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Beyond Survival: Anxiety, Depression, and Unspoken Fear of Death Among Children and Adolescents with Cancer in Saudi Arabia

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Abstract

Background: Cancer diagnosis in children and adolescents is associated with significant psychological distress. International evidence indicates a high prevalence of anxiety and depression in this population, but evidence from Saudi Arabia and the Gulf region is limited. This study aimed to determine the prevalence and severity of anxiety and depression among children and adolescents with cancer in Saudi Arabia and to examine associations with demographic and clinical variables.

Methods:

A cross-sectional observational study was conducted; data collection spanned 12 months, from August 2020 to July 2021. Arabic-validated Revised Child Anxiety and Depression Scale-25 (RCADS-25) tool was used to calculate mean scores and severity of anxiety and depression. Associations were examined using the appropriate non-parametric test.

Results:

A total of 67 children and adolescents (aged 8–18 years) with a confirmed cancer diagnosis at a tertiary oncology centre in Jeddah completed the Arabic-validated Revised Child Anxiety and Depression Scale-25 (RCADS-25). Applying official UCLA T-score conversion tables (n = 56, Grades 3–12), 25.0% (95% CI: 15.5–37.7%) met the clinical threshold for anxiety, 17.9% (10.0–29.8%) for depression, and 23.2% (14.1–35.8%) for the combined score. A sample-internal percentile method (N = 67) yielded higher clinical rates (29.9% across all three outcomes), consistent with systematic elevation of this population above US normative benchmarks. Female sex was significantly associated with higher scores across all outcomes ($p < 0.05$); older age was associated with higher depression (rho = 0.318, $p = 0.009$); and participants receiving combined treatment had the highest distress scores (all $p < 0.05$). Notably, 20.9% (95% CI: 12.9–32.1%) of participants gave a non-standard response to the death-related RCADS-25 item, a rate 418-fold higher than for any other item. Findings were robust in sensitivity analyses excluding brain tumour participants.

Conclusions: A substantial burden of psychological distress was identified in this Saudi sample, with adolescent girls, older children, and those receiving combined treatment modalities at highest risk. These findings provide a locally grounded evidence base for integrated psycho-oncology services in Saudi Arabia. Locally derived RCADS-25 normative data for Saudi populations are urgently needed.

INTRODUCTION

Cancer has a high mortality rate worldwide among children and adolescents. An estimated 211,080 cases of cancer were diagnosed in 2022, along with 78,441 reported deaths. High-income nations have reported five-year survival rates exceeding 80%; however, this rate is under 30% in lower- and middle-income nations [1]. As the populations of long-term survivors continue to grow in higher-income countries, the focus of paediatric oncology has shifted beyond survival to encompass psychosocial

wellbeing [2]. In Saudi Arabia, childhood cancers make up about 8% of all cancer diagnoses and are broken down into: Leukemia (34.1%), Lymphomas (15.2%), and Brain Tumors (12.4%) [3]. The incidence of childhood Acute Lymphoblastic Leukemia has risen from 1.58 in 2001 to 2.35 per 100,000 from 2001 through 2014 [4]; the five-year survival rate at each of the major centers in Saudi Arabia is roughly 74.6% [5]. As survival rates improve, the psychological well-being of young survivors becomes an increasingly urgent clinical priority [6].

The impact of a childhood cancer diagnosis is recognised as one of the most psychologically traumatic events a child can experience. Psychologically, it causes anxiety and depression, which then result in low quality of life, difficulty in therapeutic alliance, and poorer clinical outcomes [7, 8]. Patients' exposure to treatments like chemotherapy and combined modality further heightens their vulnerability. The treatment is associated with pain, fatigue, alopecia, or extended hospitalizations, which impact patients' mental health [9]. The use of corticosteroid drugs further affects children's mood lability and euphoria, which makes the psychological assessment challenging most of the time [10].

Given the increasing number of international studies, the Arab Middle East and North African (MENA) region is still seriously underrepresented in psycho-oncology studies of children and adolescents. A systematic review by Al Hussaini et al. revealed that the majority of the regional studies were performed on adults, and there was very little specific literature on Gulf Cooperation Council (GCC) countries [11]. However, Psycho-oncology services in the Arab world remain limited and decentralized. Despite significant investment in healthcare infrastructure, challenges remain in providing structured psychosocial support to children and adolescents with cancer in Saudi Arabia [12]. Cultural and religious norms may influence the experience and expression of psychological distress in the Saudi population compared with Western cohorts, as a result of which culturally relevant studies should be carried out.

Three reasons motivated this study: 1) the need for local prevalence data for informing service planning; 2) methodological shortcomings in available regional prevalence studies; and 3) the absence of systematic examination of clinical and demographic correlates (such as treatment modality, steroid use, and developmental factors) in a Saudi context. This study aimed to determine the prevalence and severity of anxiety and depression among children and adolescents (8–18 years) with cancer at a tertiary oncology centre in Jeddah, Saudi Arabia, and to examine associations with clinical and demographic variables.

METHODS

Study Design and Setting

A cross-sectional observational study was conducted at the Security Forces Hospital, Jeddah, Saudi Arabia, a tertiary institution with dedicated inpatient and outpatient oncology services for children and adolescents. The data were collected consecutively over a year from August 2020 to July 2021, using a standardised self-report measure administered with data collector support where needed.

Participants

Children and adolescents aged 8–18 years with a confirmed cancer diagnosis were consecutively recruited from both the inpatient oncology ward and the outpatient oncology clinic. Inclusion required: (1) confirmed cancer diagnosis; (2) age 8–18 years; (3) ability to complete the questionnaire with or without minimal assistance; and (4) informed parental consent and child assent. Cancer status was confirmed from oncology service records.

Children with Central Nervous System (CNS) tumours associated with documented cognitive impairment or altered mental status were excluded; cognitively intact brain tumour participants were retained. A pre-specified sensitivity analysis excluding all nine brain tumour participants confirmed the robustness of findings.

Sample size was determined based on the requirement to detect a medium effect size ($r = 0.30$) using non-parametric association at $\alpha = 0.05$ with 80% power, requiring a minimum of 64 participants [13]. The enrolled sample of 67 meets this threshold. All analyses were based on this complete dataset. For nine participants (13.4%), the exact diagnostic subtype was categorised as 'Unspecified', as the treating physician was unavailable at data collection.

Ethics

Ethical approval

was gained from King Abdullah International Medical Research Centre (KAIMARC), Jeddah [Memo Ref. No. IRBC/0198/20], before the data collection began. The research was carried out in line with the Declaration of Helsinki guidelines [14]. Written informed consent was gathered from parents or carers, and child assent was also obtained from all participants. Numeric identifiers ensured confidentiality, and only the research team had access to the data.

Measures

The RCADS-25 short version [15, 16] was used to assess anxiety and depression symptoms in children and adolescents (ages 8–18). Responses range from 0 (Never) to 3 (Always). The instrument measures three scores: Total Anxiety (15 items, range 0–45), Total Depression (10 items, range 0–30), and Total Anxiety and Depression (25 items, range 0–75). Unlike the RCADS-47, this short form does not include “disorder-specific” subscale scores. The current sample showed excellent internal consistency for the total scale ($\alpha = 0.927$, $\omega = 0.938$) and depression subscale ($\alpha = 0.950$, $\omega = 0.958$), and good internal consistency for the anxiety subscale ($\alpha = 0.810$, $\omega = 0.849$).

Arabic adaptation. The published Arabic RCADS-25 [17] validated in 250 Arabic-speaking school children, was used as the basis for this study. A formal suitability review was conducted, comprising (1) expert committee review by six specialists in child psychiatry, oncology, linguistics, paediatrics, oncology

nursing, and medical education; and (2) pilot testing on 15 children from the target age range [18]. No items required modification.

Administration. The RCADS-25 was self-completed by each participant in a private clinical setting. If children asked for clarification, the data collector read the items with no interpretation. Fourteen participants (20.9%, 95% CI: 12.9–32.1%) did not engage with item 18 ('Do you think about death?') through a standard Likert response, comprising 8 who actively crossed out the item, refused to answer, or drew a sad face, and 6 who left only item 18 blank despite completing all other 24 items.

This was interpreted as content-specific rather than a random omission and was strongly supported by the overall missing data pattern. Across 1,675 possible item responses (67 participants × 25 items), only 13 were missing (0.8%), distributed across four participants whose omission patterns were consistent with fatigue or incomplete completion rather than item content. By contrast, item 18 alone generated 14 non-standard responses classified as active or passive avoidance, a non-standard response rate of 20.9% for this item versus 0.05% across all other items combined. This 418-fold disparity constitutes strong prima facie evidence that non-response to item 18 is content-driven rather than attributable to random omission, fatigue, or comprehension difficulty, consistent with established models of content-specific avoidance in which emotionally threatening stimuli elicit deliberate non-engagement [19–21].

All 14 avoiders were assigned a conservative score of 2 ('Often') for item 18 for total score calculation, as their responses were considered item-specific rather than random, given that the rest of the questionnaire was completed. A score of 2 (Often) was based on the preliminary assumption that item-specific non-response to a death-related item was more consistent with moderate distress than with the absence of symptoms [19, 22, 23]. This approach presents an analytical assumption based on reported literature in similar instances of not-missing-at-random data.

One participant left both items 17 and 18 blank alongside other scattered omissions; this was retained as missing data (general non-response pattern). The avoidance response pattern is documented descriptively in the Results section.

Statistical Analysis

Normality was examined using the Shapiro-Wilk test (all $p < 0.05$) [24]. Non-parametric tests were used throughout: Spearman rank-order correlation (rho) for continuous predictors (age, education); Mann-Whitney U test for binary categorical variables, with effect size $r = Z/\sqrt{N}$; Kruskal-Wallis H test for multi-category variables, with epsilon-squared (ε^2) effect sizes; and Bonferroni-corrected post-hoc Mann-Whitney comparisons where significant. All tests were two-tailed, $\alpha = 0.05$. Severity was classified using two complementary approaches. First, official UCLA RCADS-25 T-score conversion tables (T < 65 = normal; T 65–69 = borderline; T ≥ 70 = clinical) were applied to the 56 participants in Grades 3–12, equivalent to ages 8–18 years in the Saudi sample for whom US normative data are available. Second, a sample-internal percentile method was applied to the full sample (N = 67), with clinical threshold defined as scoring at or above the 70th percentile of the present sample and borderline as scoring between the

65th and 70th percentile. This dual-reporting approach accounts for the absence of Saudi-specific normative data and is discussed further in Section 6 of the Discussion. All prevalence estimates were presented with 95% confidence intervals calculated using the Wilson score method. All three outcome variables were non-normally distributed. RCADS-25 scores were used for all inferential analyses [25]. The 11 participants who were in Grades 1 and 2 (approximately below age 8) could not be T-score classified, as UCLA normative conversion data were not available for that age range. Analyses were conducted in Python (SciPy, pandas).

RESULTS

1. Sample Characteristics

A total of 67 children and adolescents participated (mean age 12.2 years, SD 2.8, range 8–18). The majority were male (68.7%), Saudi nationals (95.5%), and urban residents (80.6%). The most common documented diagnosis was leukemia (40.3%), followed by lymphoma (14.9%) and brain tumours (13.4%), and a non-specific category was assigned to nine participants (13.4%). The most common treatment methods were chemotherapy (74.6%) and combined treatment (11.9%). The full characteristics are given in Table 1. Percentages are calculated based on available data for each variable. Missing data were present for the following variables: stimulant use (n = 21, 31.3%), steroid use (n = 9, 13.4%), current treatment (n = 1, 1.5%), income level (n = 1, 1.5%), and parental marital status (n = 1, 1.5%). All remaining variables were complete for the full sample (N = 67). Missing data for steroid use were confirmed as Missing Completely at Random (MCAR; p = 0.729).

Table 1
Sample Demographic and Clinical Characteristics (N = 67)

Variable	Category	n (%)
Age, years	**Median (IQR)**	**12 (10–14)**
Mean (SD), range	12.2 (2.8), 8–18	
Gender	Male	46 (68.7%)
	Female	21 (31.3%)
Nationality	Saudi	64 (95.5%)
	Non-Saudi	3 (4.5%)
Residence	Urban	54 (80.6%)
	Rural	13 (19.4%)
Cancer diagnosis	Leukemia	27 (40.3%)
	Lymphoma	10 (14.9%)
	Brain tumours	9 (13.4%)
	Bone tumours	8 (11.9%)
	Unspecified	9 (13.4%)
	Other	4 (6.0%)
Current treatment	Chemotherapy	50 (74.6%)
	Combined treatment	8 (11.9%)
	No active treatment	5 (7.5%)
	Surgery	2 (3.0%)
	Radiotherapy	1 (1.5%)
	Not documented	1 (1.5%)
Steroid use	Yes	26 (38.8%)
	No	32 (47.8%)
	Not documented	9 (13.4%)
Stimulant use	Sometimes	37 (55.2%)
	No	6 (9.0%)

Note. Q18 avoidance responses (n = 14, 8 active + 6 passive item-specific) were assigned a conservative score of 2 for total score calculation; see Methods.

Variable	Category	n (%)
Age, years	**Median (IQR)**	**12 (10–14)**
	Yes	3 (4.5%)
	Not documented	21 (31.3%)
Family history of cancer	Yes	11 (16.4%)
	No	56 (83.6%)
Family income	Level 1 (< 5000 SAR)	19 (28.4%)
	Level 2 (5000–10000 SAR)	28 (41.8%)
	Level 3 (10000–20000 SAR)	17 (25.4%)
	Level 4 (> 20000 SAR)	2 (3.0%)
	Not documented	1 (1.5%)
Father's employment	Employed	47 (70.1%)
	Unemployed	9 (13.4%)
	Retired	10 (14.9%)
	Deceased	1 (1.5%)
Parental marital status	Married	62 (92.5%)
	Other	4 (6.0%)
	Not documented	1 (1.5%)
Q18 death item response	Standard Likert response	52 (77.6%)
	Active avoidance	8 (11.9%)
	Passive item-specific avoidance	6 (9.0%)
	Missing (general non-response)	1 (1.5%)

Note. Q18 avoidance responses (n = 14, 8 active + 6 passive item-specific) were assigned a conservative score of 2 for total score calculation; see Methods.

2. Prevalence and Severity of Anxiety and Depression

Descriptive statistics for all three outcome scores are presented in Table 2. Applying official RCADS-25 T-score conversion tables to the 56 participants in Grades 3–12, 25.0% (95% CI: 15.5–37.7%) met the clinical threshold for anxiety, 17.9% (10.0–29.8%) for depression, and 23.2% (14.1–35.8%) for the combined score (Table 3). A further 10.7%, 5.4%, and 8.9% were classified as borderline clinical for

anxiety, depression, and the combined score, respectively. The 11 participants in Grades 1–2 or with missing grade data could not be T-score classified, as normative conversion data are unavailable below Grade 3.

Table 2
Descriptive Statistics for RCADS-25 Outcome Scores (N = 67)

Outcome	N	Mean	SD	Median	IQR	Min	Max	Max Possible
Total Anxiety	67	14.36	8.45	14.0	7.0–20.5	0	32	45
Total Depression	67	10.37	9.38	7.0	1.0–19.0	0	28	30
Total Anxiety & Depression	67	24.73	16.77	20.0	10.5–38.0	0	58	75

Note. Total Anxiety = 15 items (max 45); Total Depression = 10 items (max 30); combined = 25 items (max 75). All scores are based on the correct UCLA RCADS-25 scoring structure.

Table 3
RCADS-25 T-Score Severity Classification (n = 56, Grades 3–12)

Outcome	Normal n	Normal %	Borderline n	Borderline %	Clinical n	Clinical % (95% CI)
Total Anxiety	36	64.3%	6	10.7%	14	25.0% (15.5–37.7%)
Total Depression	43	76.8%	3	5.4%	10	17.9% (10.0–29.8%)
Total Anxiety & Depression	38	67.9%	5	8.9%	13	23.2% (14.1–35.8%)

Note. *T ≥ 70 = clinical; T 65–69 = borderline. 95% CIs were calculated using the Wilson score method* [25]. *Eleven participants (Grades 1–2 or missing grade) were excluded.*

Using a sample-internal percentile method applied to the full sample (N = 67), with the clinical threshold defined as scoring at or above the 70th percentile of the sample, clinical rates were higher than T-score estimates: Total Anxiety was 29.9% (95% CI: 20.2–41.7%), Total Depression was 29.9% (95% CI: 20.2–41.7%), and the combined score was 29.9% (95% CI: 20.2–41.7%). This elevation reflects the possible systematic difference between the Saudi population and the US normative reference group. Both methods are reported for transparency, and implications are discussed further in Section 6.

3. Associations with Demographic and Clinical Variables

All inferential analyses used raw RCADS-25 scores. Results are presented in Tables 4–6.

Age and education (Spearman correlations). Age was significantly positively correlated with Total Depression (rho = 0.318, p = 0.009); no significant association was found with Total Anxiety or the combined score. Education level did not show significant associations *(*Table 4).

Table 4
Spearman Correlations: Age and Education vs. RCADS-25 Outcome Scores

Predictor	Outcome	rho	p-value	Sig.	Direction
Age	Total Anxiety	0.074	0.554	ns	—
	Total Depression	0.318	0.009	**	Positive ↑
	Total Anx & Dep	0.226	0.065	ns	—
Education	Total Anxiety	−0.024	0.848	ns	—
	Total Depression	0.212	0.090	ns	—
	Total Anx & Dep	0.117	0.352	ns	—

*Note. ** p < 0.01; ns = not significant. rho = Spearman rank-order correlation coefficient.*

Binary categorical variables (Mann-Whitney U tests). Female participants reported significantly higher scores than males on all three outcomes (anxiety p = 0.012; depression p = 0.028; combined p = 0.022; medium effects r = 0.268–0.309); p ≤ 0.002. Steroid use was paradoxically associated with significantly lower scores across all outcomes (all large effects, r = 0.412–0.490). Nationality, residence, family cancer history, and brain tumour status were not significantly associated with any outcome (Table 5).

Table 5
Mann-Whitney U Tests: Binary Variables vs. RCADS-25 Outcome Scores

Variable	Outcome	G1 Mdn	G2 Mdn	U	p-value	r	Sig.
Gender (Male vs Female)							
Gender	Total Anxiety	12.0 (M)	17.0 (F)	296	0.012	0.309	*
	Total Depression	6.5	16.0	320	0.028	0.268	*
	Total Anx & Dep	17.0	33.0	312	0.022	0.281	
Steroid Use (Yes vs No)							
Steroid use	Total Anxiety	7.0 (Yes)	17.0 (No)	179	< 0.001	0.484	**
	Total Depression	3.0	18.5	216	< 0.002	0.412	**
	Total Anx & Dep	10.5	34.0	178	< 0.001	0.490	**
Non-significant variables: Nationality, Residence, Family cancer history, Brain tumour status (all p > 0.10)							

Note

*** p < 0.01; * p < 0.05; ns = not significant. G1 = Group 1; G2 = Group 2. r = effect size (Z/√N).*

4. Multi-category variables (Kruskal-Wallis tests)

Current treatment modality was significantly associated with all three outcomes (H = 9.712–10.639, all p ≤ 0.021, ε^2 = 0.152–0.166); combined treatment carried the highest distress, and no active treatment the lowest. Stimulant use predicted Total Depression and the combined score (both p ≤ 0.041). Income level was significantly associated with Total Anxiety (H = 8.154, p = 0.043). Diagnosis category, father's employment, and parental marital status were not significantly associated with any outcome (Table 6).

Table 6
Kruskal-Wallis Tests: Multi-Category Variables vs. RCADS-25 Outcome Scores

Variable	Outcome	H	p-value	Sig.	ε^2	Post-hoc significant pairs (Bonferroni)
Current treatment	Total Anxiety	9.712	0.021	*	0.152	Chemo vs No Tx p = 0.024; Combined vs No Tx p = 0.030
	Total Depression	10.498	0.015	*	0.164	Combined vs No Tx p = 0.047
	Total Anx & Dep	10.639	0.014	*	0.166	Chemo vs No Tx p = 0.022; Combined vs No Tx p = 0.049
Stimulant use	Total Depression	6.819	0.033	*	0.152	Sometimes vs No p = 0.034
	Total Anx & Dep	6.372	0.041	*	0.142	Sometimes vs No p = 0.040
Income level	Total Anxiety	8.154	0.043	*	0.125	—
Diagnosis category	All outcomes	—	> 0.20	ns	—	—
Father's employment	All outcomes	—	> 0.15	ns	—	—
Marital status	All outcomes	—	> 0.15	ns	—	—

*Note. * $p < 0.05$; ns = not significant. ε^2 = epsilon-squared effect size. Post-hoc p-values are Bonferroni-corrected.*

5. Sensitivity Analysis

After excluding the nine brain tumour participants (n = 58), all significant findings were reproduced in consistent directions and significance levels (Table 7), confirming that primary results were not driven by the inclusion of brain tumour participants.

Table 7
Sensitivity Analysis: Key Results Excluding Brain Tumour Participants (n = 58)

Variable	Outcome	Statistic	p-value	Sig.	Direction	Consistent
Gender	Total Anxiety	U = 227	0.018	*	F > M	Yes
	Total Depression	U = 240	0.031	*	F > M	Yes
	Total Anx & Dep	U = 237	0.029	*	F > M	Yes
Steroid use	Total Anxiety	U = 140	0.001	**	No > Yes	Yes
	Total Depression	U = 198	0.033	*	No > Yes	Yes
	Total Anx & Dep	U = 154	0.004	**	No > Yes	Yes
Age	Total Depression	rho = 0.295	0.025	*	Positive	Yes
Current treatment	Total Anxiety	H = 6.241	0.044	*	—	Yes

*Note. * p < 0.05; ** p < 0.01. All analyses used corrected raw RCADS-25 scores.*

6. Death-Related Item: Association Analysis

14 participants (20.9%, 95% CI: 12.9–32.1%) actively refused or passively avoided item 18 ('Do you think about death?'): 8 participants actively refused (crossed out, refused, drew a sad face); 6 passively avoided (only item 18 blank, all other 24 items completed). One participant was excluded from this analysis (Q17 and Q18 both missing; general non-response). Association analyses are presented in Table 8.

Among numeric responders (n = 52), the actual Q18 score was strongly correlated with all three outcomes: Total Anxiety rho = 0.628 (p < 0.001), Total Depression rho = 0.524 (p < 0.001), and combined rho = 0.624 (p < 0.001). The avoiders (n = 14) had higher medians than numeric responders (n = 52) across all outcomes: notably, total depression, median 14.5 vs. 7.0; however, these differences did not reach statistical significance, likely reflecting insufficient power given the small avoidance group (n = 14). Avoidance of item 18 was widely distributed and did not differ by gender (p = 0.340), age group (p = 1.000), treatment modality (p = 0.925), diagnosis (p = 0.948), or steroid use (p = 0.222).

Table 8
Q18 Death-Related Item: Avoidance vs. Numeric Response Analysis

Variable	Outcome	Avoided Mdn (n = 14)	Numeric Mdn (n = 52)	Statistic	p-value	Sig.
Avoidance vs Numeric (Mann-Whitney U)	Total Anxiety	14.0	14.0	U = 432	0.289	ns
	Total Depression	14.5	7.0	U = 438	0.251	ns
	Total Anx & Dep	27.5	19.0	U = 437	0.255	ns
Q18 score vs totals* (Spearman rho)	Total Anxiety	—	—	rho = 0.628	< 0.001	**
	Total Depression	—	—	rho = 0.524	< 0.001	**
	Total Anx & Dep	—	—	rho = 0.624	< 0.001	**

*Note. * Spearman rho was calculated among numeric responders only (n = 52), examining the continuous Q18 score (0–3) against total scores. ** p < 0.001; ns = not significant.*

DISCUSSION

This study aimed to determine the prevalence and severity of anxiety and depression and their associations with demographic and clinical factors among children and adolescents with cancer in Jeddah, Saudi Arabia. A substantial burden of psychological morbidity was identified and discussed below in order of clinical and scientific priority.

1. Prevalence and Severity

The prevalence of clinically significant anxiety and depression in the present sample substantially exceeded the pooled international estimates of 14% for anxiety and 20% for depression reported in a recent systematic review [7]. The reason for these high levels may be related to the particularly onerous nature of intense oncological treatments, inadequate psycho-oncology services, or specifics of the healthcare setting. In addition, the results from [26] examined adolescents and young adults who had survived cancer, demonstrating that while psychological distress may occur during the period of active treatment, it does indeed persist after completion of such. These two sets of research findings collectively provide evidence that reinforces the rationale for routine psychological assessment within pediatric oncology services in Saudi Arabia, as suggested for other countries throughout the Middle East and North Africa Region [27].

2. Age, Gender, and Developmental Vulnerability

The present findings indicate that older age was significantly related to higher scores of depressions. This aligns with research indicating that the onset of adolescence increases an individual's susceptibility to cognitive patterns associated with depression. When combined with cancer, which disrupts the processes of identity formation, peer relations, and independence, adolescents, and particularly females, are at heightened risk of psychological distress [28]. Research related to COVID-19 has shown how disruptions in developmental milestones result in greater psychological burdens on older adolescents [29] and it can be inferred that similar mechanisms exist for adolescents experiencing serious illness like cancer.

Moreover, the female gender was associated with significantly higher scores in all three domains of anxiety, depression, and combined scores. The results are consistent with many earlier studies in which it has been reported that the prevalence of internalizing symptoms is higher for girls than boys and that there is an increase in depressive symptomatology. Researchers have suggested several possible reasons for these associations, such as pubertal hormonal changes, a greater level of concern regarding how others evaluate them socially, body image issues, and the normal development process of learning one's own identity and becoming independent [30]. While the current study design (cross-sectional) did not allow researchers to assess whether or why these associations occurred, other unmeasured biological, psychosocial, and illness-related factors may also be responsible for some portion of the association.

3. Steroid Use and Psychological Symptoms

The paradoxical association between steroid use and significantly decreased distress across all outcomes needs careful interpretation. Oncological corticosteroid treatment protocols are well documented for their biphasic neuropsychiatric profile, defined as euphoria and mood elevation during active treatment, followed by rebound dysphoria during corticosteroid taper; neurobehavioural side effects have been reported in several cancer treatment protocols in childhood [10, 31]. Children who were receiving steroids might have felt like they were making some therapeutic progress, and this could have helped to buffer distress; the euphoric effects of the corticosteroid activity may have obscured distress at the time of assessment. The lack of information regarding the type of steroid, dose, and time of administration does not allow definitive interpretation; prospective studies are needed to address these issues.

4. Treatment Modality and Dose-Response Gradient

The dose-response gradient across treatment groups (combined modality treatment had the highest distress rating, and no active treatment had the lowest) is consistent with the clinical assumption that treatment intensity is a key determinant of distress. Children and adolescents who are prescribed combined treatment protocols are at high-risk for neurotoxicity, which can manifest in the form of psychiatric disorders like anxiety and depression [32]. Moreover, the detrimental effects of this treatment

on quality of life are well documented and understandable given the severe side effects most of these cytotoxic therapies incur [33]. This finding is directly relevant to service planning: children receiving combined treatment protocols represent a clearly identifiable high-risk group warranting targeted psychosocial intervention beyond standard care.

5. Death-Related Item Avoidance Findings and Clinical Implications

A clinically significant finding of this study was that 20.9% of participants (95% CI: 12.9–32.1%) did not respond to item 18 ('Do you think about death?') in a standard manner. This included 8 participants who actively crossed out this item, refused to answer, or drew a sad face, and 6 participants who left this item blank among all other 24 items. The latter group's item-specific response (by completing all items except item 18) was interpreted as content-specific passive avoidance, because item 18 produced a non-standard response rate 418-fold higher than the mean response rate for all other items.

RCADS-25 scores were higher in these avoiders as compared to the rest of the participants across all three outcomes, i.e., depression, anxiety, and both. Even though these differences were not statistically significant, possibly due to a lack of power from the small number of avoiders, the differences between scores were large and consistent across all outcomes, including a Total Depression median score of 14.5 for avoiders and 7.0 for numeric responders. Avoidance group membership needs to be formally tested in future studies with larger samples to determine if there is a clinical elevation of RCADS-25 scores.

The Spearman correlation analysis done among the numeric responders gave the most solid quantitative insight; all three outcomes (Total Anxiety, Total Depression, and combined) were strongly and significantly correlated with the continuous Q18 score (all rho > 0.50; all $p < 0.001$). These are large effect sizes and suggest that death-related cognition is an important cross-cutting factor of anxiety and depression in this population. Studies with adolescents and young adults have identified death anxiety in over 65% of the participants with a cancer diagnosis [34]. Children's thoughts about death are associated with significantly greater anxiety and depressive symptoms [35].

There was no significant difference in avoidance of the death item among subgroups analyzed, including gender ($p = 0.340$), age group ($p = 1.000$), treatment modality ($p = 0.925$), cancer diagnosis ($p = 0.948$), or steroid use ($p = 0.222$). This indicates that avoidance of death is not limited to any particular profile but rather a vulnerability throughout this population.

The findings support two clinical practices: systematic documentation of non-verbal and avoidant responses to death-related items during psychological assessments, and explicit targeting of death anxiety in psychological interventions with young cancer patients rather than treating it as a secondary or taboo topic. Specific instruments validated for measuring death anxiety in these populations could be added to general screening for anxiety and depression.

6. Cancer type distribution

The present sample showed good agreement with the Saudi Cancer Registry data [36, 37] regarding the diagnostic distribution of the sample, which shows concordance in the percentages of lymphomas (14.9% vs. 15.2%), brain tumours (13.4% vs. 12.4–16.7), and male predominance. There was a slightly higher proportion of leukaemia (40.3%) compared with the national data (30.8–34.1%). This may be due to referral practice in a tertiary center. The sample is thus broadly representative of the Saudi childhood cancer diagnostic profile, but for generalizability of findings, it would be recommended to replicate the diagnostic profile in multiple centres across Saudi health regions for formal national benchmarking.

There is no validated normative data in Saudi Arabia for the RCADS-25 and no existing comparable combined anxiety and depression screening tool for 8- to 18-year-old children and adolescents [17, 38]. There is only partial validation of an Arabic child anxiety screening tool with Saudi data, the Screen for Child Anxiety Related Emotional Disorders (SCARED) [39] which measures anxiety alone and does not contain a depression subscale, which is not suitable for the aims of the present study. There are no normative data for the RCADS-25 for any Arab country or the whole region of the Gulf Cooperation Council (GCC) countries; normative data have been developed in the USA, Sweden [40] and Ireland, which are not culturally or clinically similar to a Saudi pediatric oncology population.

The tables for conversion of the T-scores provide a quantitative picture of this mismatch. The mean Total Anxiety score for the present sample (14.36) falls in the range of T = 56–62 across grade and gender groups, and the mean Total Depression score (10.37) falls in the range of T = 58–66 across grade and gender groups, according to the official UCLA RCADS-25 T-score conversion tables. The average child (of the present sample, not the most distressed, but the typical participant) is already at the upper limit of the ‘normal' range of psychological distress on U.S. calibrated thresholds, before the impact of individual differences is accounted for in psychological distress. This systematic elevation offers quantitative evidence that the normative reference group is not clinically equivalent to the current population and that clinical burden classes based on these norms will systematically underestimate the true clinical burden. It also highlights that the Arabic version of the RCADS-25, which addresses both linguistic and psychometric equivalence, does not address the lack of culturally and clinically appropriate normative thresholds for Saudi children and adolescents, and that this study quantifies this gap. The systematic elevation suggests that the true clinical burden is probably greater than reflected by t-score-based classification in the present study; that is, clinically significant anxiety and depression may be present in a larger proportion of this population than the t-scores portray. These percentile-based estimates are relative to the severity of other children in this population and are thus considered more ecologically valid severity estimates for clinical interpretation.

7. Limitations

The cross-sectional design does not allow causal inferences and cannot capture the time course of psychological distress during the illness course. The lack of time since diagnosis, parent-report data, and

a functional impairment measure restrict comprehensiveness. The participants of this study were all recruited from a single tertiary center. The RCADS-25 was used without an established Saudi normative sample, requiring dual reporting, and locally developed norms are still needed for further research. Socially desirable bias in the clinical environment cannot be ruled out.

Conclusion

The study reports a significant clinically relevant burden of anxiety and depression among children and adolescents receiving treatment at a tertiary oncology center in Saudi Arabia. Adolescent girls, older children, and those who are receiving combined treatment modalities are the highest-risk subgroups. The true clinical burden is likely underestimated by T-score-based classification alone. Additionally, 20.9% of participants actively or passively avoided a death-related item, a rate 418-fold higher than for any other item underscoring the depth of psychological vulnerability in this population. The results of this study will help to build a locally based evidence base for implementation of integrated, targeted psycho-oncology services in Saudi Arabia, in line with the Vision 2030 health agenda. Future studies should use longitudinal designs, include parent-report and functional impairment measures, and use Saudi-specific norms for the RCADS-25.

Abbreviations

RCADS
Revised Child Anxiety and Depression Scale
UCLA
University of California, Los Angeles
MENA
Arab Middle East and North African
CNS
Central Nervous System
KAIMARC
King Abdullah International Medical Research Centre
SCARED
Screen for Child Anxiety Related Emotional Disorders
GCC
Gulf Cooperation Council

Declarations

Ethics Approval and Consent to Participate

Ethical approval for this study was obtained from King Abdullah International Medical Research Center (KAIMRC) Ref. No. IRBC/0198/20. Written informed consent was obtained from all participants before

they participated in the study.

Consent for publication

Not applicable. This study does not contain any individual participant data or identifiable information requiring consent for publication.

Competing Interests

The authors declare that they have no competing interests.

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Author Contribution

AAH: Conceptualization, Formal analysis, Methodology, writing original draft, writing review and editing. AHM: Conceptualisation, writing review and editing.QH: Conceptualisation, project administration, writing review and editing. AHH: Conceptualisation, writing review, and editing. NG: Conceptualisation, writing review, and editing. All the authors have read and approved the final manuscript, and agree to be accountable for all aspects of the work.

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Data Availability

The datasets generated and analyzed during the current study are available from the corresponding author on request.

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