

Quality of Life Assessment in Adolescent Patients with Cancer: A Cross-Sectional Study from a Tertiary Cancer Centre in South India

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Abstract

Background: The incidence of neoplasms in the adolescent age group is approximately 22.4 per 10,000 population. Beyond the physical burden of malignancy, psychological and social impairments significantly affect quality of life (QOL) in this vulnerable cohort. Standardized QOL assessment tools such as SF-36 provide a validated framework to quantify these multi-dimensional deficits. The objective is to assess quality of life in adolescent cancer patients using the SF-36 questionnaire and to identify variation in physical, social, and mental well-being across different malignancy subtypes. **Material and Methods:** A hospital-based cross-sectional study was conducted among adolescents aged 13–18 years attending the Department of Radiation Oncology at RGGGH, Chennai. Of 98 enrolled cases, 35 consented participants completed a semi-structured interview using the SF-36 questionnaire. QOL scores across malignancy types were compared using ANOVA and domain-wise scores were compared using the Friedman test. **Results:** The mean total SF-36 score was 42.04 ± 10.03 out of 100. Mortality was observed in 31.6% (31/98) of cases, with Bone (5/7) and Hematological (10/28) malignancies bearing the highest mortality burden. QOL scores were similar between CNS and Hematological malignancies ($p = 0.165$), but were relatively better in other solid malignancies. Role limitation due to physical health (mean 16.43) and role limitation due to emotional problems (mean 22.86) were the most impaired domains ($p < 0.001$ by Friedman test). **Conclusion:** Adolescent cancer patients demonstrate substantially impaired QOL, with role limitation domains showing the greatest deficit. Integrated physical and psychosocial rehabilitation strategies are essential to improve QOL in this population.

Keywords: Quality of life; SF-36; adolescent; cancer; malignancy; radiation oncology; psychosocial.

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INTRODUCTION

Adolescent and young adult cancer (AYAC) is a unique clinical and psychosocial problem. Adolescents (ages 13-18) represent a special age group in childhood compared to younger children and older adults, with population based registries reporting about 22.4 cases per 10,000 population.^[1] Adolescents are in a developmental stage that is different from younger children or older adults, with pubertal growth, identity formation, and social integration that are all rapid. Conventional clinical endpoints of tumor response or survival do not fully reflect the impact of a malignant diagnosis on the lives of children during this critical developmental window when indications extend beyond the scope of academic outcomes, peer relationships, body image and psychological health.^[2-4]

The SF-36 is a generic health survey with eight multi-item domains that measure physical functioning, role limitations due to physical and emotional health, energy/fatigue, emotional well-being, social functioning, pain, general health perception, and has proven valid and reliable in a variety of chronic illness populations including pediatric cancer and adolescent cancer populations.^[5]

Rural India lacks in depth quality of life information for adolescent cancer patients. In LMIC, most publications are adult cancer patients and many factors such as peer exclusion, adversarial school experiences, and the sense of

new autonomy that adolescents experience are underrepresented in the literature.^[6] Tertiary centres in India have an unduly large proportion of patients with advanced diagnoses, which further complicates QOL outcomes.^[7]

Though uncommon in adolescents, head and neck cancers pose unique communication and disfigurement issues as well as prolonged and intense treatment schedules that can result in fatigue and emotional distress. Understanding malignancy-specific QOL impairments is essential to tailor supportive care interventions effectively.^[8-10]

This study was undertaken to provide an institutional assessment of QOL in adolescent cancer patients using the validated SF-36 questionnaire, with a secondary objective of identifying domain-specific and malignancy-specific variation in QOL outcomes. The findings aim to inform the development of integrated psychosocial support programs at our institution and to

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contribute to the growing body of evidence on AYA cancer QOL in low-resource settings.

The primary objective of this study was to assess QOL in adolescent patients with both solid and haematological malignancies attending the Department of Radiation Oncology. The secondary objective was to identify variation in physical, social, and mental well-being across malignancy subtypes and across the eight functional domains of the SF-36 instrument.

MATERIALS AND METHODS

This was a hospital-based cross-sectional study conducted at the Department of Radiation Oncology, Rajiv Gandhi Government General Hospital (RGGGH) and Madras Medical College (MMC), Chennai — one of the largest public sector tertiary care oncology centers in South India. This study was based on the review of cases during the 3 years period.

Eligible children for the study were adolescent cancer patients (age 13 to 18) receiving or having received first-line oncologic treatment in the department. There were 98 cases discovered through institutional records. Eligible participants had to be able to read and answer in Tamil or English, be able to attend a structured interview of 30 minutes duration and be prepared to sign written informed consent. The participants which could not be contacted or lost to follow-up were removed. 98 cases were identified, of which 31 (31.6%) had expired, 20 were unreachable and 47 were alive and reachable. Of these 35 agreed, and 12 did not agree, and so the analytic sample consisted of 35 participants.

The SF-36 is a well-validated patient-reported outcome (PRO) measure that assesses 8 health domains: physical

functioning (PF), role limitations due to physical health (RP), role limitations due to emotional problems (RE), energy/fatigue (EF), emotional well-being (EW), social functioning (SF), pain (P), and general health perception (GH). The scores will range from 0 to 100 for each of the domains, with higher scores reflecting greater health-related QOL. The data was gathered by conducting semi-structured interviews conducted by well-trained investigators.

Mean and standard deviation were calculated for each domain and total score on the SF-36. Median and interquartile range scores were also calculated. Box-Whisker plots were used to visualize the distribution of QOL scores across types of malignancy (CNS, Hematological, and Other solid malignancies) and one-way Analysis of Variance (ANOVA) was used for comparison. A Friedman non-parametric test was used to compare SF-36 scores domain-wise, which required that the data be related samples and have a non-normal distribution. The Pearson correlation coefficient was used for inter domain score and domain-total score. A p-value < 0.05 was considered statistically significant. Analysis of all data were done by using traditional analytical tools.

RESULTS

Of the 98 adolescent cancer patients identified, 31 (31.6%) had expired, 20 were not reachable, and 47 were alive and contactable. Among those alive and reachable, 35 (74.5%) provided informed consent and completed the SF-36 interview, while 12 (25.5%) declined. The mean age of participants was 15.06 ± 1.78 years. The cohort comprised 22 males (62.9%) and 13 females (37.1%). The distribution of malignancy subtypes and participant status is summarised in [Table 1].

Table 1: Participant Enrolment Status by Malignancy Type (N=98)

Malignancy Type	Total (N)	Alive Consented	Alive Not Consented	Lost to Follow-up	Expired
CNS	50	17	10	6	17
Hematological	28	9	6	3	10
Head & Neck	4	1	2	0	1
Breast	1	1	1	0	0
Bone	7	2	1	1	5
Others	7	7	12	2	2
Total	98	35	12	20	31

CNS = Central Nervous System tumours. 'Others' includes other solid malignancies in the adolescent age group.

The mean total SF-36 score for the 35 participants was 42.04 ± 10.03 on a 100-point scale, indicating moderately impaired overall QOL. Domain-wise analysis revealed that Pain (mean 57.79) and Emotional Well-being (mean 54.86) were the least impaired domains. In contrast, Role Limitation due to Physical Health (mean 16.43) and Role Limitation due to

Emotional Problems (mean 22.86) were the most severely impaired, reflecting considerable restrictions in both physical activity-related and emotionally-driven roles among adolescent patients. [Table 2] summarises all domain-wise scores.

Table 2: Domain-wise SF-36 Quality of Life Scores (N=35)

SF-36 Domain	Mean Score	Interpretation
Physical Functioning	45.43	Moderate impairment
Role Limitation – Physical Health	16.43	Severe impairment
Role Limitation – Emotional Problems	22.86	Severe impairment
Energy / Fatigue	45.86	Moderate impairment
Emotional Well-being	54.86	Mild-moderate impairment
Social Functioning	48.57	Moderate impairment
Pain	57.79	Least impaired domain
General Health	44.43	Moderate impairment
Total SF-36 Score	42.04 ± 10.03	—

Scores range from 0–100; higher scores indicate better QOL. Friedman test $p < 0.001$ for domain-wise comparison.

When QOL scores were compared across the three analytic malignancy groups (CNS, Hematological, and Other solid malignancies), no statistically significant difference was found by one-way ANOVA ($p = 0.165$). The mean total SF-36 score was approximately 42/100 in both Hematological and CNS malignancy groups. However, patients in the 'Other

solid malignancies' group demonstrated relatively higher QOL scores compared to the other two groups, consistent with the generally less intensive treatment regimens and absence of central nervous system involvement in these tumours. [Table 3] presents the group-wise QOL scores.

Table 3: Comparison of Total SF-36 Score by Malignancy Type (N=35)

Malignancy Group	n	Mean SF-36 Score	p-value (ANOVA)
CNS Malignancies	17	~42	0.165
Hematological Malignancies	9	~42	0.165
Other Solid Malignancies	9	Higher (relative)	0.165

ANOVA: Analysis of Variance. $p = 0.165$ indicates no statistically significant difference across groups at the 0.05 threshold.

The overall mortality rate in the study cohort was 31.6% (31/98 cases). Mortality was disproportionately high in Bone malignancies (5 out of 7 patients; 71.4%) and Hematological malignancies (10 out of 28; 35.7%). CNS malignancies, despite forming the largest subgroup (50 patients), accounted for 17 deaths (34.0%). The high mortality in Bone

malignancies likely reflects late-stage presentation with metastatic disease, while the hematological group's burden is attributable to the inherent aggressive biological behaviour of certain haematological cancers in adolescents, including acute leukaemias. [Table 4] presents malignancy-specific mortality data.

Table 4: Mortality by Malignancy Type (N=98)

Malignancy Type	Total Cases (N)	Deaths (n)	Mortality Rate (%)
CNS	50	17	34.0%
Hematological	28	10	35.7%
Head & Neck	4	1	25.0%
Breast	1	0	0%
Bone	7	5	71.4%
Others	7	2	28.6%
Total	98	31	31.6%

Mortality rate = (deaths/total cases) $\times$ 100.

Pearson's correlation analysis demonstrated that Total SF-36 Score correlated most strongly with Physical Functioning ($r = 0.723$, $p < 0.001$), followed by Role Limitation due to Physical Health ($r = 0.665$, $p < 0.001$), General Health ($r = 0.574$, $p = 0.0003$), Emotional Well-being ($r = 0.562$, $p = 0.0004$), and Energy/Fatigue ($r = 0.624$, $p = 0.0001$). Among

inter-domain correlations, Energy/Fatigue showed significant correlation with Emotional Well-being ($r = 0.529$, $p = 0.0011$) and Social Functioning ($r = 0.497$, $p = 0.0024$). [Table 5] presents key domain-total and inter-domain correlations.

Table 5: Correlation of SF-36 Domains with Total Score (N=35)

Domain	r (with Total Score)	p-value	Significance
Physical Functioning	0.723	< 0.001	Significant
Role Limitation – Physical	0.665	< 0.001	Significant
Role Limitation – Emotional	0.444	0.0076	Significant
Energy / Fatigue	0.624	0.0001	Significant
Emotional Well-being	0.562	0.0004	Significant
Social Functioning	0.502	0.0021	Significant
Pain	0.414	0.0133	Significant
General Health	0.574	0.0003	Significant

r = Pearson's correlation coefficient. All correlations were statistically significant at $p < 0.05$.

DISCUSSION

This cross-sectional study gives us valuable institutional data on QOL amongst adolescent cancer patients of a public sector tertiary care centre of South India. The overall mean SF-36 score of 42.04 ± 10.03 in our study shows a moderate to severe overall QOL, which is similar to the other international studies. Prasad et al. also reported similar low scores for QOL in paediatric cancer survivors in India, with scores of 35–50 for paediatric cancer survivors currently receiving treatment and/or within 1 year of diagnosis.^[11] The

SF-36 has been validated in adolescent cancer populations from a number of countries, with scores in the 35–50 range being commonly reported.^[12]

The most salient result of this study was the disproportionate impairment in role limitation due to physical health (16.43) and role limitation due to emotional problems (22.86), which were higher than that of other domains. This finding is in line with published evidence showing that adolescent cancer patients are highly functionally disabled across several domains, including physical aspects, such as work or school, and emotional coping with cancer.^[13] The Friedman test also confirmed that functional

disability in role functioning was statistically significantly lower in each domain ($p < 0.001$), highlighting this as an important area for rehabilitation interventions for this patient population.^[14]

The comparable QOL scores between CNS and Hematological malignancy groups (ANOVA $p = 0.165$) suggest that the QOL burden is broadly similar across these two major malignancy subtypes in adolescents. However, the trend toward higher scores in the 'Other solid malignancies' group is clinically noteworthy. Patients with other solid tumours in the adolescent age group may have undergone more localised disease and less intensive systemic therapy, which could explain the relatively better QOL.^[15] Comparable findings have been reported in paediatric oncology literature from LMIC settings, where CNS and haematological malignancies are associated with the most pronounced psychosocial and neurocognitive sequelae.^[16]

The overall mortality rate of 31.6% in the total identified cohort reflects the advanced stage of presentation typical of public sector oncology settings in India, where late diagnosis is common due to barriers including limited health literacy, geographic distance, and socioeconomic constraints.^[17] Bone malignancies had the highest case fatality rate at 71.4%, driven largely by osteosarcoma and Ewing's sarcoma, which frequently present with metastatic disease at adolescent age.^[18] The 35.7% mortality in the Hematological group reflects the aggressive biology of certain acute leukaemias and lymphomas, compounded by delayed referral and treatment interruption.^[19]

All eight SF-36 domains showed statistically significant positive correlations with the total score, with Physical Functioning showing the strongest correlation ($r = 0.723$). This indicates that the ability to perform day-to-day physical activities is the primary driver of overall perceived QOL in this cohort, a finding supported by studies of adolescent cancer patients undergoing active oncologic treatment.²⁰ The significant correlation between Energy/Fatigue and Emotional Well-being ($r = 0.529$, $p = 0.0011$) further reflects the well-established bidirectional relationship between cancer-related fatigue and psychological distress in young patients.¹³ Social Functioning showed moderate correlation with both Energy/Fatigue ($r = 0.497$) and General Health ($r = 0.344$), reinforcing that physical recovery and broader health perception are closely intertwined with social participation in adolescence.

The findings collectively underscore the need for comprehensive multidisciplinary supportive care for adolescent cancer patients. Targeted psychosocial interventions, peer support programs, and school re-integration facilitation should be integrated into the oncology care pathway.^[6] Dedicated AYA oncology programs, increasingly recognized as standard of care in high-income countries, are warranted in the Indian tertiary care setting where the specific needs of this age group are often subsumed within either paediatric or adult oncology services.^[2]

Limitations of this study include the cross-sectional design which precludes longitudinal QOL trajectory assessment, the relatively small consented sample of 35 participants, and the single-institution setting limiting generalizability. The

inability to contact 20% of alive patients and the exclusion of deceased patients from QOL analysis may introduce survivor bias. Future prospective cohort studies with larger samples, longitudinal follow-up, and inclusion of caregiver-reported outcomes are recommended.

CONCLUSION

Adolescent cancer patients attending a tertiary radiation oncology department demonstrate substantially compromised quality of life, with a mean SF-36 total score of 42.04/100. Role limitation due to physical health (16.43) and emotional problems (22.86) were the most impaired domains, confirming that adolescents with cancer face significant restrictions in both activity engagement and emotional coping. Mortality was disproportionately high in Bone (71.4%) and Hematological (35.7%) malignancies. While overall QOL did not differ significantly between CNS and Hematological groups ($p = 0.165$), all SF-36 domains were significantly correlated with total QOL scores. These findings emphasize the urgent need for integrated physical and psychosocial rehabilitation programs targeting role functioning in adolescent cancer care. Institution of dedicated AYA oncology pathways incorporating peer support, psychological counselling, and educational re-integration will be essential to meaningfully improve QOL outcomes in this vulnerable population.

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Conflicts of interest

There are no conflicts of interest.

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