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RESEARCH ARTICLE

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# Correlation between Fatigue and Quality of Life in Adolescent Oncology Patients in Jordan

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**Abstract:**

***Background:*** Adolescence represents a distinct and multifaceted developmental stage characterized by profound physical and cognitive transformations. Adolescents undergoing cancer treatment frequently have unique needs that remain unmet, leading to a notable decline in their quality of life. Cancer treatment often results in problems like fatigue, which affects patients' quality of life. Assessing quality of life and fatigue among adolescent cancer patients is essential for enhancing nursing care and improving outcomes.

***Objective:*** This study aimed to investigate the correlation between fatigue and quality of life among adolescent cancer patients in Jordan.

***Methods:*** A “cross-sectional” study was performed, with the participation of 127 Jordanian adolescent cancer patients, and data was collected through a nameless online survey of Jordanian adolescent cancer patients. The study commenced in February 2024 and concluded in June 2024. Demographic data and responses from two self-reported questionnaires—the Arabic versions of “Pediatric Quality of Life Inventory” “Multidimensional Fatigue Scale” and “Generic Core 4.0”—were collected. Descriptive statistics of means, frequencies, standard deviations, and percentages were used with demographics while inferential statistics were conducted using independent t-tests, Spearman's rank correlation coefficients, and Kruskal-Wallis tests in SPSS, version 26.

***Results:*** Significant and potent correlations were found between various types of fatigue “general, sleep/rest, cognitive, and total” and quality of life “physical, emotional, social, school, psychosocial health”. Notably, the total fatigue scores showed a potent correlation with the total summary scores ($r=0.946$), with a p-value significant at the $<0.001$ level for all correlations, indicating that adolescents with cancer experienced high fatigue and low quality of life.

***Conclusion:*** The study demonstrated a potent link between fatigue and quality of life. The study's outcomes can help enhance guidelines for routine evaluation of fatigue and quality of life by nurses and healthcare providers in adolescent cancer patients to implement and evaluate interventions aimed at reducing fatigue in patients, highlighting fatigue as a significant concern. Future research should explore interventions such as exercise, leisure activities, and sleep to alleviate fatigue. Longitudinal research is essential to assess fatigue at diverse times of the day and week; this could help develop tailored fatigue management strategies to augment the quality of life among adolescent oncology patients.

**Keywords:** Adolescent, Cancer, Fatigue, Oncology nursing, Pediatric nursing, Quality of life.

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## 1. INTRODUCTION

Cancer may be the foremost cause of death among adolescents globally. Every year, about 85,000 cancer cases are diagnosed in individuals aged 15 to 19 [1]. In Jordan, the cancer incidence rate among adolescents aged 15 to 19 years is 10.5 new cases per 100,000 [2]. Adolescence represents a distinct and multifaceted developmental stage characterized by profound physical and cognitive transformations. This period is also defined by essential psychosocial challenges, including the formation of self-identity, the navigation of peer relationships, the pursuit of autonomy, and the exploration of sexuality [3]. Adolescents undergoing cancer treatment frequently have unique needs that remain unmet, leading to a notable decline in their quality of life both after treatment and as they transition into adulthood; specific physical needs that are directly affected by cancer and its treatment encompass pain management, fatigue, and body image concerns [4]. Sociopsychological obstacles arising from cancer and its treatment may include issues related to developing autonomy, personal values, emotional well-being, and social relationships [5].

Initially, fatigue is defined as “the awareness of a decreased capacity for physical and/or mental activity due to an imbalance in the availability, utilization, and restoration of resources needed to perform the activity” [6]. Fatigue in adolescents is recognized as a subjective and multidimensional notion encompassing physical, emotional, and cognitive fatigue, which can significantly disrupt daily activities [7]. Psychosocial factors that contribute to fatigue related to cancer include sleep disturbances, future uncertainties, fear of death, and the disruption in familial roles [8]. The repercussions of fatigue encompass an inability to participate in daily activities, needing energy restoration, mood alterations, sleep irregularities, diminished social interactions, decreased school presence, lower scholastic performance, and a diminished quality of life [9]. The onset of fatigue generally coincides with diagnosis and tends to increase in both occurrence and severity during treatment, particularly with chemotherapy. This persistent fatigue can last well beyond the end of treatment and often reaches its highest intensity in the final month of life [10]. Furthermore, fatigue resulting from cancer also has substantial emotional, social, and economic costs for patients [11].

Pediatric cancer patients from developed countries and higher-income families have better outcomes in treatment due to superior medical treatments and timely diagnosis; this positively influences the quality of life [12]. According to the World Health Organization in 2017, quality of life is a person's perspective of their place in life, considering the cultural principles and values they are part of and concerning their aims, anticipations, standards, and considerations [13]. There is a general consensus that patients who report numerous symptoms and have an inadequate state of function are likely to endure a lower quality of life [14]. Overall, quality of life influences perceptions of both physiological and mental wellness, incorporating factors like health threats and conditions, functional abilities, social encouragement, and socioeconomic condition [15]. Fatigue can compromise the quality of life, making it a major benchmark for assessing patients' psychological and physical well-being with diverse diseases. In cancer treatment, enhancing the quality of life is a major goal in controlling the illness, achieving remission, and protecting the lives of patients [16]. In general, assessing quality of life allows for an exhaustive evaluation of how an illness impacts a person's capacity to adapt and function. This assessment considers various factors, including an individual's values, perspectives, overall satisfaction, living conditions, achievements, functional abilities, cultural context, and spirituality [17].

Fatigue continues to be a significant issue for adolescents with cancer, impacting their quality of life. The majority of existing studies to date have been conducted in countries other than Jordan, creating a gap in comprehension of whether fatigue affects the quality of life in Jordanian adolescents who have cancer. Furthermore, information is scarce regarding the various facets of fatigue and its influence on different aspects of quality of life in adolescents. Consequently, the study explored the various aspects of fatigue, “general, sleep/rest, and cognitive,” and contrasted the quality of life in Jordanian adolescent patients experiencing fatigue. Additionally, this research can assist nurses and caregivers in understanding the complex relationship between fatigue and other variables, guiding interventions to mitigate adverse outcomes for adolescents who have cancer.

## 2. MATERIALS AND METHODS

### 2.1. Aim

This study aimed to estimate the levels of fatigue and quality of life in adolescent oncology patients, examine the relationship between fatigue and quality of life, and determine the patients' characteristics that will impact the fatigue and quality of life within this group.

### 2.2. Study Design

A "cross-sectional" design was adopted. Questionnaires were used for data collection through an anonymous online survey.

### 2.3. Sampling and Setting

The study participants were drawn from adolescent cancer patients at major government hospitals in Jordan, identified by the Jordan Cancer Registry (JCR) as primary cancer treatment centers. Statistics indicate that these hospitals treat over 65% of adolescent cancer patients in the country; the population size was 242. This study included 127 cancer patients; their selection was based on suitability to meet the inclusion criteria: a cancer diagnosis for longer than six months, their age range from 14 to 18 years, and the ability to write, speak, and understand Arabic. Additionally, the exclusion criteria excluded participants who were unconscious, disoriented, or admitted to the ICU.

The study commenced in February 2024 and concluded in June 2024. The sample size calculation was performed using G*Power, which indicated a minimum required sample size of 100 participants, based on "α=0.05, power=0.80, and a Cohen's d (medium effect size of 0.30)" [18]. However, a larger number of participants was included to compensate for potential dropout during the data collection process.

### 2.4. Instruments

The study variables and instruments consist of three parts:

### *2.4.1. Demographic Data*

A data form was developed by the researcher to measure the participants' demographic characteristics, encompassing (age, gender, number of siblings, parents' educational levels, and pain scale (NRS)).

### *2.4.2. PedsQL Multidimensional Fatigue Scale*

Fatigue was assessed using a "self-report" instrument designed for individuals aged 13 to 18 years [19]. The instrument comprised three subscales that assessed various facets of fatigue: "general, sleep/rest, and cognitive", each containing six items: general fatigue (*e.g.*, "I feel physically weak (not strong)"); sleep/rest fatigue (*e.g.*, "I sleep a lot") and cognitive fatigue (*e.g.*, "It is hard for me to keep my attention on things"). Responses were rated based on the extent of the problem each item posed, utilizing a scale ranging from 0 "never a problem," up to 4, "almost always a problem". Completing the scale required less than five minutes. The multidimensional fatigue scale was scored following the writers' guidelines [20]. The items' scores were reversed and converted to a linear scale from 0 to 100 (4=0, 3=25, 2=50, 1=75, 0=100), where lesser scores signifying that fatigue was "often or almost always a problem." Reliability of established validity and internal consistency of the "multidimensional fatigue scale" has been previously confirmed [19]. The Arabic version's validity and reliability were confirmed in previous Jordanian research. The reported "Cronbach's alpha coefficient" was 0.94 for the "generalized fatigue subscale," 0.67 for "the sleep/rest fatigue subscale," "the cognitive fatigue subscale" 0.87, and 0.90 for the total scale [21, 22].

### *2.4.3. The PedsQL Generic Core 4.0*

The "health-related quality of life" was examined using a "self-report" measure consisting of 23 items designed for adolescents aged 13 to 18 years [19]. It comprises four subscales that capture various dimensions of "health-related quality of life": "physical, emotional, social, and school functioning"; *e.g.*, "In the past 7 days, how much of a problem has this been for you: it is hard for me to run, it is hard for me to lift something heavy, I feel angry, I forget things". The scoring techniques resemble those utilized for the "PedsQL Multidimensional Fatigue Scale," where lower scores represent the lesser health-related quality of life. The initial validation of the "PedsQL" was conducted with children diagnosed with cancer in the United States [19]. Arabiat and colleagues (2011) translated and evaluated the "psychometric characteristics" of the Arabic edition in Jordanian children, reporting a "Cronbach's alpha" value of 0.90, denoting sufficient internal consistency [23].

Authorization to utilize the validated Arabic (Jordan) version of these instruments was secured from the original author of the questionnaires. For contact information and usage permissions related to PedsQL, refer to the website "Mapi Research Trust" at https://eprovide.mapi-trust.org.

### 2.5. Data Collection

Data collection was conducted through an anonymous online survey of a convenience sampling of Jordanian patients aged 14-18. Participation was voluntary and random. Survey questionnaires were created using Google Forms, with all items designated as mandatory. The questionnaire was required to be completed in 15 minutes. Data was securely transferred to the primary researcher's email upon completion. Participants were also provided with contact information so that the researchers could address any queries regarding survey completion.

### 2.6. Data Analysis

All the collected data was double-checked for accuracy and completeness. The data was inputted into IBM SPSS 26 for analysis. The analysis of the data involved the use of both inferential and descriptive statistics, including standard deviation, percentage mean, and frequencies. Also, spearman's rank correlation coefficient discovered the potency of the link between fatigue and quality of life. The "independent samples t-test" was used to investigate the relationship between gender across various domains, “quality of life and fatigue.” Additionally, the Kruskal-Wallis test was utilized to analyze the relationship between pain severity and different aspects of “quality of life and fatigue.”

## 3. RESULTS

### 3.1. Characteristics of Study Participants

The study included 127 individuals. The age range of the individuals was 14–18 years, with an average age of 15.87 years (SD=1.32), including 54 males (42.5%) and 73 females (57.5%). The average number of brothers per participant is 3.51 (SD=1.83). Regarding parents' educational levels, 28.3% have a “high school education or less,” 15.0% hold a “diploma degree,” 37.8% have a “bachelor’s degree,” 9.4% possess a “master’s degree,” and 9.4% have a “PhD degree.” Pain severity, rated on a scale from 0 to 10, revealed that 28.3% of participants experienced no pain, 23.6% reported “mild pain” (1-3), 29.1% “moderate pain” (4-6), and 18.9% “severe pain” (7-10) (Table 1).

### 3.2. Quality of Life

The “PedsQL 4.0 Generic Core Scale”; Table 1 presents the scores for physical functioning at an average of 45.92 (SD=29.03), emotional functioning at 29.80 (SD=24.08), social functioning at 52.01 (SD=26.50), and school functioning 34.61 (SD=27.05). The psychosocial health summary score was 38.81 (SD=24.46), with a total summary score of 41.28 (SD=25.63).

### 3.3. Fatigue

For the “PedsQL Multidimensional Fatigue Scale,” participants reported general fatigue with an average score of 35.17 (SD=26.38), sleep/rest fatigue at 28.54 (SD=20.71), cognitive fatigue at 47.44 (SD=25.67), and total fatigue at 37.05 (SD=22.41) (Table 1).

### 3.4. Relationship between Fatigue and Quality of Life

The findings of the correlations between fatigue and quality of life, as manifested by Spearman correlation, are shown in Table 2. The correlations between various types of fatigue, “general, sleep/rest, cognitive, and total,” and quality of life, “physical, emotional, social, school, psychosocial health, and total summary scores,” were significant and strong. All correlations were highly significant at the p<0.001 level. General fatigue showed high positive correlations with physical functioning (r=0.899), emotional functioning (r=0.854), social functioning (r=0.866), school functioning (r=0.887), psychosocial health summary (r=0.932), and total summary scores (r=0.935). Similarly, sleep/rest fatigue was significantly correlated with physical functioning (r=0.816), emotional functioning (r=0.893), social functioning (r=0.745), school functioning (r=0.823), psychosocial health summary (r=0.842), and total summary scores (r=0.830). Cognitive fatigue also had significant correlations with physical functioning (r=0.787), emotional functioning (r=0.690), social functioning (r=0.854), school functioning (r=0.860), psychosocial health summary (r=0.830), and total summary scores (r=0.814). Lastly, total fatigue was highly correlated with physical functioning (r=0.915), emotional functioning (r=0.888), social functioning (r=0.899), school functioning (r=0.947), psychosocial health summary (r=0.952), and total summary scores (r=0.946).

**Table 1. Characteristics of the research participants (N=127).**

| Variables | | Mean | SD | Frequency | Percentage % |
|---|---|---|---|---|---|
| Age | | 15.87 | 1.32 | - | - |
| Gender | Male | - | - | 54 | 42.5% |
| | Female | - | - | 73 | 57.5% |
| Number of brothers | | 3.51 | 1.83 | - | - |
| Parents' educational level | High school and less | | | 36 | 28.3% |
| | Diploma degree | | | 19 | 15.0% |
| | Bachelor degree | | | 48 | 37.8% |
| | Master degree | | | 12 | 9.4% |
| | PhD degree | | | 12 | 9.4% |
| The degree of pain is out of 10 | None | | | 36 | 28.3% |
| | Mi | | | 30 | 23.6% |
| | Mo | | | 37 | 29.1% |
| | Sev | | | 24 | 18.9% |
| Quality of life scores | Ph f | 45.92 | 29.03 | - | - |
| | Em f | 29.80 | 24.08 | | |
| | So f | 52.01 | 26.50 | | |
| | Sch f | 34.61 | 27.05 | | |
| | Psy s | 38.81 | 24.46 | | |
| | T sum sc | 41.28 | 25.63 | | |

***(Table 1) contd.....***

| Variables | | Mean | SD | Frequency | Percentage % |
|---|---|---|---|---|---|
| Fatigue scores | General fat | 35.17 | 26.38 | - | - |
| | Sleep/rest fat | 28.54 | 20.71 | | |
| | Cognitive fat | 47.44 | 25.67 | | |
| | Total fat | 37.05 | 22.41 | | |

**Note:** Mi=Mild (1-3), Mo=Moderate (4-6), Se=Severe (7-10), Ph f= Physical functioning, Em f=Emotional functioning, So f=Social functioning, Sch f=School functioning, Psy s=Psychosocial health summary, T sum sc=Total summary scores, fat=fatigue.

**Table 2. Correlation coefficients between fatigue and quality of life by Spearman correlation.**

| - | General Fat | Sleep/rest Fat | Cognitive Fat | Total Fat |
|---|---|---|---|---|
| Ph f | 0.899** | 0.816** | 0.787** | 0.915** |
| Em f | 0.854** | 0.893** | 0.690** | 0.888** |
| So f | 0.866** | 0.745** | 0.854** | 0.899** |
| Sch f | 0.887** | 0.823** | 0.860** | 0.947** |
| Psy s | 0.932** | 0.842** | 0.830** | 0.952** |
| T sum sc | 0.935** | 0.830** | 0.814** | 0.946** |

**Note:** ** Correlation is significant at the 0.01 level (2-tailed).
All correlations were with p-values <0.001 less than 0.05.
Ph f= Physical functioning, Em f=Emotional functioning, So f=Social functioning, Sch f=School functioning, Psy s=Psychosocial health summary, T sum sc=Total summary scores, fat=fatigue.

**Table 3. The relationship between gender and fatigue or quality of life by independent samples t-test.**

| - | Domains | Gender | Mean | SD | P value |
|---|---|---|---|---|---|
| Quality of life scores | Ph f | Male | 59.7222 | 27.51679 | <0.001* |
| | | Female | 35.7021 | 25.86355 | |
| | Em f | Male | 38.8889 | 22.16292 | <0.001* |
| | | Female | 23.0822 | 23.35758 | |
| | So f | Male | 57.7778 | 21.42707 | 0.027* |
| | | Female | 47.7397 | 29.11950 | |
| | Sch f | Male | 42.2222 | 23.80476 | 0.006* |
| | | Female | 28.9726 | 28.06192 | |
| | Psy s | Male | 46.2963 | 21.29130 | 0.003* |
| | | Female | 33.2648 | 25.30133 | |
| | T sum sc | Male | 50.9662 | 23.18477 | <0.001* |
| | | Female | 34.1126 | 25.12743 | |
| Fatigue scores | General fat | Male | 41.2037 | 25.73178 | 0.026* |
| | | Female | 30.7078 | 26.12724 | |
| | Sleep/rest fat | Male | 35.6481 | 17.85589 | <0.001* |
| | | Female | 23.2877 | 21.20997 | |
| | Cognitive fat | Male | 52.7778 | 24.76303 | 0.043* |
| | | Female | 43.4932 | 25.77864 | |
| | Total fat | Male | 43.2099 | 20.45991 | 0.007* |
| | | Female | 32.4962 | 22.82264 | |

**Note:** * P value <0.05.
Ph f= Physical functioning, Em f=Emotional functioning, So f=Social functioning, Sch f=School functioning, Psy s=Psychosocial health summary, T sum sc=Total summary scores, fat=fatigue.

### 3.5. Relationship between Patients' Characteristics and related Variables

The independent samples t-test revealed significant differences in gender across various quality of life and fatigue domains (Table 3). In the quality of life scores, males consistently exhibited higher mean scores compared to females: in physical functioning (males: 59.72, females: 35.70, p<0.001), emotional functioning (males: 38.89, females: 23.08, p<0.001), social functioning (males: 57.78, females: 47.74, p=0.027), school functioning (males: 42.22, females: 28.97, p=0.006), psychosocial health summary (males: 46.30, females: 33.26, p=0.003), and total summary scores (males: 50.97, females: 34.11, p<0.001). For fatigue scores, males also reported higher mean scores: in general fatigue (males: 41.20, females: 30.71, p=0.026), sleep/rest fatigue (males: 35.65, females: 23.29, p<0.001), cognitive fatigue (males: 52.78, females: 43.49, p=0.043), and total fatigue (males: 43.21, females: 32.50, p=0.007). These results indicated that males tend to report higher levels of quality of life and less fatigue compared to females in the studied domains.

Table **4** shows the analysis of the association between pain severity and different aspects of “quality of life and fatigue” measures using the Kruskal-Wallis test; findings revealed significant differences across all measured domains with p-values of <0.001 for each comparison. Participants with no pain had significantly higher mean ranks in “physical functioning” (106.50), “emotional functioning” (97.83), “social functioning” (104.75), “school functioning” (102.92), “psychosocial health summary” (105.50), and total summary scores (106.50) compared to those with “mild (1-3), moderate (4-6), and severe (7-10) pain”. Similarly, those without pain reported p-values of

**Table 4. The relationship between pain severity and fatigue or quality of life by Kruskal wallis test.**

| - | Domains | The Degree of Pain is out of 10 | Mean Rank |
|---|---|---|---|
| Quality of life scores | Ph f | None | 106.50 |
| | | Mi | 73.20 |
| | | Mo | 42.27 |
| | | Sev | 22.25 |
| | Em f | None | 97.83 |
| | | Mi | 69.50 |
| | | Mo | 50.30 |
| | | Sev | 27.50 |
| | So f | None | 104.75 |
| | | Mi | 58.30 |
| | | Mo | 52.65 |
| | | Sev | 27.50 |
| | Sch f | None | 102.92 |
| | | Mi | 64.50 |
| | | Mo | 49.41 |
| | | Sev | 27.50 |
| | Psy f | None | 105.50 |
| | | Mi | 66.30 |
| | | Mo | 47.86 |
| | | Sev | 23.75 |
| | T sum sc | None | 106.50 |
| | | Mi | 67.50 |
| | | Mo | 45.92 |
| | | Sev | 23.75 |
| Fatigue scores | General fat | None | 108.00 |
| | | Mi | 70.10 |
| | | Mo | 46.73 |
| | | Sev | 17.00 |
| | Sleep/rest fat | None | 96.33 |
| | | Mi | 71.40 |
| | | Mo | 55.57 |
| | | Sev | 19.25 |
| | Cognitive fat | None | 99.00 |
| | | Mi | 72.30 |
| | | Mo | 44.78 |
| | | Sev | 30.75 |
| | Total fat | None | 105.00 |
| | | Mi | 71.90 |
| | | Mo | 46.24 |
| | | Sev | 20.00 |

**Note:** All correlations were with p-values <0.001 less than 0.05.

Mi=Mild (1-3), Mo=Moderate (4-6), Se=Severe (7-10), Ph f= Physical functioning, Em f=Emotional functioning, So f=Social functioning, Sch f=School functioning, Psy s=Psychosocial health summary, T sum sc=Total summary scores, fat=fatigue.

0.001 for each comparison and reported higher mean ranks in "general fatigue" (108.00), "sleep/rest fatigue" (96.33), "cognitive fatigue" (99.00), and "total fatigue" (105.00) scores. Participants with "mild (1-3), moderate (4-6), and severe (7-10) pain" had significant mean ranks in "physical functioning" (73.20; 42.27; 22.25; respectively), "psychosocial health summary" (66.30; 47.86; 23.75; respectively), and total summary scores (67.50; 45.92; 23.75; respectively). Moreover, those "mild (1-3), moderate (4-6), and severe (7-10) pain" reported p-values of <0.001 for each comparison, total fatigue (71.90; 46.24; 20.00; respectively) scores.

## 4. DISCUSSION

This study investigated the interrelation between fatigue and quality of life in Jordanian adolescents with cancer. Fatigue might be considered a significant factor contributing to diminished quality of life in oncology patients, including adolescent patients. Despite this, few studies have sought to identify and measure the interrelation between these variables. Our research underscored a notable correlation between fatigue and quality of life among adolescent oncology patients in Jordan. Our study findings on the multidimensional fatigue scale revealed that the participants had mean scores of 35.17 (SD=26.38) for general fatigue, 28.54 (SD=20.71) for "sleep/rest fatigue," and 47.44 (SD=25.67) for "cognitive fatigue", with an overall total fatigue score of 37.05 (SD=22.41). These results indicated a substantial level of fatigue through various dimensions, with "cognitive fatigue" being the most pronounced. This finding aligns with another study, which reported a "cognitive fatigue" score of 12.9 (SD=0.33) [24]. Quality of life assessments in this study indicated diverse levels across various domains, with the average "overall quality of life score" being 41.28 (SD=25.63). Social functioning had the highest mean score, while emotional health had the lowest, suggesting that participants experienced the most significant challenges in psychological health. In line with our study's results, Zareifar and colleagues reported that the disease negatively impacted the quality of life, specifically in the "physical, psychological, and emotional" dimensions [25].

The present study found a potent and statistically significant interrelation between fatigue and quality of life, with a p-value of <0.001. Notably, total fatigue exhibited the strongest correlations across all domains, particularly with school functioning (r=0.947), psychosocial health summary (r=0.952), and total summary scores (r=0.946). These results underscored the pervasive and detrimental impact of fatigue on overall functioning, emphasizing the critical need for interventions targeting fatigue to enhance physical, emotional, social, and academic performance and psychosocial health. However, Erickson's study found a moderate correlation between "cancer-related quality of life" and fatigue, with values ranging from (r=0.49) to (r=0.55) and (p<0.01). Also, significant differences were observed in physical, emotional, and school functioning between those with and without fatigue, but no significant variance was found in social functioning. Additionally, various aspects of fatigue, "general, sleep/rest, cognitive," were more pronounced in individuals with high fatigue scores set side by side with those without fatigue problems [26]. In Brazil, research has demonstrated that adolescents and children with cancer, both with and without fatigue, exhibited a statistically significant difference in the quality of life and fatigue. Specifically, those with cancer experienced a lower quality of life and higher levels of fatigue [27].

Furthermore, the study compared various domains of fatigue and quality of life across genders (male and female). The results indicated significant differences across quality of life domains, with males consistently reporting higher mean scores than females. Similarly, fatigue scores indicated that males have lesser mean scores across all measured aspects. These results showed a significant gender gap, with males reporting good quality of life and lower fatigue levels than their female counterparts. Similarly, a study performed in Jordan found that males had a better quality of life than females [28]. On the other hand, a survey conducted in the USA on pediatric functional fatigue therapy assessment for children with cancer found no significant differences in fatigue levels according to gender [29]. In Jordanian society, males are generally raised to endure pain without complaint, reflecting a superego upbringing. As a result, they are less likely to complain of minor symptoms or mild discomfort unless it is severe. Conversely, females are encouraged to express any pain or discomfort, aligning with cultural norms of femininity. These cultural traditions could help to clarify the differences in how males and females report their quality of life.

Moreover, the study evaluated how different pain levels affect functioning and fatigue, categorizing pain into four severity levels: "none, mild (1-3), moderate (4-6), and severe (7-10)". Significant differences were observed across all domains: "physical, emotional, social, school functioning, psychosocial health, general, sleep/rest, cognitive, and total fatigue," with p-values of <0.001. Higher pain severity was linked to lower mean ranks, indicating worse functioning and increased fatigue. For example, physical functioning mean ranks ranged from 106.50 (no pain) to 22.25 (severe pain), emotional functioning from 97.83 to 27.50, and social functioning from 104.75 to 27.50, respectively. These results demonstrated the substantial influence of pain severity on quality of life, with increased pain levels correlating with decreased functioning and higher fatigue. Similarly, previous research has shown that pain significantly impaired the quality of life in pediatric cancer patients, who often experienced more pain from treatments and medical interventions than from the illness itself [26]. Notably, consistent with earlier research, Varni *et al*. reported that quality of life scores for children with chronic pain were low [19, 20].

The study revealed a potent interrelation between fatigue and quality of life, with closely aligned mean values on the fatigue and quality of life scales, indicating that increased fatigue correlated with less quality of life. These findings can assist nurses and caregivers in understanding the complex relationship between fatigue and other variables, guiding interventions to mitigate adverse outcomes for adolescents who have cancer. Furthermore, nurses can educate parents on fatigue and suggest personalized approaches for the management of fatigue and quality of life improvement. Strategies may include exercise, leisure activities “such as reading, drawing, and enjoying music,” healing touch, and psychosocial interventions. Health professionals' awareness of these connections is crucial for reducing clinical symptoms that lead to suffering and poorer prognoses for patients. Additionally, it is essential to emphasize the need for enhanced psychosocial and academic reinforcement for patients and their families from diagnosis, ensured through persistent follow-up.

### 4.1. Study Limitations

The research exhibited multiple constraints. First, as it relies on adolescents’ self-reports, there is a risk of bias regarding their perception of their feelings related to the disease. Second, the survey was conducted through an online questionnaire, which may introduce sample bias. Third, variations in cancer diagnoses and therapy protocols may affect fatigue and quality of life reports, and the online questionnaire did not allow for comparisons by diagnosis and treatment protocol. Finally, the study design was “cross-sectional” and prevented examining changes in fatigue and quality of life in the long run. Future research should explore various dimensions of fatigue and quality of life during various chemotherapy phases. Longitudinal research is essential to assess fatigue at diverse times of the day and week. This could help develop tailored fatigue management strategies to augment the quality of life among adolescent oncology patients.

## CONCLUSION

In conclusion, adolescent cancer patients in Jordan experienced low quality of life and high fatigue levels. Our findings showed that adolescents with cancer suffer from fatigue in three aspects: “general, sleep/rest, and cognitive”, affecting their quality of life. Furthermore, significant correlations were observed in “physical, emotional, school, and social functioning” among those with fatigue. This study can help nurses and healthcare providers apply and evaluate interventions to reduce fatigue in these patients, and it highlights the importance of recognizing fatigue as a significant issue. Additionally, it recommends educating parents about fatigue and personalized management strategies to enhance quality of life. Future research should examine interventions like exercise, leisure activities, and sleep to relieve fatigue and enhance the quality of life in these patients. Additionally, healthcare institutions should focus on patient's psychological well-being by training health staff in psychological management, establishing counseling units in oncology centers, and implementing training programs for families and friends to address patients' psychological needs.

## AUTHORS’ CONTRIBUTION

It is hereby acknowledged that all authors have accepted responsibility for the manuscript's content and consented to its submission. They have meticulously reviewed all results and unanimously approved the final version of the manuscript.

## ABBREVIATION

JCR = Jordan Cancer Registry

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The research adhered strictly to ethical considerations, having obtained approval from Al-Balqa Applied University (IRB #: 30/4/2024/2025) on January 29, 2024, and from the Institutional Review Board (IRB) committee at Al Basheer Hospitals (IRB No. MBA/IRB/3836).

## HUMAN AND ANIMAL RIGHTS

All procedures performed in studies involving human participants were in accordance with the ethical standards of institutional and/or research committees and with the 1975 Declaration of Helsinki, as revised in 2013.

## CONSENT FOR PUBLICATION

An electronic consent form detailing the study's procedures and objectives was provided, along with the survey questionnaire. Participants and their parents reviewed and digitally signed the form before participating in the voluntary survey. Additionally, they were assured that their personal information would be kept confidential through rigorous privacy measures. After signing the consent form, participants completed the questionnaire online. To safeguard participant identities, personal information was excluded, and data encryption was used for added security.

## STANDARDS OF REPORTING

STROBE guidelines were followed.

## AVAILABILITY OF DATA AND MATERIALS

The data that support the findings of this study are available from the corresponding author [S.A.S] on request.

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None.

## CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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Declared none.

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