

Assessment of Musculoskeletal Conditions in Association with Anxiety and Depression in Cancer Patients

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ABSTRACT

Background: Cancer and its treatment can produce persistent musculoskeletal symptoms that coexist with psychological distress and may adversely affect physical function and quality of life. **Objective:** To assess musculoskeletal conditions in cancer patients and examine their association with anxiety and depression in tertiary care hospitals of Lahore, Pakistan. **Methods:** This cross-sectional observational study included 292 cancer patients aged 45 to 65 years receiving treatment for at least six months at five tertiary care hospitals. Data were collected using the Hospital Anxiety and Depression Scale and the Nordic Musculoskeletal Questionnaire. Descriptive statistics were reported as frequencies and percentages, and associations among anxiety, depression, and musculoskeletal conditions were examined using chi-square testing in SPSS version 21. **Results:** Females comprised 57.8% of the sample, and 61.3% of participants were aged 56 to 65 years. Borderline anxiety was present in 44.7% of patients and abnormal anxiety in 28.0%, while borderline depression was observed in 60.6% and abnormal depression in 15.1%. The most commonly affected regions were knees (51.4%), lower back (49.7%), and hips/thighs (46.5%). Lower back symptoms were associated with the highest activity limitation (59.9%) and physician consultation (62.3%). A significant association was found among anxiety, depression, and musculoskeletal conditions (Pearson chi-square = 122.3, df = 4, p < 0.001). **Conclusion:** Musculoskeletal morbidity and psychological distress were highly prevalent and significantly associated in cancer patients, supporting the need for integrated musculoskeletal and mental health assessment in oncology care. **Keywords:** anxiety; depression; musculoskeletal disorders; cancer; physiotherapy; cross-sectional study.

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INTRODUCTION

Cancer and its treatment are increasingly recognized as multidimensional contributors to long-term physical and psychological morbidity. Beyond the direct burden of malignancy, many patients experience substantial functional decline during and after treatment, including pain, fatigue, restricted mobility, muscle weakness, and reduced participation in daily activities. Musculoskeletal complications may arise from prolonged inactivity, surgical interventions, chemotherapy, radiotherapy, endocrine therapy, treatment-related neuropathy, and cancer-associated wasting, all of which can negatively influence quality of life and physical independence (1,2). These sequelae are clinically important because they often persist beyond the acute phase of treatment and may become major determinants of disability among cancer survivors (2).

The musculoskeletal burden of cancer is further compounded by treatment-related skeletal complications. Several oncologic therapies are associated with altered bone turnover, accelerated bone loss, osteopenia, osteoporosis, and increased fracture risk. Endocrine treatment for breast cancer, androgen deprivation therapy for prostate cancer, corticosteroid exposure, alkylating agents, platinum-

based compounds, and antimetabolites may all contribute to progressive impairment in musculoskeletal health, particularly in middle-aged and older adults already vulnerable to reduced functional reserve (3,4). As a result, pain and mobility restriction in cancer patients should not be viewed as isolated physical complaints, but rather as part of a broader symptom complex that interacts with emotional wellbeing and overall recovery (5).

Psychological distress is also highly prevalent in oncology populations. Depression in cancer patients affects mood, cognition, sleep, appetite, motivation, and treatment engagement, whereas anxiety may manifest as sustained worry, fear, restlessness, and anticipatory distress related to disease progression, suffering, or death (6,7). These symptoms frequently coexist and may intensify the perception of physical discomfort, reduce coping capacity, and worsen adherence to rehabilitation or medical treatment. Previous studies have shown that distress, fatigue, pain, and healthcare utilization are closely linked in patients with advanced and treated cancer, suggesting that physical and psychological symptoms often reinforce one another rather than occurring independently (8,9).

The relationship between musculoskeletal disorders and psychological symptoms is particularly important in patients who become physically inactive during treatment. Reduced mobility, persistent pain, loss of muscle bulk, and dependence on caregivers may increase feelings of helplessness, social withdrawal, and low self-worth. Cancer cachexia, chronic post-treatment pain, reconstructive limitations, and region-specific impairments such as shoulder dysfunction after breast cancer treatment or pelvic and lower-limb pain in other malignancies may all contribute to this cycle of disability and emotional distress (10,11). Although anxiety and depression in cancer populations have been studied separately, fewer studies have examined these outcomes together in relation to musculoskeletal conditions, especially in resource-constrained settings where symptom assessment is often fragmented and rehabilitative care remains underutilized (12).

In Pakistan, evidence on the co-occurrence of musculoskeletal problems, anxiety, and depression in cancer patients remains limited. This gap is important because untreated physical and psychological morbidity may delay functional recovery, worsen symptom burden, and reduce the effectiveness of supportive care interventions. An integrated clinical assessment of musculoskeletal symptoms alongside anxiety and depression may therefore provide a more meaningful understanding of patient needs and help identify individuals who may benefit from timely physiotherapy and psychosocial support. The present study was conducted to assess musculoskeletal conditions in cancer patients and examine their association with anxiety and depression among patients receiving treatment in tertiary care hospitals of Lahore, Pakistan (11,12).

MATERIALS AND METHODS

This cross-sectional observational study was conducted in five tertiary care hospitals of Lahore, Pakistan, including Mayo Hospital, Jinnah Hospital, INMOL Hospital, Sheikh Zayed Hospital, and Services Hospital. Data collection was completed over a period of four months after approval of the study synopsis. The study targeted adult cancer patients receiving ongoing treatment and was designed to evaluate the coexistence of musculoskeletal symptoms with anxiety and depression in a hospital-based oncology population. A total sample of 292 patients was included in the final analysis

Eligible participants were men and women aged 45 to 65 years with a confirmed diagnosis of cancer and a treatment duration of at least six months. Patients younger than 45 years, older than 65 years, cancer-free individuals, children, and emergency patients were excluded. Participants were recruited from the selected hospitals using a non-probability convenience approach after screening for eligibility criteria. This approach allowed inclusion of accessible patients undergoing active management within the study timeframe while maintaining consistency in participant selection across sites. To reduce selection ambiguity, all participants were enrolled only after confirming age range, cancer status, treatment duration, and clinical stability at the time of assessment (13).

Data were collected from primary sources using a structured questionnaire-based approach. Anxiety and depression were assessed with the Hospital Anxiety and Depression Scale, which comprised 14 items divided equally between anxiety and depression domains. Scores were categorized as normal, borderline, and abnormal according to standard HADS thresholds, with scores of 0 to 7 considered normal, 8 to 10 borderline, and 11 to 21 abnormal for each subscale. Musculoskeletal symptoms were assessed using the Nordic questionnaire, which captured the presence of trouble such as ache, pain, or discomfort in major body regions during the previous 12 months, whether symptoms prevented normal activities, whether medical consultation had been sought, and whether symptoms were present during the previous 7 days. The principal study variables were therefore anxiety status, depression status, and musculoskeletal complaints across specific anatomical regions including the neck, shoulders, upper back, elbows, wrist and hand, lower back, hips and thighs, knees, and ankles and feet

Operationally, anxiety and depression were treated as categorical outcomes based on HADS scoring, while musculoskeletal conditions were represented as region-specific symptom frequencies derived from the Nordic questionnaire. Demographic variables included age category, sex, and hospital of recruitment. Because the study was cross-sectional, exposure and outcome data were recorded at the same assessment point. To improve internal consistency, the same predefined questionnaire format was used across all participating hospitals, and all entered responses were coded in a uniform manner before analysis. This standardization supported reproducibility and minimized variability in questionnaire administration and data handling.

Several steps were taken at the design and analysis stages to limit bias. Eligibility criteria were applied uniformly across all centers to reduce inappropriate inclusion. Use of standardized instruments helped reduce measurement inconsistency, and collection of data directly from participants improved capture of current symptom burden. However, because the study relied on self-reported questionnaire responses and non-probability sampling, the findings were interpreted within the limits of potential reporting bias and restricted generalizability. Confounding was addressed descriptively through reporting of demographic distributions, although no multivariable adjustment model was applied in the original analytical framework

Data were entered and analyzed using Statistical Package for the Social Sciences version 21. Qualitative variables were summarized as frequencies and percentages. The relationship among anxiety, depression, and musculoskeletal conditions was examined using the chi-square test, and statistical significance was assessed using a two-sided p-value threshold of less than 0.05. The results table from the original manuscript reported a statistically significant association among these variables, with a Pearson chi-square value of 1.223E2, 4 degrees of freedom, and $p = 0.000$, alongside a significant linear-by-linear association of 8.680 with $p = 0.003$. Only complete responses included in the final dataset were analyzed, and the number of valid cases entered into the inferential analysis was 292 (14,15).

RESULTS

A total of 292 cancer patients were included in the analysis. Females constituted 57.8% of the sample, while males accounted for 42.2%. Patients aged 56 to 65 years represented the larger age stratum at 61.3%, compared with 38.7% aged 45 to 55 years. Recruitment was distributed across five tertiary care hospitals, with the highest proportion enrolled from Mayo Hospital (35.6%), followed by Jinnah Hospital (28.8%), Services Hospital (15.8%), and both INMOL Hospital and Sheikh Zayed Hospital (9.9% each)

Table 1. Demographic and Recruitment Characteristics of the Study Sample (N = 292)

Variable	Category	n (%)	95% CI
Sex	Male	123 (42.2)	36.7–47.9
	Female	169 (57.8)	52.1–63.3
Age group (years)	45–55	113 (38.7)	33.3–44.4
	56–65	179 (61.3)	55.6–66.7

Variable	Category	n (%)	95% CI
Hospital	Jinnah Hospital	84 (28.8)	23.8–34.3
	Mayo Hospital	104 (35.6)	30.3–41.3
	INMOL Hospital	29 (9.9)	7.0–13.8
	Sheikh Zayed Hospital	29 (9.9)	7.0–13.8
	Services Hospital	46 (15.8)	12.0–20.5

Female patients outnumbered male patients by 15.6 percentage points, and the older age stratum exceeded the younger group by 22.6 percentage points. Mayo Hospital alone contributed over one-third of the sample, indicating that the study population was concentrated in a limited number of tertiary oncology settings rather than being evenly distributed across sites

Psychological symptom grading showed that anxiety was most frequently categorized as borderline, affecting 44.7% of participants, while abnormal anxiety was observed in 28.0% and normal anxiety in 27.3%. Depression showed an even stronger clustering in the borderline range, reported in 60.6% of patients, whereas 24.3% were normal and 15.1% were abnormal. These findings indicate that psychological distress was common, with nearly three-quarters of the cohort falling outside the normal range for both anxiety and depression

Table 2. Distribution of Anxiety and Depression Severity According to HADS (N = 292)

Domain	Category	Score range	n (%)	95% CI
Anxiety	Normal	0–7	80 (27.3)	22.5–32.7
	Borderline	8–10	131 (44.7)	39.1–50.4
	Abnormal	11–21	82 (28.0)	23.2–33.4
Depression	Normal	0–7	71 (24.3)	19.7–29.5
	Borderline	8–10	177 (60.6)	54.9–66.0
	Abnormal	11–21	44 (15.1)	11.4–19.7

Depression demonstrated a higher borderline burden than anxiety by 15.9 percentage points. Although abnormal anxiety was more frequent than abnormal depression (28.0% versus 15.1%), the overall pattern suggests that subthreshold-to-moderate psychological morbidity was highly prevalent in this cancer population. Clinically, this implies that a substantial proportion of patients may not meet the most severe threshold yet still carry meaningful emotional symptom burden likely to affect pain experience, mobility, and rehabilitation engagement

Musculoskeletal symptoms were distributed unevenly across body regions. Knee complaints were the most frequently reported 12-month problem at 51.4%, followed by lower back symptoms at 49.7% and hip/thigh symptoms at 46.5%. Lower back involvement showed the greatest functional and care-seeking burden, with 59.9% reporting activity limitation, 62.3% consulting a physician, and 56.9% reporting symptoms during the last 7 days. By contrast, wrist/hand and elbow regions showed the lowest overall burden across all Nordic domains

Table 3. Regional Musculoskeletal Burden According to the Nordic Questionnaire (N = 292)

Body region	12-month symptoms %	Activity limitation %	Physician consultation %	7-day symptoms %	Composite burden score* %
Neck	23.7	75.6	75.9	75.9	62.8
Shoulders	34.6	43.4	43.4	43.4	41.2
Upper back	41.7	46.4	46.1	46.1	45.1
Elbow	23.1	24.1	24.1	23.1	23.6
Wrist/hand	21.4	24.4	20.0	19.3	21.3
Lower back	49.7	59.9	62.3	56.9	57.2
Hips/thigh	46.5	46.5	46.5	49.0	47.1
Knees	51.4	51.9	52.2	50.5	51.5
Ankle/feet	39.3	33.2	29.0	38.8	35.1

The composite burden profile ranked the neck highest at 62.8%, followed by lower back at 57.2% and knees at 51.5%. This pattern suggests two clinically distinct profiles: first, axial regions such as the neck and lower back showed marked consequences in terms of persistent symptoms, activity restriction, and healthcare use; second, weight-bearing lower-limb regions, particularly knees and hips/thighs, displayed sustained symptom prevalence consistent with mobility-related limitation. Wrist/hand and elbow regions remained comparatively less affected, with composite scores of 21.3% and 23.6%, respectively

A statistically significant association was reported between anxiety, depression, and musculoskeletal conditions. The Pearson chi-square value was 122.3 with 4 degrees of freedom and a two-sided p-value < 0.001, while the likelihood ratio was 134.254 with the same degrees of freedom and $p < 0.001$. The linear-by-linear association was also significant (8.680, $p = 0.003$), indicating a graded relationship across the studied categories. No expected cell count was below 5, supporting the appropriateness of the chi-square procedure

Table 4. Association Between Anxiety, Depression, and Musculoskeletal Conditions

Test	Value	df	p-value
Pearson Chi-square	122.300	4	<0.001
Likelihood ratio	134.254	4	<0.001
Linear-by-linear association	8.680	1	0.003
Valid cases	292	—	—

These inferential findings support the central study premise that psychological distress and musculoskeletal morbidity were not occurring independently in this cohort. The strength and significance of the chi-square statistics suggest that patients with greater musculoskeletal symptom burden were more likely to report anxiety and depression, reinforcing the need for integrated assessment pathways in cancer care rather than isolated symptom management approaches

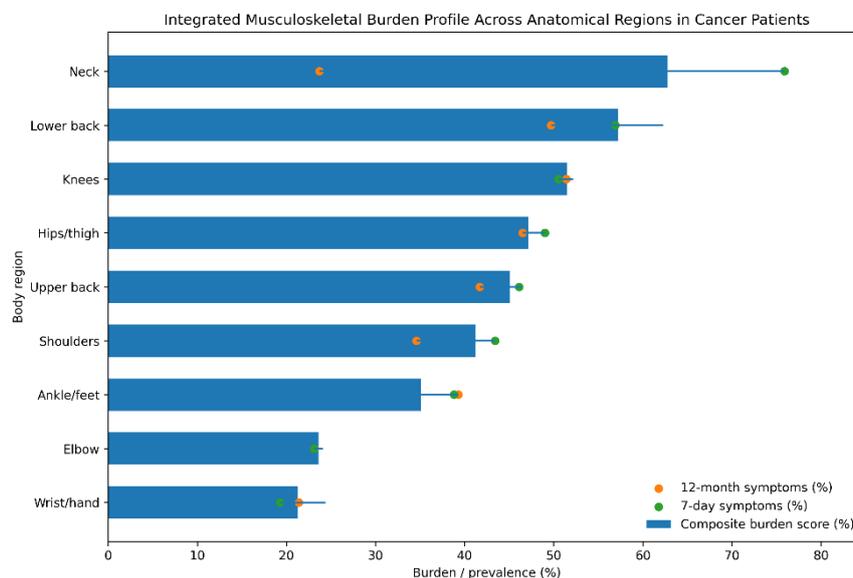


Figure 1 Integrated Musculoskeletal Burden Profile Across Anatomical Regions in Cancer Patients

The integrated regional profile showed the highest composite burden in the neck (62.8%), followed by lower back (57.2%) and knees (51.5%), while wrist/hand (21.3%) and elbow (23.6%) had the lowest overall burden. Lower back symptoms demonstrated the most balanced high-intensity pattern across all Nordic domains, with 49.7% reporting 12-month symptoms, 59.9% activity limitation, 62.3% physician consultation, and 56.9% recent 7-day symptoms. Knees showed the highest 12-month prevalence at 51.4%, whereas the neck exhibited a striking asymmetry between lower 12-month symptom prevalence (23.7%) and markedly higher functional and care-seeking indicators (75.6%–75.9%), suggesting that when cervical symptoms occurred, they were associated with disproportionately greater disability and medical attention. Together, these patterns indicate that axial and weight-bearing regions carried the greatest clinically meaningful burden in this cancer cohort

DISCUSSION

The present study demonstrated a statistically significant association between musculoskeletal conditions and psychological distress in cancer patients, with chi-square analysis confirming that anxiety, depression, and musculoskeletal morbidity were interrelated rather than independent clinical problems.

The burden observed in this cohort was substantial, as 44.7% of participants had borderline anxiety and 28.0% had abnormal anxiety, while 60.6% had borderline depression and 15.1% had abnormal depression. These findings indicate that most patients were experiencing at least some degree of emotional distress while also reporting region-specific musculoskeletal symptoms, particularly in the neck, lower back, knees, and hips/thighs. This combined symptom profile is clinically plausible because cancer-related pain, immobility, treatment adverse effects, and fear surrounding disease progression often reinforce one another, ultimately worsening both physical function and emotional wellbeing. The findings are broadly consistent with prior work showing that physical and psychological symptoms in cancer frequently cluster and contribute to increased functional disability and healthcare needs (16).

A notable finding of the present study was the distribution of musculoskeletal burden across body regions. Knee symptoms showed the highest 12-month prevalence at 51.4%, while lower back symptoms demonstrated the strongest overall impact, including 59.9% activity limitation, 62.3% physician consultation, and 56.9% recent 7-day symptoms. The neck also showed an important pattern, with a lower reported annual symptom prevalence of 23.7% but disproportionately high activity restriction and physician consultation rates of 75.6% and 75.9%, respectively. This suggests that cervical symptoms, when present, may be associated with greater perceived disability than some more prevalent complaints. These observations align with previous literature indicating that musculoskeletal consequences in cancer are not limited to a single anatomical site and may differ according to disease type, treatment exposure, reconstructive procedures, cachexia, and prolonged inactivity. Studies in breast cancer survivors and other oncology populations have similarly reported persistent pain, restricted upper-body mobility, fatigue, and treatment-related musculoskeletal syndromes that interfere with daily functioning long after diagnosis or treatment initiation (17).

The psychological findings of the current study are also consistent with earlier reports showing that depression and anxiety are common in patients receiving cancer care, especially when accompanied by pain, fatigue, or advanced symptom burden. Previous studies have shown that emotional distress may be amplified by fear, sleep disturbance, uncertainty, and dependence on others for basic activities, all of which are relevant in patients with cancer-related physical decline. In the present sample, the high proportion of borderline HADS scores is particularly important because these patients may not yet meet the threshold for severe psychiatric morbidity, but they still represent a vulnerable group at risk of worsening functional and psychological outcomes if symptoms remain unrecognized. This has practical implications for oncology rehabilitation, as early identification of borderline anxiety or depression may allow supportive physiotherapy, mobility restoration, symptom education, and timely psychosocial referral before severe impairment becomes established (18).

Another relevant interpretation of the present findings is that musculoskeletal disorders in cancer patients may function both as consequences of treatment and as independent drivers of poorer mental health. Pain and restricted mobility can reduce autonomy, disturb sleep, limit participation in family and social roles, and negatively affect self-image, thereby increasing the likelihood of depressive and anxious symptomatology. Conversely, anxiety and depression may heighten pain perception, reduce motivation for physical activity, and worsen adherence to rehabilitation. This bidirectional relationship helps explain why the observed association was statistically strong and why integrated rather than symptom-isolated care is likely to be more effective. The current study therefore supports a multidisciplinary model in which oncology, physiotherapy, rehabilitation medicine, and mental health services operate in coordination, particularly for middle-aged and older patients receiving prolonged treatment (19).

The study also has important limitations that should be considered when interpreting the results. Its cross-sectional design precludes causal inference, so it cannot determine whether musculoskeletal symptoms preceded psychological distress or vice versa. The use of non-probability convenience sampling limits generalizability beyond the selected hospitals, and the absence of multivariable adjustment means that potential confounders such as cancer type, stage, treatment modality,

comorbidities, and duration of immobility were not analytically controlled. In addition, the manuscript contained one internal inconsistency in depression reporting, with borderline depression presented as 60.6% in the narrative and 66.6% in the table; this should be harmonized in the final version. Despite these limitations, the study contributes useful local evidence from a Pakistani tertiary-care context and highlights the need for standardized screening of both musculoskeletal and psychological symptoms in cancer populations. Future studies should use probability-based sampling, stratified cancer subgroups, and multivariable models to clarify the strength and direction of these relationships and to identify patients at greatest risk of combined functional and emotional deterioration

CONCLUSION

Cancer patients in this study showed a considerable burden of musculoskeletal symptoms together with anxiety and depression, and these domains were significantly associated with one another. Lower back, knee, and neck complaints emerged as clinically important contributors to disability, while a large proportion of participants demonstrated borderline or abnormal psychological distress. These findings support the need for integrated screening and management pathways in oncology settings, with greater attention to physiotherapy-led musculoskeletal assessment, early mobility-focused rehabilitation, and timely psychosocial support to improve function, independence, and overall quality of life in patients undergoing cancer treatment

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