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Original Article

Assessment of Pain by Brief Pain Inventory (BPI) and Analgesics Utilization Pattern in Cancer Patients Receiving Palliative Care: A Prospective Observational Study

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ABSTRACT

Background: Pain is a prevalent worry in advanced cancer, significantly impairing patients' quality of life, functional ability, and emotional well-being during palliative care. Effective pain management, guided by the World Health Organization (WHO) analgesic ladder, is essential to alleviate suffering and improve clinical outcomes. Hence, the present study is planned to evaluate changes in pain severity and disruption of daily activities among cancer patients receiving supportive care. It also examined trends in the prescribing of analgesics according to the World Health Organization (WHO) analgesic guidelines. **Materials and Methods:** An observational study was conducted on 146 patients receiving palliative chemotherapy in a tertiary care hospital's palliative unit from November 2023 to November 2024. Pain levels were assessed using the Brief Pain Inventory over two consecutive days. Analgesic prescriptions were recorded and analyzed for compliance with WHO pain ladder recommendations. Descriptive statistics and paired t-tests were used ($p<0.05$ considered significant). **Results:** Among 146 patients (77 females, 52.7%; 69 males, 47.3%), the mean age was 56.91±12.89 years. Maximum ($p<0.001$) and minimum ($p=0.007$) pain scores significantly decreased, with improved sleep quality ($p=0.006$). Commonly prescribed drugs included Gabapentin (26.36%), Paracetamol (24.85%), and Buprenorphine (20.3%). Opioids were frequently used for moderate (76.78%) and severe pain (54.54%), and non-opioids for mild pain (29.32%). **Conclusion:** Analgesic interventions effectively reduced pain and improved sleep, aligning with WHO guidelines. Multimodal strategies remain essential for addressing residual functional limitations.

Keywords: Brief Pain Inventory, Non-Opioid Analgesics, Opioid Analgesics, Palliative Care, WHO Analgesic Guidelines.

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INTRODUCTION

Pain is particularly prevalent among cancer patients, with more than 70% experiencing significant pain in advanced stages of the disease (Crawford *et al.*, 2021; Ashique *et al.*, 2020). The International Association for the Study of Pain defines pain as "an unpleasant sensory and emotional experience" (IASP, 2020). Cancer pain arises from various causes, including tumor invasion, chemotherapy-induced neuropathy, post-surgical pain, metastasis, and associated conditions such as infections. Psychological factors like anxiety and depression additionally exacerbate the pain experience, highlighting the need for effective management to preserve quality of life and dignity in palliative care patients (Faria *et al.*, 2021). Despite the importance of palliative care, global access remains a significant challenge, specifically in economically developing countries. An estimated 1 million people in India receive a cancer diagnosis each year, with more than 80% of cases occurring in stages 3 and 4, when palliative care is crucial and treatment is less effective (Bag *et al.*, 2020). Indeed, according to the World Health Organization, there were 60 million people in India over 65 in 2010, and by 2050, that number is expected to rise to 227 million, or 20% of the total population (Bag *et al.*, 2020).

Palliative care involves specialized interventions to improve the well-being of patients with critical, life-threatening diseases. Effective pain management is a foundation of this care, alleviating suffering and improving physical, psychological, and social well-being (Hedman *et al.*, 2024). Pain in palliative care is more than a physical symptom; it is a complex, multifactorial experience influenced by physiological, psychological, and social factors (Faria *et al.*, 2021). Addressing this challenge necessitates

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comprehensive and personalized strategies that cater to individual patient needs (Charak *et al.*, 2021).

The World Health Organization (WHO) outlines a graduated method for addressing cancer pain, moving from non-opioid treatments for mild pain to weak opioids for moderate pain, and strong opioids for more severe cases (Anekar *et al.*, 2023). Non-opioid analgesics such as paracetamol and NSAIDs remain relevant at all stages, mainly in the early steps. Opioid analgesics are the cornerstone of treatment for moderate to severe pain (Anekar *et al.*, 2023). Complementary non-drug therapies, including physical therapy, acupuncture, and psychological support, are increasingly recognized for enhancing medication efficacy and providing additional coping mechanisms (Crawford *et al.*, 2021). Pain scales and tools help assess and quantify pain intensity, type, and impact. Common tools include the Numeric Rating Scale (NRS), Visual Analog Scale (VAS), and Faces Pain Scale-Revised (FPS-R). In palliative care, multifaceted pain measurement scales like the McGill Pain Questionnaire (MPQ), Brief Pain Inventory (BPI), and PROMIS Pain Interference Scale provide insights into pain intensity, quality, emotional influence, and daily life effects (Charak *et al.*, 2021).

The Brief Pain Inventory (BPI) is a validated tool assessing pain severity and its effect on daily functions. Patients rate their pain intensity (worst, least, average, and current) using a numeric scale and describe pain relief from treatments. It also assesses how pain interferes with walking, mood, work, sleep, and social relationships (Sampaio *et al.*, 2024).

This study seeks to assess the effectiveness of different pain management strategies in palliative care over two days, focusing on their impact on pain severity, daily activities, and prescribing trends for analgesics and fixed drug combinations. By addressing these objectives, the study aims to improve patient care and optimize treatment outcomes in palliative settings.

MATERIALS AND METHODS

This prospective observational study was conducted from November 2023 to November 2024, focusing on patients admitted to the palliative care unit who were admitted for supportive care. Convenience sampling was used to recruit participants during the study period. This research was performed per ethical principles, with the necessary clearance obtained from the Institutional Ethics Committee of Deenanath Mangeshkar Hospital and Research Centre (Approval No PharmD_2023_Oct_SB_10). Written informed consent was secured from all patients or their legal representatives before data collection.

To meet inclusion criteria, participants had to be at least 18-year-old, receiving palliative chemotherapy for any type of cancer, admitted for supportive care and providing informed consent. Patients were excluded if they were admitted to the Intensive Care Unit (ICU), were comatose, unable to communicate effectively, or had language barriers that hindered communication.

Data were collected on two consecutive days. On Day 1, demographic data, including age and gender, as well as medical history, such as cancer type and Numeric Rating Scale (NRS), were recorded. Pain characteristics, including intensity and quality, were assessed using the Brief Pain Inventory (BPI), a validated tool commonly used in palliative care settings. The prescribed and administered analgesics were documented, specifying the drug name, dose, and route of administration. On Day 2, follow-up pain assessments were conducted using the BPI to evaluate changes in pain severity and interference with daily activities, and NRS readings were recorded.

For statistical analysis, descriptive statistics, including mean, standard deviation, and percentages were employed to summarize demographic, clinical, and pain-related information. The paired *t*-test was employed to compare BPI scores between Day 1 and Day 2, given the ordinal nature of the scores. A *p*-value below 0.05 was regarded as statistically significant.

RESULTS

A total of 146 patients were enrolled in the study, comprising 77 females (52.7%) and 69 males (47.3%), with a mean age of 57.64±12.84 years for females and 56.14±12.96 years for males. Pain severity and its impact on daily activities were assessed using the Brief Pain Inventory (BPI). A significant reduction in pain severity was observed from Day 1 to Day 2 (Figure 1). Additionally, significant reductions in pain severity and improvements in medication relief were observed through this period (Table 1).

Among the daily activity domains, only sleep showed a statistically significant improvement (*t*-value: -2.80, p=0.006), whereas other domains such as general activity, mood, and walking ability did not exhibit statistically significant changes (Table 2).

Gabapentin and Paracetamol were the most commonly prescribed medications, accounting for over half of the overall usage, while Diclofenac was the least utilized drug (Figure 2).

Opioid analgesics were the most commonly used medications, particularly for moderate pain (76.78%) and severe pain (54.54%), compared to analgesics/antipyretics/NSAIDs and anticonvulsants. Corticosteroids were the least employed for pain management, with negligible usage for both mild and severe pain (Figure 3).

Paracetamol was the most regularly used non-opioid analgesic across all pain severities, while Buprenorphine played a significant role among opioids. Gabapentin was primarily used for moderate pain, with reduced usage for mild and severe pain. Corticosteroids and Diclofenac were used sparingly across all pain levels (Table 3).

The analysis of drug combinations revealed that Paracetamol, in combination with Tramadol, Morphine, Buprenorphine, or Gabapentin, was widely used. These patterns varied depending on pain severity: Paracetamol+Tramadol was commonly used for mild pain, whereas Paracetamol+Morphine, Buprenorphine, or Gabapentin combinations were prevalent in moderate pain. For severe pain, there was a reduced reliance on combinations, favouring individual drugs with strong efficacy (Table 4).

DISCUSSION

Effective pain management is crucial for palliative care, especially for cancer patients, where pain significantly influences quality of life. Our study assessed the short-term outcomes of pain management using the Brief Pain Inventory (BPI) and demonstrated a reduced pain severity. In our study, significant reductions in pain severity were recorded from Day 1 to Day 2, with notable improvements in worst pain (p=0.001) and least pain (p=0.007). Andersson *et al.*, reported a reduction in NRS pain scores from 7.4 to 5.6 in the intervention group, attesting that visionary pain attestation and clinician feedback grease acclimatized analgesic interventions (Andersson *et al.*, 2020).

Our study observed a statistically significant improvement in sleep (p=0.006) among the BPI functional interference domains, while other domains (e.g., mood, walking ability, general activity) showed non-significant changes. This contrasts with Andersson *et al.*, who reported broader improvements across multiple BPI domains, supported by ESAS score reductions, suggesting their longer intervention period and multidisciplinary inputs may have yielded more holistic patient benefits.

Our results on analgesic prescription patterns and drug combinations are consistent with those of Menezes *et al.*, and other studies, highlighting adherence to the WHO pain ladder and the use of multimodal analgesia in palliative care. Gabapentin (26.36%) and paracetamol (24.85%) were the drugs most often prescribed, followed by buprenorphine (20.3%), reflecting their critical roles in managing mild to moderate pain and addressing neuropathic pain components (Andersson *et al.*, 2020). These findings align with Al Lawati *et al.*, who reported frequent use of gabapentin and non-opioid analgesics for mild to moderate pain, and opioids such as morphine and buprenorphine for moderate to severe pain (Al Lawati *et al.*, 2023).

Opioid analgesics in our study were mostly used for moderate (76.78%) and severe pain (54.54%), consistent with Menezes *et al.*'s emphasis on the central role of opioids in managing higher pain intensities. Non-opioid analgesics/NSAIDs, such as paracetamol and diclofenac, were prescribed more frequently for mild pain (29.32%) but were not as effective for severe pain due to limited analgesic potency and potential side effects. Gabapentin (15.79-37.5%) and dexamethasone (5.26-9.09%) were employed as adjuvants across all pain severities, underscoring their utility in

Table 1: Changes in Pain Severity and Medication Relief from Day 1 to Day 2.

Parameters	Day 1	Day 2	*t*-value	*p* value
Worst Pain	6.29±2.13	5.29±2.11	-4.03	<0.001
Least Pain	4.49±2.33	3.75±2.27	-2.75	0.007
Average Pain	5.38±2.01	4.67±1.95	-3.06	0.003
Current Pain	4.55±2.18	3.72±2.17	-3.26	0.001
Medication Relief	5.56±1.71	5.98±1.85	2.01	0.046

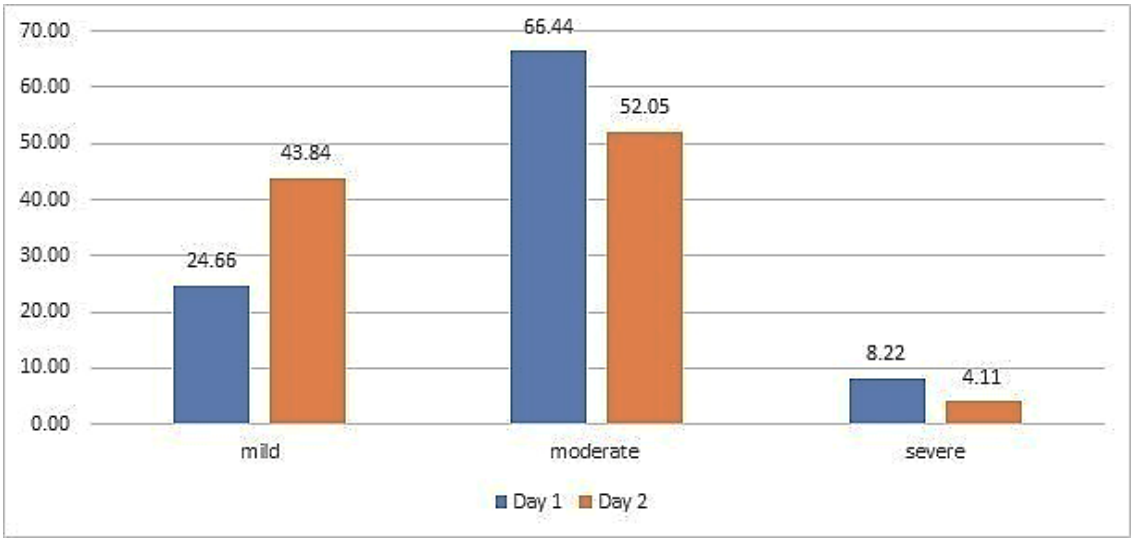

Figure 1: Reduction in Pain Severity from Day 1 to Day 2 as Assessed by BPI.

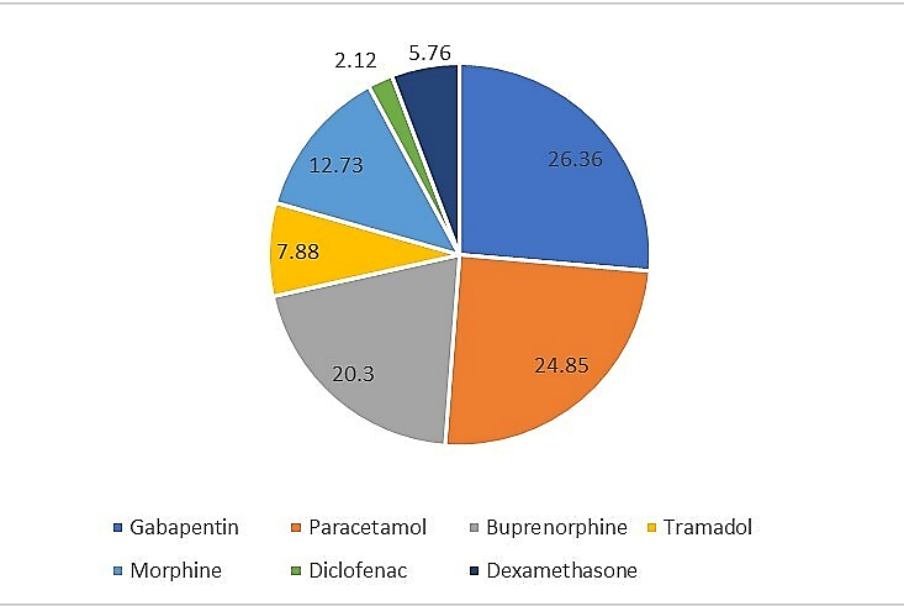

Figure 2: Prescription Pattern of Analgesics and Adjuvants in Palliative Oncology Management.

Table 2: Impact of Pain on Daily Activities from Day 1 to Day 2.

Parameters	Day 1	Day 2	*t*-value	*p*-value
General activity	4.49±3.29	3.96±3.35	-1.36	0.175
Mood	4.28±2.96	3.79±2.98	-1.41	0.161
Walking ability	4.16±3.57	3.75±3.53	-0.99	0.325
Normal work	4.41±3.46	4.02±2.69	-1.08	0.284
Relationship with others	3.68±2.69	3.27±2.71	-1.3	0.197
Sleep	4.81±2.94	3.86±2.85	-2.8	0.006
Enjoyment of life	4.64±2.55	4.14±2.65	-1.64	0.103

Table 3: Medication Usage by Pain Severity.

Medication	Class	Mild *n*=36	Moderate *n*=97	Severe *n*=12
Gabapentin	Anticonvulsant	15.79	37.5	18.18
Paracetamol	Analgesic / Antipyretic	26.32	34.82	27.27
Buprenorphine	Opioid Analgesic	24.56	29.46	27.27
Morphine	Opioid Analgesic	8.77	27.68	18.18
Tramadol	Opioid Analgesic / SNRI	12.28	19.64	9.09
Dexamethasone	Corticosteroid	5.26	9.82	9.09
Diclofenac	NSAID	3.51	2.68	0

managing neuropathic pain, inflammation, and other symptoms like fatigue (Menezes *et al.*, 2016).

In terms of analgesic utilization, our study highlighted Gabapentin (26.36%) and Paracetamol (24.85%) as primary agents, supported by opioids like Buprenorphine (20.3%) for moderate and severe pain. Andersson *et al.*, similarly reported increased usage of Paracetamol, opioids, and neuropathic pain medications (25% post-intervention), along with higher prescriptions of strong opioids (80%). This supports our findings and reinforces the central role of WHO stepwise analgesia, particularly opioid titration for moderate-to-severe pain (Andersson *et al.*, 2020).

Combination therapies are integral to multimodal pain management. Paracetamol combined with tramadol was mainly used for mild (40.00%) and moderate pain (60.00%), with no use in severe pain, reflecting its limits in dealing with higher intensities. Paracetamol combined with morphine was predominantly used for moderate pain (66.70%). The consistent use of paracetamol and gabapentin across all severities, particularly for moderate pain (59.10%), highlights its efficacy in addressing mixed pain

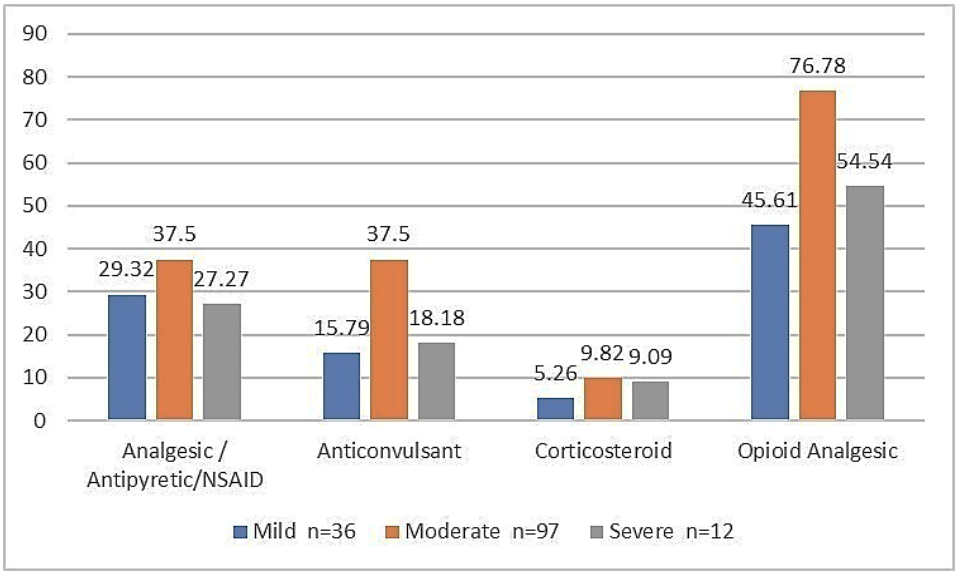

Figure 3: Analgesic Class Utilization Based on Pain Severity in Palliative Care Cancer Patients.

Table 4: Drug Combination Usage by Pain Severity.

Drug Combination	Pain Severity	Percentage (%)
Paracetamol+Tramadol	Mild *n*=36	40.00%
	Moderate *n*=97	60.00%
	Severe *n*=12	0.00%
Paracetamol+Morphine	Mild *n*=36	25.00%
	Moderate *n*=97	66.70%
	Severe *n*=12	8.30%
Paracetamol+Buprenorphine	Mild *n*=36	31.30%
	Moderate *n*=97	62.50%
	Severe *n*=12	6.30%
Paracetamol+Gabapentin	Mild *n*=36	31.80%
	Moderate *n*=97	59.10%
	Severe *n*=12	9.10%

profiles, including neuropathic pain. These patterns align with Menezes *et al.*'s findings, though variations, such as the lower usage of tramadol in our study, may reflect differences in institutional protocols or patient characteristics (Menezes *et al.*, 2016).

The relatively low use of morphine (8.77-27.68%) despite WHO recommendations may reflect a tailored approach to patient care. In this study, the goal frequently shifted from aggressive escalation of analgesia to comfort, as many of the patients were elderly or had limited life expectancy. In these situations, lesser opioids or non-opioid drugs frequently provided sufficient relief without the possible side effects of powerful opioids. This implies that morphine was saved for situations in which it was necessary, in line with a customized approach to pain management that took into account each patient's requirements, prognosis, and level of tolerance.

While this study highlights important trends and outcomes, it has certain limitations. A key limitation is the two-day follow-up period for pain assessment using the BPI scale. This duration was determined in consideration of the uncertain and often limited life expectancy of palliative care patients; however, it may not adequately capture the sustained impact of pain management interventions over time. The observational design and short follow-up period restrict the ability to evaluate long-term outcomes or trends in pain management. Additionally, the sample size, though adequate for short-term analysis, limits generalizability to larger populations and diverse care settings. Data collection over only two consecutive days may not fully capture variations in pain severity or the impact of longer treatment regimens. Furthermore, reliance on self-reported pain scales could introduce subjective bias, potentially affecting the accuracy of results (Andersson *et al.*, 2020). Finally, the study did not account for non-pharmacological interventions, such as psychological or physical therapies, which may have influenced pain relief and functional outcomes.

CONCLUSION

This study highlights the effectiveness of tailored pain management strategies in reducing cancer-related pain in a palliative care setting. Pain severity showed a notable decline across worst, least, and average levels, alongside improvements in sleep quality. Key medications included Gabapentin, Paracetamol, and opioids like Buprenorphine, frequently used in synergistic combinations based on pain severity. However, limited improvements in daily activities, such as mood and general activity, point to the need for integrating multimodal therapies. These findings validate WHO pain management protocols and emphasize the importance of holistic approaches to enhance patient outcomes and improve quality of life in palliative care.

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ABBREVIATIONS

BPI: Brief Pain Inventory; **ESAS:** Edmonton Symptom Assessment Scale; **FPS-R:** Faces Pain Scale-Revised; **ICU:** Intensive Care Unit; **IRB:** Institutional Review Board; **MPQ:** McGill Pain Questionnaire; **NRS:** Numeric Rating Scale; **NSAIDs:** Non-Steroidal Anti-Inflammatory Drugs; **PC:** Palliative Care; **PCU:** Palliative Care Unit; **PROMIS:** Patient-Reported Outcomes Measurement Information System; **SNRI:** Serotonin-Norepinephrine Reuptake Inhibitor; **VAS:** Visual Analog Scale; **WHO:** World Health Organization.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ETHICAL APPROVAL

The research/study was approved by the Institutional Ethics Committee of Deenanath Mangeshkar Hospital and Research Centre (Approval No PharmD_2023_Oct_SB_10).

DECLARATION OF PATIENT CONSENT

The authors certify that they have obtained all appropriate patient consent.

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