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Original Article

Pain and emotional status in pediatric oncology: Evaluation and insights

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Abstract

Objective: This study aimed to determine the depression status of pediatric cases diagnosed with cancer and to investigate the possible relationship between depression and pain levels.

Methods: This descriptive, cross-sectional, single-center study was conducted at Prof. Dr. Cemil Taşcıoğlu City Hospital and included a total of 79 participants. The patient group consisted of 49 pediatric oncology patients diagnosed with malignancy and were under regular follow-up at the Pediatric Oncology Clinic. The control group comprised 30 age- and sex-matched healthy children without any chronic diseases recruited from pediatric outpatient clinics. Demographic and clinical data of the patients, including age, sex, diagnosis, stage of the disease, age at the time of diagnosis, number of hospitalizations, and length of hospital stay, were recorded. The emotional states of the patients were evaluated using the Children's Depression Inventory (CDI), and the pain levels were evaluated using the Wong Baker Faces Pain Rating Scale (WBFPS).

Results: There was no significant difference in the sex distribution and mean age between the groups ($p>0.05$). Of the patients, 3 had Stage I disease, 14 had Stage 2 disease, 23 had Stage 3 disease, and nine had Stage 4 disease. The most common type of malignancy was a bone tumor in 14 patients. The rate of depression was 14.2% in the patient group, which was not statistically significant ($p=0.312$). However, the pain score of the patients was statistically significantly higher than that of the control group ($p=0.001$). There was a positive and moderate correlation between the CDI and pain scores of the patients ($r=0.550$; $p=0.001$). These findings suggest the importance of routine assessment and targeted management of pain symptoms in pediatric oncology patients, as unmanaged pain may be associated with increased psychological distress.

Conclusion: In this study, pediatric oncology patients demonstrated significantly higher pain scores compared to the healthy control group, as well as a moderate positive correlation between pain intensity and depressive symptoms. These findings suggest that implementing effective pain management strategies could potentially alleviate depressive symptoms in pediatric cancer patients. Although increasing survival rates in pediatric oncology represent a major advancement, it is equally important to address the challenges associated with comorbid conditions that frequently arise during cancer treatment. A multidisciplinary approach, including pain management, mental health support, and long-term care strategies, essential to promote the overall well-being and quality of life of pediatric oncology patients following treatment.

Keywords: Child, depression, malignancy, oncology, pain.

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INTRODUCTION

Cancer has become increasingly prevalent among children and adolescents in recent years. Advances in technology and the development of novel treatment methods have significantly improved survival rates in pediatric cancer patients However, the primary burden of the disease, hospitalization processes, and treatment-related complications such as pain, cognitive impairment, reduced social functionality, and depression can still impact patients' overall health and well-being adversely (1). In children undergoing cancer treatment, particularly in the terminal phase, pain levels can reach extreme levels. While pain management in the terminal phase is effectively provided in developed countries, the majority of patients in developing countries lack access to such support. The World Health Organization (WHO) and various cancer organizations highlight that out of approximately 250,000 children affected annually, at least 100,000 live in densely populated regions of low socioeconomic status and receive no pain relief at all (2). Pain management in children with cancer requires a multidisciplinary approach, addressing both psychological effects and physical causes of pain. Before initiating pain treatment, the nature, severity, and organic causes of the pain should be identified (3). Mental health problems such as depression affect not only adults but also young individuals. According to the 2004 UK Office for National Statistics Mental Health of Children and Young People (MHCYP) survey, the prevalence of depression among children aged 5 to 16 years was reported to be 4%. (4). In addition to being a leading cause of mortality, cancer also increases the risk of developing psychiatric disorders (5).

A study conducted in 2011 reported that the prevalence of depression among cancer patients reached as high as 16% (6). Cancer-related depression is a complex condition influenced by a combination of biological, psychological, and social factors. Among the biological mechanisms, inflammation, cytokine activity, and neural pathways play key roles in the development and progression of depressive symptoms. Tumor cells, along with the body's immune response to cancer, stimulate the release of pro-inflammatory cytokines such as interleukin-1β (IL-1β), interleukin-6 (IL-6), and tumor necrosis factor-alpha (TNF-α). These cytokines are capable of crossing the blood–brain barrier and can disrupt the functioning of brain regions involved in mood regulation, particularly the hypothalamus, hippocampus, and prefrontal cortex. Studies have demonstrated that elevated levels of inflammatory markers in cancer patients are associated with increased rates of depression (1,7). Chronic inflammation and oxidative stress further contribute to neurodegeneration, especially in brain areas responsible for mood and cognitive functions. (7).

The presence of pre-existing emotional problems prior to a cancer diagnosis can make it more difficult for patients to cope with the added stressors associated with the disease (8,9). These patients need psychosocial support in addition to medical treatment (10). Depression in cancer patients also negatively impacts quality of life and adherence to treatment. (6,11).

In the present study, we aimed to determine the depression status of pediatric cases diagnosed with cancer and to investigate the possible relationship between depression and pain levels. Although previous research has separately assessed either pain or depression in patients with pediatric oncology, studies examining the relationship between these two factors remain limited and have predominantly focused on adults. This study, which simultaneously assessed both depression and pain, compared data from children diagnosed with cancer to that of healthy controls. It also enabled an evaluation of how variables such as cancer stage, tumor type, and length of hospital stay relate to depression and pain scores. Understanding these relationships is crucial for developing targeted therapeutic interventions that will significantly improve clinical care and enhance the quality of life for children undergoing cancer treatment.

MATERIALS AND METHODS

Study design and population

This single-center, cross-sectional, descriptive study was conducted at the Department of Pediatric Oncology of a tertiary care center between June and August 2019. A total of 49 pediatric cases who were diagnosed with

a malignancy and followed in our clinic were included in the study over a period of three months. The control group consisted of 30 age- and sex-matched healthy children without any chronic disease. The study excluded individuals with psychiatric disorders or those using psychiatric medications. Additionally, patients in the terminal stage with cognitive impairments severe enough to hinder psychiatric evaluation and test administration were not included. Prior to the study, written informed consent was obtained from the parents and/or legal guardians of the patients. The study protocol was approved by the institutional Ethics Committee (No: 1309, Date: 05/28/2019). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Demographic and clinical data of the patients, including age, sex, diagnosis, stage of the disease, age at the time of diagnosis, number of hospitalizations, and length of hospital stay (LOS), were recorded. Pain and depression scales were administered through face-to-face interviews by the researcher.

Assessment tools

The emotional states of the patients were evaluated using the Children's Depression Inventory (CDI), and the pain levels were evaluated using the Wong Baker Faces Pain Rating Scale (WBFPS). The CDI is a validated psychological assessment tool designed to measure depressive symptoms in children and adolescents. It evaluates emotional and behavioral aspects of depression, such as mood, self-esteem, anxiety, and social withdrawal. The scale is applicable to individuals aged between 6 and 17 years. The scale uses self-reported outcomes and consists of a total of 27 items and a single factor. It relies on self-reported outcomes and consists of 27 items representing a single factor. Each item presents three statements, from which the child selects the one that best describes their experiences over the past two weeks. Items are scored on a scale from 0 to 2, yielding a total score ranging from 0 to 54. The cut-off score for the scale is set at 19, and its Cronbach's alpha coefficient was reported as 0.77. (12). Higher scores indicate a high severity of depressive symptoms. The validity and reliability of the scale was conducted by Öy in 1991 in the Turkish population (13). The WBFPS is a self-report instrument to measure pain in young children (14). The validity and reliability of the Turkish version of the WBFPS were confirmed by Çeliker et al., who demonstrated that the scale is a valid and reliable measure of pain intensity in Turkish pediatric patients (15). It consists of six visual representative faces ranging from a "happy face" to a "crying face," with 0 indicating no pain and 10 indicating the worst pain imaginable. It is a practical and valid method for evaluating both the sensory and psychological components of pain. The patients who scored ≥19 using the CDI were referred to the Child and Adolescent Psychiatry and Mental Health Unit.

Statistical analysis

Statistical analysis was performed using the NCSS version 2007 software (NCSS LLC, Kaysville, UT, USA). Continuous data were expressed in mean ± standard deviation (SD) or median (min-max), while categorical data were expressed in number and frequency. The normality of quantitative data was assessed using the Shapiro-Wilk test and graphical examinations. For comparisons between two groups of quantitative variables with normal distribution, the Student t-test was used, while the Mann-Whitney U test was used for those that did not meet normal distribution. For comparisons of quantitative variables without normal distribution across more than two groups, the Kruskal-Wallis test was used. The Pearson chi-square test was performed to compare categorical data. The Spearman correlation analysis was used to assess the relationships between quantitative variables. A p-value of <0.05 was considered statistically significant.

A power analysis was conducted with a significance level (α) of 0.05 and a statistical power of 0.80. The analysis indicated that the study could detect a minimum effect size (Cohen's d) of approximately 0.66. The low patient turnover in the pediatric oncology clinic makes it challenging to recruit the necessary sample size for high-powered statistical analyses.

RESULTS

Among the 49 patients included in the study, 17 were female and 32 were male. Of 30 healthy participants, 20 were female and 10 were male. There was no significant difference between the groups in terms of sex distribution or mean age (p>0.05). Among the patients, three were diagnosed with Stage I disease, 14 with Stage II, 23 with Stage III, and nine with Stage IV. The most common type of malignancy was bone tumor, observed in 14 patients. Demographic and clinical characteristics of the patients are shown in Table 1.

Table 1. Demographic and clinical characteristics of participants

Age, Patients (n=49)	*Median (Min-Max)*	13 (4-18)
Age, Healthy (n=30)	*Median (Min-Max)*	11 (7-17)
Sex	Patient, Female	17 (45.9%)
	Healthy, Female	20 (54.1%)
Stage (n=49)	Early	17 (34.7%)
	Late	32 (65.3%)
Length of hospital stay (day) (n=49)	*Median (Min-Max)*	6 (1-30)
Number of hospitalizations (n=49)	*Median (Min-Max)*	8 (3-19)
Diagnosis (n=49)	Bone tumor	15 (30.6%)
	Hodgkin's lymphoma	14 (28.6%)
	Non-Hodgkin's lymphoma	7 (14.3%)
	Malignant mesenchymal tumor	3 (6.1%)
	Medulloblastoma	3 (6.1%)
	Gastrointestinal stromal tumor	1 (2%)
	Nasopharyngeal cancer	1 (2%)
	Langerhans cell histiocytosis	1 (2%)
	Neuroblastoma	1 (2%)
	Ovarian tumor	1 (2%)
	Pleuroblastoma	1 (2%)
	Willms	1 (2%)

The rate of depression was 14.2% in the patient group, and was not statistically significant (p=0.312). Nevertheless, the pain score of the patients was statistically significantly higher than that of the healthy group (p=0.001) (Table 2).

Table 2. Depression and pain scores according to the groups

		Group		
		Patient (n=49)	**Healthy (n=30)**	***p***
CDI score	*Mean±SD*	10.35±7.29	8.37±5.92	[c]***0.312***
Pain score	*Mean±SD*	3.92±2.86	1.67±2.35	[c]***0.001****

Abbreviation: CDI: Children's Depression Inventory, [c]*Mann-Whitney U Test,* ***p<0.01*

There is no statistically significant difference in pain scores among advanced-stage patients and early-stage patients (p=0.781). Also, there is no statistically significant difference in the presence of depression between advanced-stage and early-stage patients (p=0.951).

According to the correlation analysis results, there was a positive and moderate correlation between the CDI and pain scores of the patients (r=0.550; p=0.001). However, there was no statistically significant difference between the stage of the disease and the depression score (p=0.474), between the stage of the disease and the pain score (p=0.829), and the rate of depression (p=0.681) Furthermore, no significant correlation was observed between the age, sex, type of disease (bone tumor and others), LOS, number of hospitalizations, and the rate of depression and pain score (Table 3).

Table 3. Correlation analysis results

	Age		Pain score	
	r	*p*	r	*p*
CDI score	0.276	***0.014****	0.550	***0.001****
Pain score	0.019	***0.869***	-	-

Abbreviation: CDI: Children's Depression Inventory, **p<0.05, **p<0.01, r= Spearman correlation coefficient. (r) interpretation: 0-0.3= weak, 0.3-0.7 moderate, >0.7 strong correlation.*

DISCUSSION

Cancer not only causes many deaths in the pediatric age group, but also increases the risk of psychiatric disorders. Pediatric oncology patients experience mood fluctuations due to frequent hospital visits, prolonged hospitalizations, aggressive cancer treatments, and the side effects of these treatments (16). In the literature, there are several studies showing that pediatric oncology patients have higher rates of depression compared to general population, while others suggest that their mood status is similar to that of healthy peers (6,11). In the present study, we aimed to assess the depression status of pediatric patients diagnosed with cancer and investigated the possible relationship between depression and pain levels. Our study results showed higher depression rates and pain scores in the patient group compared to the control group. We also found a correlation between pain scores and depression scores. This finding suggests that effective pain management strategies may help reduce depression rates among oncology patients. Similar findings have been reported in previous studies, highlighting the importance of addressing both psychological and physical symptoms in pediatric oncology patients (1,17,18). However, no significant correlation was found between depression and pain with factors such as disease stage, type of cancer, sex, age, number of hospitalizations, and length of stay. Similarly, some studies have also failed to demonstrate a significant correlation between these factors and mental health outcomes (3,10). The absence of significant correlations can be attributed to the relatively small sample size in our study. While certain studies suggest that disease-related factors may contribute to the development of depression and pain in oncology patients, others argue that psychological resilience, coping mechanisms, and social support exert a greater influence on mental health outcomes (8).

In our study, no statistically significant difference was observed in pain scores between early-stage and advanced-stage pediatric oncology patients (p=0.781). A previous study examining pain management in children with cancer reported that 87.1% of patients were diagnosed at Stage IV upon admission, with 72.3% experiencing severe pain for at least one month (19). These findings highlight high prevalence of severe pain in those with late stage malignancies. However, our findings did not show a statistically significant difference between early and advanced stages; this discrepancy may be attributed to the small sample size in our study. Similarly, the presence of depression did not significantly differ between these groups (p=0.951). These findings are consistent with previous studies that have shown that the psychological and pain-related distress experienced by pediatric oncology patients may not always correlate directly with disease stage (8,10). Additionally, chronic pain has been identified as a major contributor to emotional distress in cancer patients, with some studies indicating that unrelieved pain can exacerbate symptoms of anxiety and depression, further impairing quality of life (3). Comprehensive pain

management strategies, including pharmacological and non-pharmacological interventions, have been shown to alleviate both physical discomfort and psychological distress in pediatric oncology patients (3). Therefore, incorporating early intervention strategies that simultaneously address pain management and mental health support could significantly benefit pediatric oncology care, potentially improving patient outcomes and quality of life (20). Pediatric oncology nurses reported higher distress rankings for symptoms such as mouth sores ($p<0.001$), and difficulty swallowing ($p=0.003$) compared to the patients. Conversely, pediatric oncology patients reported higher distress rankings for feeling nervous ($p=0.016$), weight loss ($p=0.003$), constipation ($p=0.014$), and swelling of arms/legs ($p<0.001$). These findings were observed in a study conducted by pediatric oncology nurses across three university hospitals (21). In a meta-analysis of pediatric oncology patients, psychological support interventions did not yield a statistically significant overall effect on quality of life, anxiety, or depressive symptoms (22). The wider range of psychological load was shown by research conducted on adult cancer patients, which revealed that emotional distress was more common than severe depression. This implies the presence of considerable subclinical distress among pediatric patients as well, highlighting the necessity of comprehensive psychosocial evaluations that go beyond the evaluation of depression alone (23). Despite the absence of a significant correlation in our study, we maintain that all oncology patients—not only those with a severe disease burden—should be routinely assessed for depression and pain. Implementing regular psychological screening alongside multidisciplinary pain management strategies is essential to ensure optimal care and improve overall well-being in children with cancer.

Limitations:

This study has several limitations. It was conducted at a single center with a relatively small sample size, which may limit the generalizability and statistical power of the results. The cross-sectional design precludes the drawing of conclusions regarding the causal relationship between depression and pain. Selection bias may have been introduced by excluding patients undergoing psychological treatment or those with cognitive impairments. Furthermore, psychological outcomes may be influenced by critical factors such as treatment type, socioeconomic status, and family support, which were not assessed. Finally, the use of self-reported instruments may be susceptible to reporting bias, particularly in the case of younger children.

CONCLUSION

The pain scores of pediatric oncology patients were substantially higher than those of healthy controls in this study, and there was a moderate positive correlation between pain and depressive symptoms. These results indicate that effective pain management may play a key role in reducing depression among pediatric cancer patients. However, it is also imperative to provide comprehensive psychosocial support, including routine psychological interventions and education on emotional well-being and coping strategies for both patients and families. Future research utilizing longitudinal designs and larger samples is required to investigate the causal relationship between depression and pain management. Although the survival rates in pediatric oncology have improved, it is crucial to address comorbidities such as depression and pain. A multidisciplinary approach that encompasses long-term care, mental health support, and pain control is essential for improving both survival and quality of life. In order to fortify the evidence base for these interventions, it is advised that large-scale, multi-center studies be conducted.

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