, making these the most common locations. Head and facial pain may result from postoperative headaches caused by anesthesia or tension from intubation. Facial pain may also arise from muscle tension or maxillofacial interventions. Posterior leg pain is often linked to prolonged lying positions during surgery or muscle strain from immobilization[10]. In orthopedic surgeries, such pain is often exacerbated by circulatory issues, such as deep vein thrombosis, requiring close monitoring[11].

Abdominal and lower back pain were also common, each affecting 11% of patients. Abdominal pain is frequently associated with visceral surgeries, such as gastrointestinal or gynecological procedures, where recovery can be prolonged and painful due to abdominal cavity invasion, internal sutures, or inflammatory complications[12]. Lower back pain is common after prolonged immobilization or spinal surgeries and can be exacerbated by poor postoperative posture, particularly if the patient remained in a supine position for an extended period[13].

Pain in the upper back and occiput, reported by 10% of patients, is typical of muscle tension following surgery. These pains are often exacerbated by the supine position during surgery and mechanical stress on the cervical and thoracic spine[14]. They are particularly prevalent in patients undergoing lengthy anesthesia or positioned in constrained postures during surgery[15].

Pain in the legs (8%) or arms (6%) is generally linked to orthopedic surgeries or prolonged immobilization postoperatively. Leg pain often arises from recovery after hip or knee procedures, necessitating longer rehabilitation and physical therapy. Arm pain can result from muscle tension or nerve strain caused by extended positions or regional anesthetic techniques, such as nerve blocks[16].

Pain in the shoulders and buttocks (5% each) is commonly associated with muscle tension due to surgical or recovery positioning. These pains may be linked to orthopedic surgeries or interventions involving joints or soft tissues. Prolonged immobilization during surgery or recovery often exacerbates pressure on these areas[17].

Neck pain (4%) and heel/foot pain (3%) are relatively rare but can significantly impact postoperative mobility. Neck pain often results from muscle tension due to poor posture or immobilization of the cervical region during procedures[18].

Pain in the chest (1%) and hips (2%) is uncommon but typically associated with specific interventions. Chest pain often occurs after cardiac or thoracic surgeries, while hip pain is related to orthopedic procedures or interventions addressing joint issues[19].

Table 6: Distribution of Locations of the Most Intense Pain in Patients (BPI2)

Question	Body Part	Percentage
BPI 2: Location of pain (where is the most intense pain located?)	Head/Face	12 b
	Neck	04 a
	Shoulders (left/right)	05 a
	Chest	01 a
	Abdomen	11 ab
	Hips (left/right)	02 a
	Arms (left/right)	06 a
	Legs (left/right)	08 a
	Head/Occiput	10 ab
	Upper Back	10 ab
	Lower Back/Lumbar	11 ab
	Buttocks	05 a
	Posterior Legs	12 b
	Heel/Foot	03 a
	Total	**100**

Means in the same column with the same letter do not differ significantly at the 5% threshold.

e. Types of Treatments or Medications Used by Patients to Manage Pain

The results on the types of treatments used by surgical patients reveal that 56% of patients rely on paracetamol as their primary choice for relieving postoperative pain. This preference is unsurprising, as paracetamol is a widely recognized analgesic for mild to moderate pain and boasts a favorable safety profile with few severe side effects. Additionally, it is easily accessible, well-tolerated, and a staple in the therapeutic toolkit familiar to both healthcare professionals and patients. However, for patients experiencing more intense pain, paracetamol alone may be insufficient, necessitating complementary or alternative solutions (Table 7).

Nonsteroidal anti-inflammatory drugs (NSAIDs) rank second, with 34% of prescriptions, highlighting their crucial role in treating postoperative pain accompanied by inflammation. NSAIDs, such as ibuprofen or diclofenac, reduce inflammation, making them particularly effective for moderate to severe postoperative pain. However, their use is accompanied by precautions due to risks of gastric, renal, and cardiovascular complications, especially in vulnerable patient populations. This explains why NSAIDs are often prescribed as an alternative or supplement, rather than as a universal solution. Their efficacy, coupled with these necessary precautions, underscores the importance of tailoring therapeutic choices to individual needs and patient histories.

Additionally, 10% of patients report not using any treatment for pain. This may stem from various factors: some postoperative pain is mild and temporary; some patients prefer avoiding medications when possible; and in other cases, contraindications limit therapeutic options[20].

Table 7: Types of Treatment Voluntarily Used by Patients

Type of Medication	Percentage
Paracetamol	56 c
Nonsteroidal anti-inflammatory drugs (NSAIDs)	34 b
No treatment used	10 a
Total	**100**

Means in the same column with the same letter do not differ significantly at the 5% threshold.

f. Analysis of the Perceived Effectiveness of Pain Treatments

The majority of patients report moderate treatment effectiveness, with approximately 58% experiencing pain relief between 20% and 50%. Specifically, 19% achieve 50% relief, while 20% experience 40% relief. Furthermore, treatments provide partial relief for many, they fail to deliver complete pain control, suggesting the need for adjustments in pain management strategies, including reconsidering medication types or integrating complementary therapies.[21] A concerning finding is that 15% of patients report only 20% relief, 12% report 10% relief, and 3% experience no relief at all. These results are consistent with previous studies indicating that a significant proportion of patients remain inadequately treated despite established protocols [22,23]. Factors such as analgesic resistance, complex conditions, or psychological influences may explain this low level of relief, supported by research showing that chronic pain and altered thresholds due to poor sleep or underlying conditions hinder treatment efficacy[24].

Notably, no patients reported relief exceeding 80%, contrasting with studies demonstrating higher satisfaction rates through multimodal approaches

combining NSAIDs, opioids, and regional anesthetics[25]. This discrepancy highlights potential limitations in current protocols or individual variability in treatment responses.

Individual differences in pain perception, medical history, and psychological factors like anxiety significantly influence outcomes[26]. Studies emphasize the overlooked role of psychosocial factors in postoperative pain management[27,28]. with anxiety potentially lowering pain thresholds[29]. Overall, these findings underscore the need for more tailored and comprehensive pain management strategies.

Table 8: Distribution of Responses on Perceived Treatment Effectiveness for Pain Relief

Question	Pain intensity (%)	Percentage
BPI8: Perceived effectiveness of pain treatments	00	03 b
	10	12 c
	20	15 c
	30	19 cd
	40	20 d
	50	19 cd
	60	08 bc
	70	04 b
	80	00 a
	90	00 a
	100	00 a
	Total	**100**

Means in the same column with the same letter do not differ significantly at the 5% threshold.

Dimension II: "Pain Interference"

a. Functional Impairment

- Analysis of the Impact of Pain on General Activity

The results on the impact of pain on general activity show that the majority of patients report significant interference of pain with their daily activities (Table 9).

A relatively small percentage of patients (19%) report that pain has little or no effect on their daily activity. Specifically, 1% of patients indicate no pain, and 8% estimate their pain to be very mild, marginally affecting their activities. Similarly, 10% of patients report mild pain. These patients appear to have better control over their pain, allowing them to maintain an acceptable level of functionality in their daily lives.

However, a significant proportion of patients experience moderate to intense discomfort in their general activity. Indeed, 34% of patients fall into the slightly intense pain category, while 18% report intense pain, and 16% report moderate-to-intense pain. These percentages suggest that more than half of the patients experience significant interference with their general activity due to pain, necessitating enhanced therapeutic interventions to improve their quality of life. The presence of such a large proportion of intense pain indicates that, for these patients, pain disrupts their ability to function normally in daily life, and adjustments in pain management strategies are crucial[30].

Although only 4% of patients report very intense, extremely intense, or "the most horrible" pain, this minority represents a group in significant distress, requiring immediate and more aggressive interventions. Pain at this level of intensity strongly interferes with their ability to perform basic tasks and severely impacts their overall well-being.

- Analysis of the Impact of Pain on Walking Ability

The results regarding the impact of pain on walking ability show a relatively balanced distribution between mild-to-moderate pain levels and more intense pain levels. These findings help assess how pain affects patients' mobility, a critical factor for quality of life and postoperative recovery (Table 9).

A significant proportion of patients (23%) report no pain while walking, which is a positive indicator suggesting that nearly one-quarter of patients experience no major difficulty with mobility. Additionally, 13% of patients report very mild pain, and 20% indicate mild pain. This demonstrates that more than half of the patients (56%) experience little to no discomfort in terms of mobility, likely attributable to effective pain management strategies or the less invasive nature of certain surgical procedures.

However, a substantial portion of patients remains affected by more severe pain that compromises their ability to walk. Approximately 33% of patients report pain ranging from moderate to moderately intense. Specifically, 12% experience mild-moderate pain, and 10% report moderate pain, reflecting a moderate yet concerning impact on mobility. Furthermore, 11% fall into the moderately intense pain category, indicating that pain significantly disrupts their ability to move smoothly and independently.

Severe pain is less common in this category, with 7% of patients reporting slightly intense pain and only 1% reporting intense or very intense pain, as well as extremely intense or "the most horrible" pain. While this proportion is small, it represents a group of patients for whom mobility is severely compromised, potentially necessitating additional interventions to improve their quality of life and autonomy.

b. Social and Familial Repercussions

- Analysis of the Impact of Pain on Social Relationships According to the Brief Pain Inventory

The results regarding the impact of pain on relationships with others show that pain does not significantly affect the social dimension for the majority of patients. Specifically, 38% of respondents report no discomfort in their social interactions due to pain, indicating that for over one-third of patients, pain is well-controlled or does not notably impact their relationships with those around them (Table 9).

Another substantial group of patients (16%) experiences minimal discomfort, and 24% report very mild discomfort. This suggests that for approximately 40% of patients, although they experience some level of pain, it only marginally affects their relationships, allowing them to maintain relatively stable social connections. These results can be viewed positively, as minimal or very mild discomfort enables patients to preserve social and familial interactions despite the presence of pain.

However, 20% of patients report mild discomfort, indicating that pain begins to influence their relationships with others. While this level of discomfort is not yet significant, it may lead to reduced quality in social interactions or diminished participation in collective activities.

Interestingly, no patients reported moderate to extreme discomfort or severe to unbearable discomfort. This indicates that, in this population, pain does not reach a level that imposes a significant barrier to interpersonal relationships. This finding contrasts with other dimensions of pain, such as general activity or work, where a higher proportion of patients is affected. This could be attributed to the fact that pain, while present, is more tolerable within social interactions, or that patients adapt and maintain their relationships despite physical discomfort.

These results highlight that while pain may slightly hinder the social relationships of some patients, it does not reach a severity that strongly impacts their ability to interact with others. This can be seen as a positive indicator in the overall management of pain, but it is also important to monitor patients experiencing mild discomfort, as this could evolve into more significant discomfort if the pain persists or worsens[31].

Psychological Distress Level

The results, as illustrated in Table 15, regarding the impact of pain on mood indicate that for the majority of patients, pain causes little to no emotional disturbance. Specifically, 42% of respondents report that pain has no impact on their mood, suggesting effective pain management for these patients, preserving their emotional well-being (Table 9).

Additionally, a significant proportion of patients experience very mild discomfort due to pain. 24% report minimal discomfort, while 31% indicate very slight discomfort. Thus, over 55% of participants experience only marginal emotional distress related to pain. These results are encouraging, as they suggest that while pain is present, it does not reach a level that significantly compromises patients' mood or emotional stability.

However, 3% of respondents report mild discomfort, suggesting that for this small proportion of patients, pain begins to influence their emotional state. Although this discomfort remains moderate, it could be an early indicator of emotional distress that requires monitoring. The emotional impacts of pain, while low in this case, have the potential to develop into more serious issues such as anxiety or depression if pain is not well-managed over the long term.

It is notable that no patients reported moderate to unbearable discomfort, indicating that in this population, pain does not cause major emotional disturbances. This may reflect adequate pain management, preventing it from reaching a severity that could harm patients' psychological well-being[32].

- Impact of Pain on Sleep According to the Brief Pain Inventory (BPI)

The results regarding the impact of pain on sleep reveal that, overall, pain has a limited effect on this dimension for the majority of patients. Specifically, 42% of respondents report that pain does not interfere with their ability to sleep. This indicates that for a significant proportion of patients, pain management is sufficiently effective to prevent disruptions in sleep quality, which is a key factor for recovery and overall well-being

(Table 9).

Additionally, 24% of patients report minimal discomfort, and 31% indicate very slight discomfort. These figures show that while some patients experience pain, its impact on sleep remains minor. Thus, for 55% of patients, pain only mildly affects their rest, which is reassuring since sleep is crucial for the healing process and maintaining physical and psychological balance.

However, 3% of patients report mild discomfort, suggesting that for this small group, pain begins to affect their sleep. Although this discomfort is still moderate, it may be an early warning sign of more serious sleep disturbances if pain persists. Pain is known to disrupt sleep cycles, and even mild discomfort can lead to poor sleep quality, thereby reducing patients' recovery capacity.

It is particularly noteworthy that no patients reported moderate to unbearable discomfort. This indicates that in this sample, pain does not cause severe insomnia or major sleep disturbances. This finding is positive, as sleep is often one of the first functions to be affected by uncontrolled pain. These results suggest that the pain management strategies in place are effective in preserving sleep quality for the majority of patients.

- Effect of Pain on Enjoyment of Life

The data collected on the impact of pain on enjoyment of life reveal that, for a substantial majority of patients, pain does not cause a significant disturbance to this key dimension of well-being. Specifically, 56% of patients affirm that they experience no discomfort in this regard, suggesting that more than half of individuals are able to maintain a sense of satisfaction and enjoyment of life despite their pain (Table 9).

Another significant group, comprising 27% of patients, reports minimal discomfort, while 9% indicate very slight discomfort. These figures show that while some discomfort is present for these patients, its impact remains minimal and does not severely affect their emotional well-being or ability to enjoy life. Thus, approximately 92% of patients perceive only mild discomfort or none at all, reflecting relatively effective pain management in this psychological aspect.

It is also notable that no patients reported moderate to unbearable discomfort. This indicates that pain, in this sample, does not significantly compromise the enjoyment of life. This finding is reassuring as it suggests that patients can maintain a positive perception of their quality of life even in the context of pain. The current pain management strategies appear well-suited to limit negative effects on this dimension.

Consequently, pain does not seem to significantly impact the enjoyment of life for the vast majority of the patients studied. These results demonstrate that current pain management strategies are effective in preserving overall well-being, particularly in terms of pleasure and life satisfaction[33,34].

Table 9: Distribution of Responses to BPI3, BPI4, BPI5, BPI6 Questions

Response	Pain interfering with general activity	Pain interfering with usual work	Pain that interferes with relationships with others	9B. Pain interfering with mood	9F. Pain interfering with sleep	9G. Pain interferes with taste for life
No pain	01 a	10 bc	38 d	42 d	42 d	56 d
Very mild pain	08 a	08 b	16 c	24 c	24 c	27 c
Mild pain	10 b	07 b	24 c	31 c	31 cd	09 b
Mild to moderate pain	05 a	10 bc	20 c	03 b	03 b	00 a
Moderate pain	05 a	10 bc	02 b	00 a	00 a	00 a
Moderate to intense pain	16 b	09 b	00 a	00 a	00 a	00 a
Slightly intense pain	34 c	12 c	00 a	00 a	00 a	00 a
Intense pain	18 b	18 d	00 a	00 a	00 a	00 a
Very intense pain	01 a	12 c	00 a	00 a	00 a	00 a
Extremely intense pain	01 a	02 a	00 a	00 a	00 a	00 a
The most horrible pain imaginable	01 a	02 a	00 a	00 a	00 a	00 a
Total	**100**	**100**	**100**	**100**	**100**	**100**

Means in the same column with the same letter do not differ significantly at the 5% threshold.

- Analysis of the Presence of Unusual Pain in Patients

The results from Question 1 of the Brief Pain Inventory (BPI), addressing the presence of pain other than what is considered usual, reveal that 58% of patients report experiencing unusual or unfamiliar pain. This finding indicates that more than half of the patients live with pain that goes beyond common discomforts such as headaches or toothaches, suggesting more significant or chronic pain (Table 10).

In contrast, 42% of patients do not experience unusual pain, suggesting that they suffer only from "typical" and potentially less concerning pain. These patients might benefit from simpler pain management approaches or less intensive follow-up, though regular evaluations should not be overlooked to prevent the emergence of more severe pain.

Table 10: Distribution of Responses Regarding the Presence of Unusual Pain (BPI)

Question	Response	Percentage
BPI1 Presence of pain other than the usual ones	Yes	58 b
	No	42 a
	Total	**100**

Means in the same column with the same letter do not differ significantly at the 5% threshold.

III.3 Global Scoring of the Brief Pain Inventory (BPI)

The global scoring results of the Brief Pain Inventory (BPI) for individuals who underwent surgical procedures reveal a balanced distribution among low, moderate, and severe levels of pain or impact on daily life. This distribution reflects the diverse experiences of patients and highlights specific challenges in postoperative pain management (Table 11).

A significant proportion of 42% of patients report low pain or impact levels. This group represents those for whom current treatments appear effective, providing adequate pain control and minimizing its influence on activities and well-being. These patients likely benefit from well-suited pharmacological or non-pharmacological interventions or exhibit a naturally faster recovery. These findings indicate that, for a large portion of patients, postoperative pain is managed satisfactorily without significantly affecting their quality of life.

However, 38% of patients fall into the moderate pain or impact category, indicating partially effective management. This group reflects patients whose pain remains noticeable and interferes with their daily activities, although this interference is not debilitating. These results suggest that therapeutic adjustments could improve their care, such as optimizing medication dosages or introducing complementary strategies like physiotherapy or relaxation techniques. Moderate impact may also point to variable pain tolerance or contextual factors, such as anxiety or postoperative stress, influencing pain perception[35].

Finally, 20% of patients report severe pain or impact, a concerning level that necessitates immediate intervention. These patients represent those with poorly controlled pain, which could severely affect their physical and psychological recovery. This group may include complex cases, such as neuropathic pain or inadequate responses to standard treatments. These patients require a multidisciplinary approach, including specialized consultations, enhanced analgesic regimens, and potentially psychological support to address distress associated with pain.

Table 11: Distribution of global scores of the Brief Pain Inventory (BPI)

Scoring	Percentage
Low pain or impact	42 b
Moderate pain or impact	38 b
Severe pain or impact	20 a
Total	**100**

Means in the same column with the same letter do not differ significantly at the 5% threshold.

CONCLUSION

The analysis of responses to the Brief Pain Inventory (BPI) highlights the validity of this tool for assessing pain intensity and its impact on daily life, with high psychometric reliability (Cronbach's alpha). Clinical data indicate that 58% of patients experience atypical pain, which affects their mobility and autonomy, underscoring the need to adapt treatments to improve their functional quality of life.

However, psychological and social aspects, such as mood and relationships, remain largely preserved, and the majority of patients maintain an acceptable quality of sleep. This reflects overall psychological well-being despite the presence of pain.

Funding

This research received no external funding.

Conflicts of Interest

The authors declare no conflict of interest.

Ethical clearance

Not applicable

Author Contributions

Conceptualization, writing—original draft preparation, EM.A., B.D., A.R.; writing and article final text corrections, EM., B.D., A.O., S.A.; Writing—review and editing, EM., B.D., A.R., A.O., S.A.; Supervision, . All authors have read and agreed to the published version of the manuscript.

REFERENCES

1. Naiditch, N., Billot, M., Moens, M., Goudman, L., Cornet, P., Le Breton, D., ... et Rigoard, P. (). Persistent spinal pain syndrome type 2 (PSPS-T2), a social pain? Advocacy for a social gradient of health approach to chronic pain. *Journal of Clinical Medicine*, 2021 ;**10**(13)□ 2817.
2. Thurston, K. L., Zhang, S. J., Wilbanks, B. A., Billings, R., & Aroke, E. N. (). A systematic review of race, sex, and socioeconomic status differences in postoperative pain and pain management. *Journal of PeriAnesthesia Nursing*2023;**38**(3)꞉504-515.
3. Siddiqui, N., et Urman, R. D. (). Opioid use disorder and racial/ethnic health disparities: prevention and management. *Current Pain and Headache Reports*, 2022 ;**26**(2)꞉ 129-137.
4. Feldman, C. H., Dong, Y., Katz, J. N., Donnell-Fink, L. A., et Losina, E. (). Association between socioeconomic status and pain, function and pain catastrophizing at presentation for total knee arthroplasty. *BMC musculoskeletal disorders*, 2015; **16**꞉1-10.
5. Ferreira, K. A., Teixeira, M. J., Mendonza, T. R., & Cleeland, C. S. (). Validation of brief pain inventory to Brazilian patients with pain. *Supportive Care in Cancer*, 2011;**19**꞉ 505-511.
6. Lovich-Sapola, J., Smith, C. E., & Brandt, C. P. (). Postoperative pain control. *The surgical clinics of North America*, 2015;**95**(2)꞉ 301-318.
7. Imani, F. (2011). Postoperative pain management. *Anesthesiology and pain medicine*, 1(1), 6.
8. Rawal, N. (). Current issues in postoperative pain management. *European Journal of Anaesthesiology| EJA*, 2016;**33**(3)꞉ 160-171.
9. Thomazeau, J., Rouquette, A., Martinez, V., Rabuel, C., Prince, N., Laplanche, J. L., ... & Lloret-Linares, C. (). Acute pain factors predictive of post-operative pain and opioid requirement in multimodal analgesia following knee replacement. *European journal of pain*, 2016;**20**(5)꞉822-832.
10. Howie, M. T., Sandblom, G., & Österberg, J. (). The impact of pain frequency, pain localization and perceived cause of pain on quality of life after cholecystectomy. *Scandinavian Journal of Gastroenterology* , 2017;**52**(12)꞉ 1391-1397.
11. Chunduri, A., & Aggarwal, A. K. (). Multimodal pain management in orthopedic surgery. *Journal of clinical medicine* , 2022;**11**(21)꞉ 6386.
12. Pirie, K., Traer, E., Finniss, D., Myles, P. S., & Riedel, B. (). Current approaches to acute postoperative pain management after major abdominal surgery: a narrative review and future directions. *British Journal of Anaesthesia* , 2022;**129**(3)꞉ 378-393.
13. Chanif, C., Petpichetchian, W., & Wimo, W. (). Acute postoperative pain of Indonesian patients after abdominal surgery. *Nurse Media Journal of Nursing* , 2012;**2**(2)꞉ 409-420.
14. Sommer, M., De Rijke, J. M., Van Kleef, M., Kessels, A. G. H., Peters, M. L., Geurts, J. W. J. M., ... & Marcus, M. A. E. (). The prevalence of postoperative pain in a sample of 1490 surgical inpatients. *European journal of anaesthesiology* , 2008;**25**(4)꞉ 267-274.
15. Sommer, M., de Rijke, J. M., van Kleef, M., Kessels, A. G., Peters, M. L., Geurts, J. W., ... & Marcus, M. A. (). Predictors of acute postoperative pain after elective surgery. *The Clinical journal of pain* , 2010;**26**(2)꞉ 87-94.
16. Vasilopoulos, T., Wardhan, R., Rashidi, P., Fillingim, R. B., Wallace, M. R., Crispen, P. L., ... & Temporal Postoperative Pain Signatures (TEMPOS) Group. (). Patient and procedural determinants of postoperative pain trajectories. *Anesthesiology* , 2021;**134**(3)꞉ 421-434.
17. García, L. T. C., Ponce, F. E. E. O., & Esparza, A. C. M. (2023). Postoperative Pain in Orthopedics. In Topics in Postoperative Pain. IntechOpen.
18. Croci, D. M., Sherrod, B., Alvi, M. A., Mummaneni, P. V., Chan, A. K., Bydon, M., ... & Bisson, E. F. (). Differences in

postoperative quality of life in young, early elderly, and late elderly patients undergoing surgical treatment for degenerative cervical myelopathy. *Journal of Neurosurgery: Spine* , 2022; **37**(3)꞉ 339-349.

19. Lepot, A., Elia, N., Tramer, M. R., & Rehberg, B. (). Preventing pain after breast surgery: A systematic review with meta-analyses and trial-sequential analyses. *European Journal of Pain* , 2021;**25**(1)꞉ 5-22.
20. Rojals, V. M., Charaja, M., Casasola, O. D. L., Montero, A., Tamayo, M. A. N., & Varrassi, G. . New insights into the pharmacological management of postoperative pain: A narrative review. *Cureus* , 2022; **14**(3).
21. Krenk, L., Jennum, P., et Kehlet, H. (). Postoperative sleep disturbances after zolpidem treatment in fast-track hip and knee replacement. *Journal of Clinical Sleep Medicine* , 2014 ;**10**(3)꞉321–326.
22. Gong, L., Wang, Z., et Fan, D. Sleep quality effects recovery after total knee arthroplasty (TKA)--a randomized, double-blind, controlled study. *Journal of Arthroplasty* , 2015; **30**(11)꞉ 1897–1901.
23. Kirksey, M. A., Baumgarten, R., Shaw, J. D., Ahn, J., Kim, S., et Pan, P. H. (). Impact of melatonin on sleep and pain after total knee arthroplasty under regional anesthesia with sedation: A double-blind, randomized, placebo-controlled pilot study. *Journal of Arthroplasty*, 2015;**30**(12)꞉2370–2375.
24. Simpson, N. S., Scott-Sutherland, J., Gautam, S., Sethna, N., Haack, M., et Mullington, J. M. (). Chronic exposure to insufficient sleep alters processes of pain habituation and sensitization. *Pain*, 2018;**159**(1)꞉33–40.
25. Parvizi, J., Miller, A. G., & Gandhi, K. (). Multimodal pain management after total joint arthroplasty. *JBJS*, 2011 ;**93**(11)꞉ 1075-1084.
26. Haack, M., Sanchez, E., et Mullington, J. M. (). Activation of the prostaglandin system in response to sleep loss in healthy humans: Potential mediator of increased spontaneous pain. *Pain*, 2009 ;**145**(1–2)꞉ 136–141.
27. Chou, L. B., Wagner, D., Witten, D. M., Martinez-Diaz, G. J., Brook, N. S., Toussaint, M., & Carroll, I. R. Postoperative pain following foot and ankle surgery: a prospective study. *Foot & ankle international*, 2008;**29**(11)꞉ 1063-1068.
28. Pinto, P. R., McIntyre, T., Almeida, A., & Araújo-Soares, V. (). Understanding pre-surgical predictors of acute pain experience following hysterectomy for benign causes: conceptual and methodological issues. *Pain*, 2012;**153**(9)꞉ 1974-1976.
29. IP et al., 2009 (Note : Cette référence semble manquante dans votre liste initiale. Vous pouvez préciser ou ajouter une source si nécessaire).
30. Small, C., & Laycock, H. J. J. O. B. S. (). Acute postoperative pain management. *Journal of British Surgery* , 2020;**107**(2)꞉ e70-e80.
31. Wang, L., & Zhang, Q. (). Effect of the postoperative pain management model on the psychological status and quality of life of patients in the advanced intensive care unit. *BMC nursing*, 2024; **23**(1) ;꞉ 496.
32. Periañez, C. A. H., Diaz, M. A. C., Bonisson, P. L. V., Simino, G. P. R., Barbosa, M. H., & Mattia, A. L. D. (). Relationship of anxiety and preoperative depression with post-operative pain. *Texto & Contexto-Enfermagem*, 2020;**29**꞉ e20180499.
33. Berkowitz, R., Vu, J., Brummett, C., Waljee, J., Englesbe, M., & Howard, R. (). The impact of complications and pain on patient satisfaction. *Annals of surgery*, 2021;**273**(6)꞉1127-1134.
34. Puspitosari, W. A. ., Rohman, H. H. ., & Dewi, A. . (). Reducing the hemodialysis patient stress level through progressive relaxation. Bangladesh Journal of Medical Science, 2022;**21**(4)꞉ 842–847. https://doi.org/10.3329/bjms.v21i4.60283
35. Zainulabid, U. A. ., Md Jalil, M. A. ., Jaafar, K. A. ., & Yunus, R. M. . (). Resilience and Health-Related Quality of Life among Hepatitis C Patients in Pahang, Malaysia. Bangladesh Journal of Medical Science, 2022; **21**(1)꞉165–170. https://doi.org/10.3329/bjms.v21i1.56344