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ORIGINAL RESEARCH

Pain and Its Treatment Among Outpatients with Malignant Tumors in China

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Background: Pain is common among patients with malignant tumors. It significantly impacts quality of life, yet over 80% of advanced cancer patients lack adequate pain management. Despite improvements in China's pain management program, challenges remain, especially for older adults and outpatient care.

Methods: We evaluated pain intensity management adequacy using a 0–10 numerical rating scale (NRS), and Pain Management Index (PMI) at an outpatient oncology clinic. Differences and changes in pain levels were statistically analyzed using *t*-test, rank-sum, and chi-square tests. Factors associated with inadequate pain management were identified using multivariate logistic regression.

Results: Among 589 participants, 45.41% scored moderate to severe pain ≥ 4, and 81.32% experienced inadequate pain management (PMI < 0). Pain was more severe among older, than younger patients (4.15 ± 2.89 vs 3.65 ± 2.41, $P < 0.001$) and pain management was inadequate in older compared with younger patients (75.47% vs 89.87%). Undergoing targeted or immune adjuvant therapy (odds ratio [OR], 3.206; 95% confidence interval [CI], 1.538–6.684) and poor physical status (OR, 5.053; 95% CI, 2.023–12.622) emerged as significant risk factors for inadequate pain management.

Conclusion: Pain management is challenging for patients aged ≥60 years. Therefore, tailored interventions are needed to enhance care quality.

Plain Language Summary: Over 80% of advanced cancer patients lack adequate pain management, especially older adults. Tailored interventions are needed to improve care quality.

Keywords: cancer pain, pain management index, out-of-hospital pain management, older adult patients

Introduction

Pain is a prevalent and significant issue among patients with malignant tumors.

A meta-analysis of pain prevalence between 2007 and 2014 found that approximately 55% of patients with malignancies and 66% of patients with late-stage or metastatic disease experienced pain, and 39% of survivors had post-treatment pain.[1–4] This indicates that >50% of all patients diagnosed with malignant tumors endure pain, of which approximately 40% is moderate to severe, defined as a score of ≥4 on a 0–10 pain scale.[5]

Furthermore, pain severely impacts quality of life (QOL) among patients, as >30% of them have described tumor-induced pain as intolerable.[6] Although oncologists and patients recognize that effective pain management can improve the QOL,[2] gaps in effective pain management remain substantial.[3] Approximately 80% of patients worldwide with advanced malignant tumors do not receive adequate pain treatment.[7]

Regardless of primary tumor sites or disease stage,[8] most patients with malignant tumors require regular analgesics as well as anti-cancer therapies.[9]

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The Chinese Ministry of Health initiated a nationwide program between 2011 and 2013 to establish, "Demonstration Wards for Standardized Management of Malignant Tumor Pain". The purpose was to enhance the standardization of tumor diagnosis and treatment in China and improve the quality of pain management for patients with malignant tumors.

A 2016 survey of 9785 patients at 175 hospitals among 17 provinces conducted by the Chinese Anti-Cancer Association, revealed that 67% of participants experienced moderate to severe pain. Between 2012 and 2015, the proportion of hospitals offering standardized pain management to patients with malignant tumors increased from 28.6% to 47.4%, leading to an approximately 11% increase in the number of recipients.[8]

Despite these efforts, research into outpatient pain management for malignant tumors in China is limited, particularly among older adults.[10] The approach to pain management significantly differs between outpatients and inpatients care. Healthcare professionals manage pain and hospital inpatients take analgesics under clinical supervision, whereas outpatients with malignant tumors need to manage pain independently at home, frequently without clinician guidance. This reliance on self-management might result in inconsistent and inadequate pain management outside the hospital.

Herein, we analyzed baseline data from a cohort of patients with malignant tumors who regularly attended outpatient clinics to define their current status of pain management. We also aimed to identify factors that contribute to inadequate pain control specifically among individuals aged ≥60 years, who had reported a high probability of inadequate pain control while in hospital.[11]

Methods

Study Design and Population

The Institutional Review Board at Mianyang Central Hospital approved this cross-sectional study of outpatients with malignant tumors who attended an oncology outpatient clinic at a tertiary hospital in southwestern China (Approval ID: S20220357-02). All participants provided written informed consent to participate upon enrollment. Data were then collected between April and May 2023. The inclusion criteria were: age ≥ 18 years and a pathological or clinical diagnosis of a malignant tumor. The exclusion criteria were cognitive impairment and inability to understand or comply with research procedures or provide informed consent.

Demographic and Clinical Information

The demographic information included sex, age, education level, type of medical insurance, and occupation. Clinical information included family, surgical, infectious disease histories, tumor type, and clinical stage. Recent treatment information included attendance, prescribed medications, medical advice, and the most recent Karnofsky Performance Status (KPS) score, and other details derived from medical records.

Symptom Assessment

We developed a symptom questionnaire for outpatients based on expert input and a review of relevant literature.[12] The questionnaire addressed 18 symptoms such as pain, fatigue, lack of appetite, constipation, diarrhea, and others. The patients were prompted to rate the severity of their symptoms over the past 24 hours, using a 0–10 numerical rating scale (NRS), where 0 indicates none, and 10 represents the most severe symptoms imaginable.[13] Patients received and completed the questionnaire at a registration desk before entering a consultation room.

Pain Management Data

Analgesics prescribed during a visit were documented for pain management assessment. When patients were not given analgesics during a clinic visit, information about their analgesic usage was retrieved from electronic medical records at the hospital. Analgesics can only be prescribed for a maximum of 15 days per outpatient department policy. Therefore, any patient with records of analgesics prescribed within 15 days before the visit was classified as currently using analgesics.

Pain Management Index (PMI)

The Pain Management Index (PMI) assesses the adequacy of responses by healthcare providers to pain reported by patients. Management was considered sufficient when analgesic treatment aligned with the pain levels of patients.[14] We scored analgesics based on established guidelines[15] as none (0), non-opioid drugs (1), weak (2) and strong (3) opioids. We categorized and scored pain as none (0), mild (1–3), moderate (4–6), and severe (7–10). The PMI was then calculated by subtracting the score for pain from that of the analgesic, yielding a range from −3 to +3. Pain management indexes of <0 or ≥0 indicated inadequate and appropriate analgesic use, respectively.[15]

Statistical Analysis

Demographic data were summarized using descriptive statistics. Continuous variables with normal distribution and categorical variables are respectively presented as means ± standard deviation (SD), and as frequencies and ratios (%). Patients aged ≥60 and <60 years were classified as older and younger, respectively.[16] Pain was classified as mild (1–3), moderate (4–6), or severe (7–10). Any pain from 1–10 or with a record of any analgesic in one cycle of clinic visits reported by patients was categorized. Univariate analysis (two-way) identified predictors of PMI, then variables with $P < 0.05$ were included in multivariate logistic regression models. The dependent variable was the dichotomized PMI, representing the adequacy of pain control (PMI < 0 vs PMI ≥ 0). All data were statistically analyzed using SAS 9.4 (SAS Institute Inc., Cary, NC, USA) and SPSS, and graphs were generated using GraphPad Prism 9 (GraphPad Software Inc., San Diego, CA, USA). All statistical tests were two-sided, with significance set at $p < 0.05$.

Results

Among 589 patients who completed the survey, 289 (49.07%) were aged ≥60 years. A greater proportion of this group reported a higher incidence of pain or painkiller use than younger patients (32.87% vs 22.67%, $P = 0.005$). Among those reporting any level of pain, the severity was higher in patients aged ≥60 than <60 years (23 [24.21%] of 95 vs 6 [8.82%] of 68). Table 1 shows the demographic and clinical characteristics of the study participants. Figure 1 shows the pain score divided by cancer type.

Table 1 Demographics of Patients and Characteristics of Malignant Tumors

Variable	Mean Age > 60 y	Mean Age ≤ 60 y	*P*
Age (n = 589)			0.005
Patients (total)	289 (70.11 ± 5.73)	300 (51.20±7.66)	
With pain or using analgesics	95 (70.83 ± 6.09)	68 (50.81±8.04)	
Without pain	194 (69.71±5.49)	232 (51.47±7.49)	
Sex (n =588)			0.002
Female	187 (54.68%)	155 (45.32%)	
Male	102 (41.46%)	144 (58.54%)	
Type of cancer (n =579)			< 0.001
Lung	79 (57.66%)	59 (42.34%)	
Gastrointestinal	100 (54.64%)	83 (45.36%)	
Liver, gallbladder and pancreas	17 (37.78%)	28 (62.22%)	
Esophagus	40 (75.47%)	13 (24.53%)	
Prostate	10 (90.91%)	1 (9.09%)	
Gynecologic	12 (22.64%)	41 (77.36%)	
Other	28 (29.17%)	68 (70.83%)	
Treatment (n = 589)			0.779
None	112 (47.46%)	124 (52.54%)	
Chemotherapy	58 (51.33%)	53 (48.67%)	
Chemotherapy + adjuvant therapy	22 (53.66%)	19 (46.34%)	
Adjuvant	97 (48.26%)	104 (51.74%)	

Note: Data are shown as means (±SD) or as n (%).

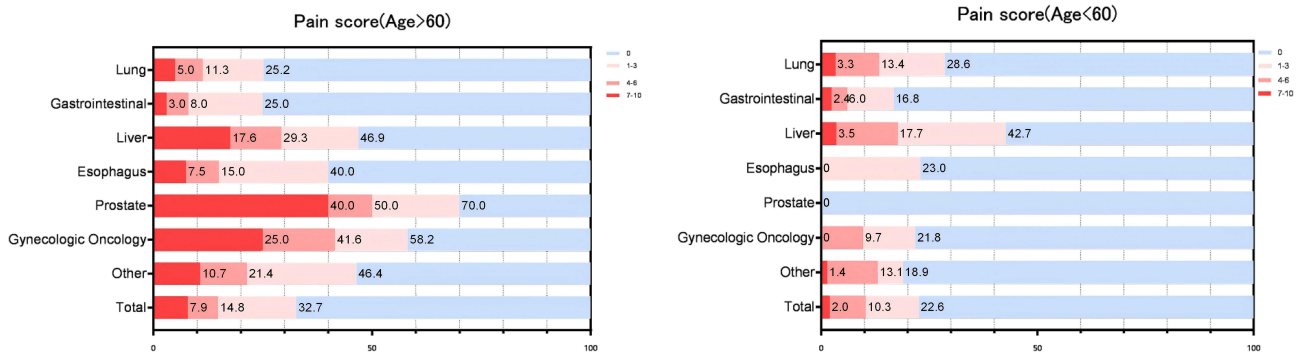

Figure 1 Pain scores categorized by cancer type.

Pain-Related Symptoms and Management

The five most severe symptoms frequently reported by older patients were pain, sleep disorders, constipation, nausea, and dizziness. Levels of pain and constipation were significantly higher among older than younger patients (4.15 ± 2.89 vs 3.65 ± 2.41, $p < 0.001$; 2.60 ± 3.30 vs 1.64 ± 2.88, $P < 0.001$). However, the older patients controlled their pain more effectively (PMI ≥ 0; 98.50% vs 85.26%, $P = 0.003$) (Supplementary Table 1).

Factors Associated with Pain Among Older Patients

Older patients were assigned to groups with pain that had been treated or not using painkillers (Table 2). Patients were less likely to report pain if they had higher, than lower KPS scores (odds ratio [OR], 0.26; 95% confidence interval [CI], 0.11–0.66). The type of cancer influenced pain levels among older patients; prostate cancer was associated with less pain than with other types of cancer (OR, 0.07; 95% CI, 0.01–0.33). Patients were more likely to report pain when undergoing adjuvant therapy compared with other treatments (OR, 3.21; 95% CI, 1.54–6.68).

Table 2 Risk Factors Associated with Pain Among Elderly Patients

Variable	Without Pain n (%)	With Pain or Using Analgesics n (%)	Chi Square Test		Multivariate Analysis		
			x^2	*P*	*P*	OR	95% CI
Disease location			16.11	0.13			
Lung	59 (74.68)	20 (25.32)			0.227	0.62	(0.29–1.34)
Gynecologic Oncology	7 (58.33)	5 (41.77)			0.101	0.31	(0.08–1.26)
Liver, gallbladder and Pancreas	9 (52.94)	8 (47.16)			0.01	0.23	(0.07–0.71)
Other	17 (54.84)	14 (45.26)			0.09	0.46	(0.19–1.13)
Prostate	3 (30.00)	7 (70.00)			<0.001	0.07	(0.01–0.33)
Esophagus	24 (60.00)	16 (40.00)			0.188	0.58	(0.25–1.31)
Gastrointestinal (ref)	75 (75.00)	25 (25.00)					
Current KPS			9.13	0.003			
≤ 70 (ref)	10 (40.00)	15 (60.00)					
100–80	184 (69.71)	80 (30.29)			0.004	0.27	(0.11–0.66)
Current treatment			7.96	0.047			
Adjuvant	73 (75.26)	24 (24.74)			0.002	3.21	(1.54–6.68)
Chemotherapy	42 (72.41)	16 (27.69)			0.193	1.64	(0.78–3.43)
Chemotherapy + adjuvant	14 (63.64)	8 (36.46)			0.703	1.22	(0.45–3.32)
Untreated (ref)	65 (58.00)	47 (42.00)					

Abbreviations: CI, confidence interval; OR, odds ratio.

Table 3 Patients Affected by Pain or Age

Variable	PMI < 0	PMI ≥ 0	*P* (Chi Square Test)
Total patients (n = 75)			0.038
Moderate pain	42 (93.33)	3 (6.67)	
Severe pain	23 (76.67)	7 (23.33)	
Patients with moderate pain categorized by age (y) (n = 45)			0.115
> 60	18 (90.00)	2 (10.00)	
≤ 60	24 (96.00)	1 (4.00)	

Note: PMI is shown as n (%).

Factors Associated with PMI

Inadequate pain management significantly differed between older and younger patients (85.26% vs 98.50%, $P = 0.004$). Among 95 older patients who reported pain, 81 (85.26%) did not receive adequate pain relief. We found that good patient performance, indicated by a KPS score of ≥80, might be associated with insufficient pain management ($P < 0.001$). Pain management was inadequate (PMI < 0) among 96.08%, 96.43%, 60.00%, and 89.19% of patients who received adjuvant therapy, chemotherapy, both, or no treatment, respectively. Differences among these treatment groups were statistically significant ($P = 0.002$). However, the multivariate analysis did not select these factors as statistically significant for PMI among older patients. Supplementary Table 2 shows the factors affecting PMI scores. Furthermore, patients with higher scores for pain severity managed their pain more effectively (23.33% vs 6.67%, $P = 0.038$), regardless of age ($P = 0.115$) (Table 3).

Discussion

The present findings emphasize the prevalence of persistently inadequate pain management in China, particularly among older patients. This is despite several national initiatives aimed at improving pain associated with cancer, such as establishing standardized treatment demonstration wards,[17,18] where patients with malignant tumors often experience severe pain. The literature suggests that clinicians should assess pain at every patient visit. Although patients might not achieve complete pain relief, collaborative efforts between clinicians and patients can facilitate a management plan that allows patients to function independently and manage tolerable pain levels.[19] Additionally, exploring alternative pain management strategies, such as applications designed to assist patients with cancer pain outside hospitals might help to reduce pain scores and enhance the QOL.[20] Addressing significant pain and inadequate management among patients with cancer, particularly among older populations in China, necessitates urgent attention and further investigation. We hope that this article stresses gaps in outpatient pain management in China and that it will serve as a foundation for future investigation.

Older patients in outpatient settings report more severe pain symptoms. Although this has led to relatively better pain management among older than younger patients, a substantial number of older individuals still do not receive adequate analgesic treatment. Persistent inadequate pain management can severely impact the QOL,[21,22] which can lead to decreased appetite, insomnia, anxiety, depression, and even suicidal thoughts.[23] Some studies suggest a correlation between the QOL and survival rates in patients with malignancies,[24] indicating that effective pain management could enhance both the QOL and longevity.

This issue stems from multiple contributing factors. Significant side effects associated with specific analgesics might be key.[25] For instance, in the present study, celecoxib emerged as the most frequently prescribed non-opioid analgesic (Supplementary Table 3). However, it is noteworthy that nonsteroidal anti-inflammatory drugs (NSAIDs), including celecoxib, are associated with potential adverse effects such as renal impairment, gastrointestinal complications, and elevated stroke risk.[26] Similarly, while tramadol was identified as the most commonly utilized weak opioid in our investigation, its administration is generally contraindicated in cases of severe hepatic impairment.[27] In this study, a significant proportion of elderly patients presented with comorbidities. Given that conditions such as liver or kidney disease often limit suitable analgesic options, this may partially explain the observed inadequacy in pain relief. Hypertension was the most prevalent comorbidity among elderly patients in our study (Supplementary Table 4). Notably, hypertensive nephropathy is a common complication of chronic hypertension,[28] and impaired renal function can alter drug metabolism—particularly opioids like morphine—by affecting critical pathways such as the cytochrome

P450 enzyme system and renal clearance mechanisms.[29] In light of these challenges, some researchers have proposed a modified analgesic ladder tailored for patients with renal impairment.[30] Another contributing factor is cultural attitudes toward pain endurance.[31] Many older individuals in China adhere to the cultural belief in, "enduring pain" and perhaps perceive it as a normal aspect of aging;[32] however, this might hinder pursuit of treatment.[23]

In contrast, pain management outcomes are often poorer in younger, than older patients, possibly due to less severe pain not being taken seriously.[33] Our findings support this notion, indicating that younger patients generally have better physical health, which correlates with less intensive pain management.

These findings underscore the urgent need for research into effective pain management approaches specifically designed for older outpatients. This group often have limited or no access to professional care, and their pain symptoms might not receive sufficient attention during routine tumor assessments.[34,35]

This study has some limitations. The incidence of reported pain was lower than that in the literature, which this might be due to our study population. Outpatient treatment typically involves patients who have either completed, or are currently undergoing treatment and often experience mild symptoms.[8] We applied the NRS,[36] an internationally established single-item tool, to evaluate pain severity. However, multidimensional pain assessment tools, such as the Brief Pain Inventory,[8,37] were not used to assess pain and its impact on activities of daily living. We collected data only from an outpatient department, where patient records do not have information about socioeconomic status, tumor type, staging, and treatment methods. This data gap restricted our ability to identify specific factors influencing pain management. For instance, varying levels of insurance reimbursement might impact patients' decisions regarding pain management and treatment outside a hospital.[19] Effective pain management is inherently complex, requiring collaboration among clinicians, patients, and other stakeholders. Constrained by the temporal and geographical scope of data collection, we were unable to evaluate depressive symptoms in our study. This represents a significant limitation, as existing evidence consistently demonstrates that depression and impaired communication in elderly patients substantially compromise pain management efficacy.[38] Particularly in oncological populations, research indicates a high prevalence of comorbid depression and pain, likely mediated through shared neurobiological pathways that create a mutually reinforcing cycle.[38,39] Furthermore, cognitive impairment - typically assessed using the Mini-Mental State Examination (MMSE) in geriatric oncology research - presents additional challenges for pain management.[40,41] The recent implementation of China's National Depression and Dementia Prevention Initiative (2020) may help address these critical comorbidities in elderly cancer patients, potentially yielding secondary benefits for pain control.

Conclusion

The findings of this study reveal persistent inadequacies in cancer pain management within Chinese outpatient settings, particularly among elderly populations who exhibit higher pain severity yet encounter significant therapeutic barriers, including comorbidities limiting analgesic options and cultural norms emphasizing pain tolerance. While younger patients receive less aggressive pain management, their comparatively better physiological resilience may partially offset clinical consequences. These results underscore a critical imperative for the development of age-specific pain management protocols, incorporating innovative approaches such as digital health technologies and comprehensive multidimensional assessment tools.

Methodological constraints, notably reliance on unidimensional pain metrics (NRS) and absence of socioeconomic/treatment covariates, delineate important directions for future investigations. Subsequent research should integrate holistic evaluation frameworks to elucidate socioeconomic determinants and optimize therapeutic strategies, thereby enhancing quality of life across this clinically vulnerable demographic.

Data Sharing Statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author Qiuling Shi on reasonable request.

Ethics Approval

The Institutional Review Board at Mianyang Central Hospital approved this cross-sectional study of outpatients with malignant tumors who attended an oncology outpatient clinic at a tertiary hospital in southwestern China (Approval ID: S20220357-02). All procedures involving human participants adhered to the ethical standards of the Declaration of Helsinki.

Consent to Participate

All participants who met the inclusion criteria provided written informed consent to participate upon enrollment.

Consent to Publish

All participants who met the inclusion criteria provided written informed consent to publish their innominate data.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas.

All authors contributed to data analysis, drafting or revising the article, have agreed on the journal to which the article will be submitted, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

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Disclosure

The authors have no financial conflicts of interest.

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