

ORIGINAL RESEARCH ARTICLE

Pain characteristics of adult hematological cancer patients at an outpatient clinic in Nigeria: A cross-sectional study

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Abstract

Pain is a very common complaint among hematological cancer patients. There has yet to be a study on the portrayal of pain experiences among hematological cancer patients in Nigeria. This study primarily aims to appraise the clinical characteristics of pain issues in Nigerian hematological cancer patients. The 36 hematological cancer patients from the University of Ilorin Teaching Hospital were divided into myeloma and non-myeloma groups. Their socio-demographics and clinical attributes were recorded. The PainDETECT Questionnaire, numeric pain rating scale, and Pain Management Index (PMI) were used to evaluate their pain levels. Approximately 67% of study participants complained of pain at presentation, and 92% reported it as their worst in the past four weeks. The mean participant age was 58 years. Multiple myeloma was significantly associated with age ($p = 0.035$), performance status ($p = 0.044$), pain at presentation ($p = 0.047$), worst pain in four weeks ($p = 0.013$), and neuropathic pain ($p < 0.001$). Due to the small sample size ($n = 36$), these associations are exploratory and hypothesis-generating. The percentage of patients receiving inadequate pain therapy ($PMI < 0$) was 22.2%. This research shows the characteristics of pain in hematological cancer patients in Nigeria. The findings highlight the unevenly higher frequency of neuropathic pain in multiple myeloma compared to other hematological cancers. In addition, the study exposed inadequate pain management.

Keywords: Hematological cancer; Multiple myeloma; Cancer pain; Neuropathic pain; Pain management index

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1. Introduction

Hematological cancers are uncommon worldwide. They constitute about 6.5% of all cancers worldwide and about 10% of cancers in Africa.^{1,2} However, incidence is increasing rapidly in Africa, with a recent systematic analysis estimating the pooled prevalence of hematological malignancies at 27.3%.³ As incidence increases, so do morbidity and

mortality. One such morbidity is pain. Pain is common in hematological malignancies, with up to 60% actively receiving anti-neoplastic treatment known to have pain.⁴ This can arise from the use of drugs such as vinca-alkaloids, bortezomib, and thalidomide, or it may be as a result of the malignancy itself. The issue of pain in these patients is rather rife, and there is a lack of complete understanding of the pain experienced because the usual narrative is that people with solid tumors experience more pain than people with hematological malignancies. However, a study by Kibret *et al.*⁵ in Ethiopia showed that apart from gastrointestinal cancer, patients with hematological malignancies had the highest odds of having cancer pain compared to other cancers. In some studies in Italy, the prevalence of pain in multiple myeloma and leukemia/lymphoma patients was 86% and 83%, respectively.⁶ These studies show that pain occurs in hematological malignancy patients. What remains unknown is the characteristics of the pain among Nigerian hematological malignancy patients, and whether there is effective pain management.

Hematological malignancy patients can present with pain just like any other cancer patient. This pain can either be nociceptive (inflammatory) or neuropathic. It can be the exacerbation of an old pain with varying intensities. More importantly, cancer pain can have adverse effects on a patient's well-being, including their functionality, social and emotional engagement, and compliance with treatment modalities. In addition, the proper management of cancer pain should involve an effective assessment of pain features and characteristics as well as the utilization of a pain management index. A three-step pain ladder guideline uses analgesics for different grades of pain, i.e., paracetamol for mild pain, codeine for moderate pain, and morphine for severe pain, as recommended by the World Health Organization (WHO).⁷

The Pain Management Index (PMI) is a tool developed to evaluate the adequacy of pain treatment.⁸ It compares the pain level of a patient with the strength of the analgesic prescribed. A PMI score is obtained by subtracting the categorized pain level from the categorized analgesic level (score). A negative score indicates that the pain treatment was inadequate.

The prevalence of cancer pain is high in Nigeria, with some studies reporting over 80%, along with inadequate pain management.⁹⁻¹¹ However, existing studies did not primarily focus on pain in hematological malignancy patients. The current study is the first in Nigeria to examine the characteristics of pain among hematological malignancy patients.

The primary aim of this research is to examine the prevalence and clinical characteristics of pain and other

contributing elements in hematological malignancy patients in a cohort attending a clinic at a teaching hospital in Nigeria. Our secondary objective is to assess features of neuropathic pain and the pattern of pain management in hematological malignancy patients.

2. Methodology

2.1. Study design and settings

This observational study was conducted at the University of Ilorin Teaching Hospital. Data were collected between June 2023 and December 2023 at the adult outpatient hematology clinic. The study employed a cross-sectional design to capture a snapshot of pain experiences in the hematology clinic population. Adult hematological patients aged 18 years and above with a confirmed diagnosis of a hematological malignancy, including leukemias, lymphomas, myelomas, and myeloproliferative neoplasms, without a concomitant solid tumor, and who attended the outpatient hematology clinic at the University of Ilorin Teaching Hospital during the six-month data collection period were included in this study. A non-probability, consecutive sampling technique was used to enroll study participants. The exclusion criteria for the study participants included age < 18 years, admitted inpatients, those who are critically ill, patients with significant cognitive impairment or diagnosed with a psychiatric condition that would impede their ability to provide accurate pain reports, or those who declined to provide informed consent. Eligible patients were approached in the clinic; the study was explained in detail in their preferred language. The questionnaire was then administered in a private room to ensure confidentiality and patient comfort. Medical records were reviewed to verify the diagnosis and current medications. To ensure data quality, completed questionnaires were checked for completeness and consistency at the end of each clinic day. Ethical approval was obtained from the Committee on Ethics and Research of the hospital (UITH/CAT/189/21/1119). Each participant provided written informed consent.

A questionnaire with socio-demographic and clinical information was filled out by each participant. The socio-demographic data captured included the age, gender, level of education, occupation, and marital status; the clinical data collected included the specific hematological diagnosis, the current treatment regimen (e.g., on chemotherapy, radiotherapy), and a performance status assessment using the Karnofsky performance status scale. The Karnofsky performance status scale is a validated tool that grades a patient's functional impairment from 100 (fully active) to 0 (dead), providing crucial context for understanding the impact of pain on daily life. Pain levels

were evaluated using the numeric pain rating scale (NPRS) and the PainDETECT Questionnaire for neuropathic pain. The NPRS is a widely used, reliable, and valid unidimensional measure of pain intensity, with pain rated from 0 (no pain) to 10 (worst imaginable pain). Two key metrics were assessed: (i) pain intensity at the time of the clinic visit (current pain), and (ii) the worst pain intensity experienced in the past four weeks. The four-week recall period was chosen to capture a more representative picture of patients' pain experience beyond the immediate moment, accounting for fluctuating pain levels related to treatment cycles or disease activity. Regarding neuropathic pain, the PainDETECT Questionnaire is a fully patient-completed screening tool designed to identify neuropathic pain components. It does not require a clinical examination, thus making it highly practical for the clinic setting. It consists of seven items that assess the quality and pattern of pain (e.g., burning, tingling, electric shock-like sensations) and one item on pain radiation. Its validity and reliability have been established in various populations, including cancer patients. PMI was also calculated. Patients reported their current pain level at presentation and their worst pain over the past four weeks. The type of pain relief medications used by the patient was also recorded, including non-opioids (e.g., paracetamol, non-steroidal anti-inflammatory drugs [NSAIDs]), weak opioids (e.g., tramadol, codeine), strong opioids (e.g., morphine), and co-analgesics (e.g., gabapentin, pregabalin, amitriptyline).

For the categorization of pain, a pain score of "0" indicates no pain, "1" indicates mild pain, "2" indicates moderate pain, and "3" indicates severe pain. These categorizations stemmed from the NPRS, where "0" indicates no pain, "1–3" indicate mild pain, "4–6" indicate moderate pain, and "7–10" indicate severe pain.¹² For PMI calculation, the analgesic score was categorized by the type of analgesia used to treat pain and subtracted from the categorized pain score. Thus, where no analgesia was used, the pain score was "0"; a non-opioid (i.e., NSAID or paracetamol) scored "1"; a weak opioid (e.g., dihydrocodeine, tramadol) scored "2"; and a strong opioid (e.g., morphine, fentanyl) scored "3." The patient's pain at presentation and the worst pain experienced in the previous four weeks were categorized and used to calculate the PMI separately. This dual approach provides a more nuanced view, potentially revealing instances where a patient's background pain is controlled but breakthrough or incident pain is not. Neuropathic pain, screened using the PainDETECT Questionnaire, has a maximum score of 38. The scores were also categorized: less than 13 were deemed improbable, 13–18 were deemed likely, and 19 and above were deemed very probable. This categorization helped to ensure that the likelihood of a neuropathic pain

component is captured, guiding further clinical evaluation and management. A score ≥ 13 was considered evidence of neuropathic pain.

2.2. Data analysis

The SPSS 26.0 statistical software (IBM, United States) was used for data analysis. Data normality was verified using the one-sample Kolmogorov–Smirnov test. Quantitative variables were presented as mean $\pm$ standard deviation for patient characteristics, including pain measurements, and as proportions for nominal variables. For the convenience of analysis, PMI was grouped as positive or negative; neuropathic pain as with neuropathic pain (total score ≥ 13) or without neuropathic pain (total score ≤ 12); and NPRS > 0 indicated the presence of pain. Given the prominent findings related to multiple myeloma, the participants were divided into two groups, myeloma and non-myeloma, for comparative analysis. Inferential analyses were conducted to explore relationships. The Fisher's exact test and the Chi-square test were used; the Chi-square test was used for categorical variables, and Fisher's exact test was employed where subject counts were less than 5. A p -value < 0.05 was considered statistically significant. A binary logistic regression analysis was conducted to assess associations between significant variables and multiple myeloma, using variables with $p < 0.05$ from the bivariate analyses.

3. Results

A total of 36 hematological malignancy patients participated in this study, including 22 (61.1%) males and 14 (38.9%) females, with a mean age of 58.2 ± 14.0 years (range: 21–82 years). The hematological malignancies included 4 (11.1%) chronic lymphocytic leukemia, 4 (11.1%) chronic myeloid leukemia, 2 (5.6%) essential thrombocythemia, 1 (2.8%) Hodgkin lymphoma, 13 (36.1%) multiple myeloma, 11 (30.6%) non-Hodgkin lymphoma, and 1 (2.8%) polycythemia vera. Table 1 shows the relevant characteristics of the patients.

At presentation, 12 (33.3%) patients had no pain, 18 (50.0%) had mild pain, and 6 (16.7%) had moderate pain. For the worst pain over the past four weeks, 3 (8.4%) had no pain, 12 (33.3%) had mild pain, 12 (33.3%) had moderate pain, and 9 (25.0%) had severe pain. For neuropathic pain, 26 (72.2%) had a score ≤ 12 , while 10 (27.8%) had a score ≥ 13 ; among the 10 patients with a neuropathic pain score ≥ 13 , 8 (80%) had multiple myeloma (Table 2). Using the worst pain experienced within the past four weeks as the criterion, the percentage of patients with a negative PMI (PMI < 0) was 22.2% (Table A1). The median NPRS for pain intensity was 2 for pain at presentation and 5 for the worst pain over the past four weeks. A total of 8 (22.2%) complained of their pain radiating (Figure 1).

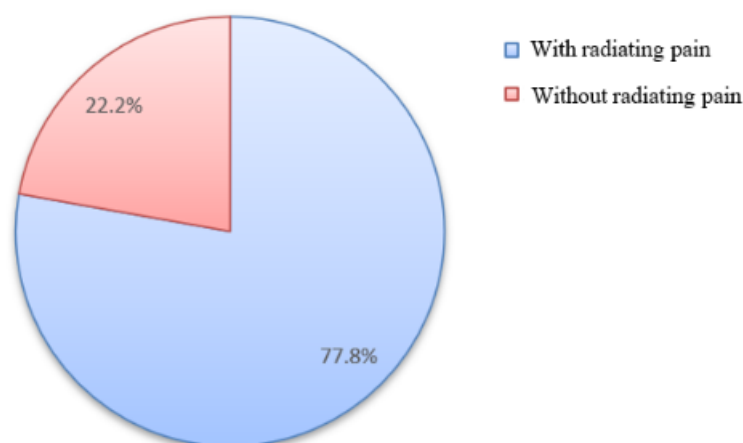


Figure 1. A pictorial depiction of radiating pain in hematological cancer patients. Only 22.2% complain of radiating pain.

All the patients except for one (2.8%) were on analgesics, with paracetamol (88.9%) and NSAIDs (72.2%) being the most used, followed by weak opioids (38.9%) and strong opioids (22.2%); 8.3% were on co-analgesics (pregabalin and amitriptyline). The analgesic score and other pain parameters are presented in [Table 2](#). Most patients reported back pain ([Table A2](#)).

Analysis was also conducted on the presence of neuropathic pain (score ≥ 13). Age and performance status were significantly associated with multiple myeloma; performance status and the presence of multiple myeloma were significantly associated with neuropathic pain. Regarding their use of analgesia, NSAIDs, weak opioids, strong opioids, and co-analgesics were significantly associated with multiple myeloma as well as the analgesic score, while strong opioids, co-analgesics, and analgesic score were significantly associated with neuropathic pain. [Table 3](#) summarizes the bivariate associations between analgesic use and the presence of hematological cancer and pain. Given the small sample size, a multivariable logistic regression was not performed to avoid overfitting, and the associations identified in the bivariate analysis should be interpreted as exploratory and hypothesis-generating.

Table 1. Socio-demographic characteristics of patients (N = 36)

Variables	Myeloma (n)	Non-myeloma (n)	p-value
Age (years)			0.035
<58	3	15	
≥ 58	10	8	

(Cont'd...)

Table 1. (Continued)

Variables	Myeloma (n)	Non-myeloma (n)	p-value
Gender			0.968
Male	8	14	
Female	5	9	
Education			0.617
None	2	2	
Primary	2	2	
Secondary	2	8	
Tertiary	7	11	
Performance status			0.044
60	0	1	
70	5	1	
80	6	9	
90	2	9	
100	0	3	
On therapy (chemotherapy)			0.288
Yes	13	20	
No	0	3	
NP score			
≤ 12	5	21	
≥ 13	8	2	
NPRS			0.047
0 (no pain)	1	11	
1–3 (mild pain)	9	9	

(Cont'd...)

Table 1. (Continued)

Variables	Myeloma (n)	Non-myeloma (n)	p-value
4–6 (moderate pain)	3	3	
Worst pain in four weeks			0.013
0 (no pain)	0	3	
1–3 (mild pain)	1	11	
4–6 (moderate pain)	10	7	
7–10 (severe pain)	2	2	
Body mass index			0.509
Underweight (Below 18.5)	0	2	
Normal (18.5–24.9)	9	16	
Overweight (25.0–29.9)	3	5	
Obesity (30.0 and above)	1	0	
Smoking			0.402
Never	13	21	
Previous	0	2	
Alcohol			0.884
Never	7	15	
Previous	4	5	
Occasional	2	3	

Abbreviations: NP: Neuropathic pain; NPRS: Numeric pain rating scale.

Table 2. Characteristics of pain and frequency of analgesia use in the patients

Characteristic	Frequency (n)	Percentage (%)
NPRS score		
Mean ± SD	1.86 ± 1.79	
Median	2	
NPRS category		
0 (no pain)	12	33.3
1–3 (mild pain)	18	50.0
4–6 (moderate pain)	6	16.7
Worst pain in four weeks		
0 (no pain)	3	8.4
1–3 (mild pain)	12	33.3
4–6 (moderate pain)	17	47.2
7–10 (severe pain)	4	11.1

(Cont'd...)

Table 2. (Continued)

Characteristic	Frequency (n)	Percentage (%)
NP score		
≤12	26	72.2
≥13	10	27.8
Analgesic score		
0	1	2.8
1	18	50.0
2	9	25.0
3	8	22.2
Paracetamol		
Yes	32	88.9
No	4	11.1
NSAIDs		
Yes	26	72.2
No	10	27.8
Weak opioid		
Yes	14	38.9
No	22	61.1
Strong opioid		
Yes	8	22.2
No	28	77.8

Abbreviations: NP: Neuropathic pain; NPRS: Numeric pain rating scale; NSAIDs: Non-steroidal anti-inflammatory drugs.

Table 3. Associations between analgesic use and presence of hematological cancer and pain (Chi-square test/Fischer's exact test)

Variable	MM presence	NP presence	WP in four weeks
Paracetamol	0.609	0.293	0.473
NSAIDs	0.043*	0.223	<0.001*
Weak opioid	<0.001*	0.107	0.008*
Strong opioid	<0.001*	0.002*	0.058
Co-analgesic	0.04*	0.017*	0.25
Analgesic score	<0.001*	0.001*	0.009*

Note: * $p < 0.05$.

Abbreviations: MM: Multiple myeloma; NP: Neuropathic pain; NSAIDs: Non-steroidal anti-inflammatory drugs; WP: Worst pain.

4. Discussion

Pain is commonly experienced by patients with different types of malignancies. Moreover, in hematological malignancies, especially myeloma, about two-thirds of the patients present with bone pain.¹³ Uncontrolled pain significantly impairs performance status and other aspects of well-being.

In this study, the prevalence of pain was similar to that reported by Shen *et al.*¹⁴ (66.6% vs. 63%), though the latter was in cancer patients. This was higher than what was reported by Niscola *et al.*¹⁵ and Kibret *et al.*⁵, but lower than that reported for different hematological malignancy patients from the Italian Epidemiologia Clinico-Assistenziale del Dolore in Ospedale (ECAD-O) survey.^{16–18} Overall, pain intensity among multiple myeloma patients in this study was higher than that in previous studies. Ramsenthaler *et al.*¹⁹, in their meta-analysis, reported a pain prevalence of 73%, similar to the 71.7% reported by Zeng *et al.*²⁰ Our figure (92.3% at presentation) was also higher than those reported by Nwabuko *et al.*²¹ (84.6%) and Nonyelum *et al.*²² (74%) in Nigeria. Their reports were primarily of bone pain, as none of them reported neuropathic pain in multiple myeloma; thus, this research is perhaps the first to report the occurrence of neuropathic pain in Nigerian patients with multiple myeloma and other hematological malignancies. Neuropathic pain has been observed among cancer patients in Nigeria.¹¹ Apart from being contributory to the total pain milieu in cancer patients, it is not adequately recognized in Nigeria, as the aforementioned report showed that only 7.9% of cancer patients are on co-analgesics, such as pregabalin.¹¹ Our study also showed that multiple myeloma patients had an unusually high prevalence of neuropathic pain (61.5%). This was higher than the 33% reported by Jespersen *et al.*²³ Interestingly, all patients on co-analgesics were multiple myeloma patients and represented about 8.3% of the total patients in the study, suggesting low use of co-analgesics to manage pain in hematological cancer patients. This finding suggests that the managing physicians do not readily recognize neuropathic pain as an important aspect of pain to manage effectively, although many patients are on anti-neoplastic agents, such as bortezomib and thalidomide, that can cause neuropathic pain. Bortezomib is a proteasome inhibitor used to manage various hematological malignancies, especially multiple myeloma, where it has profoundly affected the condition. However, it is known to cause peripheral neuropathy as a complication. This side effect can happen at any stage of using the drug. However, it is more common during the fifth cycle at an accumulated dosage of 30 mg/m².²⁴ The side effect is due to its neurotoxic effect on peripheral nerves. The mechanisms through which it causes neuropathic pain are somewhat different, including impairment of axonal transport and inflammatory damage to sensory nerves. It also causes the release of inflammatory mediators such as interleukin-1. The incidence of bortezomib-induced neuropathic pain from clinical trials is between 15% and 57.2%,²⁵ but in retreatment of multiple myeloma, it is as high as 75% for grades 1–2 neuropathy, and about 30%

for grades 3–4 neuropathy.²⁶ These values are significantly higher than what was reported for carfilzomib-induced peripheral neuropathy, which is 21% in all patients, with less than 1% having grade 3 neuropathy, according to a meta-analysis.²⁷ Expósito Vizcaíno *et al.*²⁸ reported a prevalence of about 50%, which was lower than our 61.5% in multiple myeloma patients. However, our patients were also on other medications, not bortezomib alone. A synergistic effect may explain this. Thalidomide is an immunomodulatory agent used to manage multiple myeloma. It has various mechanisms of action in multiple myeloma, but its primary action is through its interaction with cereblon, a ligand-dependent substrate receptor of the cullin4–RING E3 ubiquitin ligase (CRL4) complex. Cereblon is critical to the anti-myeloma activities of thalidomide and other immunomodulatory agents, such as lenalidomide and pomalidomide.²⁹ Thalidomide, like other immunomodulatory drugs, is also implicated in neuropathy in multiple myeloma. Banach *et al.*³⁰ reported that more than 60% of multiple myeloma patients treated with thalidomide developed a thalidomide-induced neuropathy. Thalidomide-induced neuropathy is also reported to occur in 25% to 75% of patients, and it is advised that multiple myeloma patients be screened for neuropathy before the commencement of thalidomide.³¹ While some of the patients in this study were also on thalidomide, the neuropathy seen can be a result of different therapies.

Our research also provided the first comparative account of painkiller medicine utilization among hematological cancer patients in Nigeria. This was achieved through the utilization of the PMI. The PMI is a clinical instrument used to evaluate the adequacy of pain control, particularly in cancer patients. It compares the pain intensity value (i.e., mild, moderate, or severe), colloquially known as the pain score, with a categorical value assigned to a prescribed analgesic drug, known as the analgesic score. The difference between the categorical pain score and the analgesic score is the PMI. The primary function of the PMI is to evaluate whether the level of pain relief provided is appropriate for the reported pain intensity. Using the PMI, our study shows that hematological malignancy patients may also suffer from undertreatment of cancer pain. The percentage of hematological malignancy patients with undertreated pain in our study was 22.2%, which is higher than that reported by Sichetti *et al.*³² but lower than that reported by Shen *et al.*¹⁴ Our results are closer to the literature range of 25% to 62%.^{33–37} This small difference may reflect the smaller sample size in our study; a larger sample may show more patients with a negative PMI. On the other hand, the analgesic score showed that all multiple myeloma patients were on analgesia, with the majority on strong opioids, signifying the relationship between

pain and multiple myeloma. The analgesic score was also significantly associated with neuropathic pain in our study (data not shown), implying that most pain that requires the use of strong opioids has some neuropathic components in it. This is largely true, as there were significant relationships between the neuropathic pain components and the pain at presentation.

Our bivariate analysis showed that age, performance status, neuropathic pain, and the use of weak and strong opioids were significantly associated with multiple myeloma. These associations align with existing literature demonstrating that opioids are the mainstay of pain management in hematological cancers, and that in multiple myeloma patients, they have a significant association with the disease.³⁸ In our study, more than half of the multiple myeloma patients (53.8%) were on a strong opioid, and a higher number (76.9%) were on a weak opioid compared to the non-myeloma group, with only 4.3% on a strong opioid and 17.4% on a weak opioid. The use of these drugs is related to the high burden of pain syndromes found in hematological cancers, most especially in multiple myeloma.^{39,40} While these bivariate associations are compelling, the small sample size precluded a robust multivariable analysis to adjust for potential confounders.

This pioneering study provides critical insights into the under-explored realm of pain in Nigerian patients with hematological malignancies. The high prevalence of pain (66.7%) aligns with global data, firmly dispelling the misconception that blood cancers are less painful than solid tumors. More importantly, the disparity between pain “at presentation” and “worst pain in the past four weeks” is stark. While none of the subjects had severe pain at the clinic visit, about 11% of the subjects had experienced severe pain recently. This underscores the dynamic and often unpredictable nature of cancer pain, particularly in malignancies such as multiple myeloma where incident pain (pain on movement) is common. Relying solely on a single-point assessment can significantly underestimate a patient’s true pain burden, leading to complacency in management.

Another key contribution is the finding that 27.8% of all patients and 61.5% of multiple myeloma patients screened positive for neuropathic pain. Neuropathic pain is notoriously difficult to manage and responds poorly to opioids alone, often requiring higher doses and resulting in more side effects without adequate relief. The mechanisms, as discussed, are multifactorial, involving both disease processes (e.g., nerve infiltration) and neurotoxic chemotherapies. The high prevalence in our multiple myeloma cohort potentially reflects the synergistic effect of myeloma bone disease (causing nociceptive and possibly

neuropathic pain via nerve compression) and treatment with bortezomib and thalidomide. The fact that only 8.3% of the total study population was on co-analgesics, despite over a quarter screening positive for neuropathic pain, points to a critical therapeutic gap. This gap stems from several potential factors: a lack of awareness or routine screening for neuropathic pain among clinicians, limited familiarity with co-analgesics, concerns about cost and side effects, and poor availability of these drugs within the hospital pharmacy. On another note, the finding that 22.2% of patients had a negative PMI shows that the inadequacy of cancer pain management may be a symptom of broader systemic barriers, and not only a clinical oversight.

While our study did not investigate areas such as pain medication adherence and other barriers to pain management in hematological cancer patients, we perceive that opiophobia could be a factor in the standard pain management of these patients. This could be as a result of limited knowledge about opioid use for hematological cancer pain or its complications; furthermore, there may be a lack of continuous training for healthcare providers on modern pain management principles, including the distinction between nociceptive and neuropathic pain and the appropriate use of adjuvant medications. It can also be a result of patients and families declining the use of strong opioids or other medications for personal reasons. Thus, investigation into pain medication adherence and barriers to pain medication use among hematological cancer patients is an area of further research in Nigeria. Additionally, restrictive government policies surrounding the procurement, storage, and prescription of controlled substances such as morphine create significant logistical bottlenecks that limit patient access. Importantly, the out-of-pocket cost of analgesics, particularly the strong opioids and co-analgesics, can be prohibitive for many patients, leading to non-adherence or the use of less effective, cheaper alternatives.

This study has some limitations. First, it is a single-center study with a small sample size; thus, the results cannot be generalized. Specifically, with only 36 participants and 13 multiple myeloma cases, the sample size was insufficient to perform a robust multivariable logistic regression analysis. The associations identified in the bivariate analysis, while statistically significant, should be interpreted as exploratory and hypothesis-generating. A larger multi-center study is needed to confirm these associations while controlling for potential confounders. Nevertheless, as this is the first study to examine pain characteristics among hematological cancer patients in Nigeria, it may serve as a template for future studies. Thus, future multi-center studies with larger sample sizes are warranted to confirm and extend

these results. The pre-morbid condition of the patients, especially the multiple myeloma patients, whether they had a pre-existing pain condition (neuropathic or otherwise) before their diagnosis, was not known. The cross-sectional nature of the study limits our understanding of pain because we can only make associations, not infer causality; however, this study provides a basis for more prospective studies. A key strength of this study is its pioneering focus on a neglected patient population in Nigeria, using validated tools to provide a comprehensive picture of the pain experience. The PMI provides an objective measure of treatment adequacy. A nerve conduction study was not performed for patients screened for neuropathic pain.

The findings from this study have immediate and long-term implications. One of which is an urgent need to integrate routine, standardized pain assessment into every hematology clinic visit. This should include not just intensity (NPRS) but also quality, using screening tools such as the PainDETECT Questionnaire to identify neuropathic components. For multiple myeloma patients, this should be considered a standard of care. There should be development of local and national guidelines for the management of hematological malignancies, which should include dedicated sections on pain and symptom control, emphasizing the high risk of neuropathic pain and the need for a multimodal approach (combining NSAIDs, opioids, and co-analgesics). Targeted education for hematologists, oncologists, and pharmacists on the principles of cancer pain management, with a focus on neuropathic pain and opioid stewardship, is crucial.

For prospective research, this study should serve as a catalyst for further investigation. Prospective, longitudinal studies are needed to track pain evolution across the disease and treatment trajectory. Qualitative studies exploring the patient experience of pain and the barriers to effective management from the perspectives of patients, caregivers, and clinicians are essential to design targeted interventions. Furthermore, interventional studies testing the effectiveness of a standardized pain assessment and management protocol in this population are the logical next step. It is also recommended that clinicians use validated instruments to evaluate neuropathic pain before starting proteasome inhibitors (e.g., bortezomib) and immunomodulatory drugs (e.g., thalidomide) in multiple myeloma patients.

5. Conclusion

In conclusion, this study has shown that hematological cancer patients in Nigeria also suffer from significant pain complications, most importantly multiple myeloma patients. Our analysis confirms that multiple myeloma

represents a distinct subgroup with a disproportionately high pain burden—a particularly heavy burden characterized by a high likelihood of neuropathic pain. The strong independent associations between multiple myeloma and neuropathic pain/weak opioid use/ strong opioid use in the regression model highlight this. Myeloma pain is often a complex mix of somatic pain (from lytic bone lesions), visceral pain, and neuropathic pain (from treatment and potentially nerve involvement). This complexity necessitates a more sophisticated, multimodal approach to analgesia than is often employed. The high utilization of opioids in this group, while appropriate for the intensity of pain, also raises the issue of managing opioid-related side effects such as constipation, nausea, and sedation, which themselves can impair quality of life if not proactively managed. The significant rate of undertreatment, as measured using the PMI, calls for a paradigm shift in clinical practice. Moving forward, a concerted effort is required to make routine pain assessment, including neuropathic pain screening, a non-negotiable component of hematological oncology care. Designing a pain management plan for hematological cancer patients that also incorporates neuropathic pain assessment and early-onset treatment is important, especially in multiple myeloma patients, to alleviate their suffering.

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Conflict of interest

The authors have no conflicts of interest to declare.

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Ethics approval and consent to participate

This study was performed in line with the principles of the Declaration of Helsinki. The Ethics Review Committee of University Ilorin Teaching Hospital approved this research (UITH/CAT/189/21/1119). Written informed consent was obtained from all individual participants included in the study.

Consent for publication

Not applicable.

Availability of data

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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Appendix

Table A1. Total number of patients with corresponding Pain Management Index and patient-reported pain severity scores

Score	Pain Management Index						Total
	-3	-2	-1	0	1	2	
No pain (0)	0 (0%)	0 (0%)	0 (0%)	3 (8.4%)	0 (0%)	0 (0%)	3 (8.4%)
Mild pain (1–3)	0 (0%)	0 (0%)	0 (0%)	8 (22.2%)	3 (8.4%)	1 (2.8%)	12 (33.3%)
Moderate pain (4–6)	0 (0%)	1 (2.8%)	4 (11.1%)	5 (13.9%)	2 (5.5%)	0 (0%)	12 (33.3%)
Severe pain (7–10)	0 (0%)	1 (2.9%)	2 (5.5%)	6 (16.6%)	0 (0%)	0 (0%)	9 (25.0%)
Total	0 (0%)	2 (5.5%)	6 (16.6%)	22 (61.1%)	5 (13.9%)	1 (2.8%)	36 (100%)

Table A2. Different locations of pain in hematological cancer patients

Pain location	Frequency (n)	Percentage (%)
Back/Feet	1	2.8
Back/Neck	1	2.8
Back/Shoulder/Thigh/Leg	1	2.8
Back/Thigh/Leg	1	2.8
Back/Chest/Thigh	1	2.8
Back/Shoulder/Knee/Leg	2	5.6
Back/Thigh	2	5.6
Back/Thigh/Feet	1	2.8
Belly	3	8.3
Chest	1	2.8
Chest/back	4	11.1
Feet	1	2.8
Hand	1	2.8
Hand/Feet	1	2.8
Hand/Leg	1	2.8
Knee/Hand	1	2.8
Leg	1	2.8
Leg/Hand	1	2.8
Shoulder	2	5.6
Shoulder/Back/Neck/Thigh	1	2.8
Back	6	16.7
Shoulder/Hand/Leg/Feet	1	2.8
Thigh/Feet	1	2.8

Table A3. List of chemotherapy regimens used by hematological cancer patients

Chemotherapy	Frequency, n (%)
ABVD	1 (2.8)
CHLORAM/PRED	2 (5.6)

(Cont'd...)

Table A3. (Continued)

Chemotherapy	Frequency, <i>n</i> (%)
CHOP	3 (8.3)
CVP	2 (5.6)
CYCLO/FLUDARA	1 (2.8)
HYDREA	4 (11.0)
HYDREA / IMATINIB	3 (8.3)
LENALIDOMIDE	1 (2.8)
E-CHOP	1 (2.8)
R-CHOP	3 (8.3)
Rd/ZOL	3 (8.3)
Td ZOL	5 (13.9)
Vd	1 (2.8)
VRd	1 (2.8)
VRD ZOL	2 (5.6)
Not on chemotherapy	3 (8.3)
Total	36 (100)

Abbreviations: ABVD: Adriamycin, bleomycin, vinblastine, dacarbazine; CHLORAM/PRED: Chlorambucil, prednisolone; CHOP: Cyclophosphamide, adriamycin, vincristine, prednisolone; CVP: Cyclophosphamide, vincristine, prednisolone; CYCLO/FLUDARA: Cyclophosphamide, fludarabine; HYDREA: Hydroxyurea; E-CHOP: Etoposide, cyclophosphamide, adriamycin, vincristine, prednisolone; R-CHOP: Rituximab, cyclophosphamide, adriamycin, vincristine, prednisolone; Rd/ZOL: Lenalidomide, dexamethasone, zoledronate; Td/ZOL: Thalidomide, dexamethasone, zoledronate; Vd: Bortezomib, dexamethasone; VRd: Bortezomib, lenalidomide, dexamethasone; VRd/ZOL: Bortezomib, lenalidomide, dexamethasone, zoledronate.