Self-reported oral health–related quality of life among paediatric oncology patients: a cross-sectional study at Kenyatta National Hospital, Kenya

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ABSTRACT

Background: Children diagnosed with cancer often experience a substantial decline in their quality of life partly attributed to cancer therapy-induced oral complications such as oral mucositis and dental caries. Self-perceived health questions provide insight into children's lived experiences and are valuable instruments in health research. This study evaluated the oral health-related quality of life (OHRQoL) of hospitalized children aged 8-12 years undergoing cancer therapy at Kenyatta National Hospital and examined the relationship between oral mucositis, dental caries, and OHRQoL in this population. **Methods:** This was a descriptive, hospital-based study nested within a larger cross-sectional study conducted in the paediatric oncology wards of Kenyatta National Hospital. Thirty-one children aged 8-12 years undergoing cancer therapy were enrolled. Data collection comprised a clinical oral examination to assess oral mucositis and dental caries. Oral mucositis was graded according to the WHO Oral Mucositis Scale (1979). Dental caries was evaluated using the dmft/DMFT index, while OHRQoL was measured using the Child Perceptions Questionnaire ($CPQ_{8–10}$). **Results**: Acute Lymphocytic Leukaemia was the most common cancer (19.4%). The prevalence of oral mucositis was 35.5%, while 64.5% of participants presented with dental caries. Oral mucositis was linked to a significantly lower OHRQoL among affected children. **Discussion:** Oral mucositis adversely affects the quality of life of children receiving cancer therapy. Children's self-reported perceptions offer valuable insights into how oral health influences their overall well-being. **Conclusion:** Integrating oral health professionals and an OHRQoL dimension into childhood cancer care offers a holistic approach to patient management and enhanced well-being.

Keywords: dental caries; oral health-related quality of life; oral mucositis; paediatric oncology

CDHA Research Agenda category: risk assessment and management; access to care and unmet needs

INTRODUCTION

Oral health-related quality of life (OHRQoL) refers to the impact of oral conditions on an individual's functional, psychological, and social well-being, reflecting the multidimensional nature of oral health in daily life.[1] Children diagnosed with cancer often experience a substantial decline in their OHRQoL due to intensive clinical interventions, prolonged hospitalization, and cytotoxic cancer therapies.[2–4] This decline in well-being is partly attributed to cancer therapy-induced oral complications such as oral mucositis, gingival bleeding, xerostomia, and dental caries, which further increase disease burden and contribute to emotional, social, and physical distress in paediatric patients.[1,2]

Oral mucositis is one of the most debilitating oral side effects of cancer therapy resulting in pain, compromised nutrition, hospitalization, and increased susceptibility to infection.[4,5] Its incidence varies from 40% to 100%, depending on the type of malignancy, chemotherapy regimen, radiation dosage, patient age, oral health status, and neutrophil count.[6] A systematic review that evaluated 459 studies found that the impact of oral mucositis on quality of life extends beyond local oral complications, affecting physical, emotional, and psychosocial functional domains of patients undergoing cancer therapy.[7] While much of this evidence is derived from adult populations, emerging paediatric studies echo similar findings, highlighting the substantial burden of oral mucositis on children's daily functioning and well-being.

In a study by Cheng et al., 140 children aged 8-18 years who were diagnosed with cancer and undergoing cancer therapy were enrolled.[8] Participants completed the self-reported Mouth and Throat Soreness-related Questions of the Oral Mucositis Daily Questionnaire (OMDQ) for 14 days and the Oral Mucositis-specific Quality of Life Measure (OMQoL) at baseline, day 7, and day 14. The study reported that children who developed chemotherapy-induced oral mucositis experienced a decline in quality of life, particularly due to difficulties with eating, swallowing, drinking, sleeping, and talking. Likewise, a 2020 study conducted in Morocco used the Arabic version of the Child-Oral Impacts on Daily Performances (Child-OIDP) questionnaire, validated for use in Morocco, to assess the OHRQoL of 40 children aged 11-14 years with acute leukaemia undergoing chemotherapy and radiotherapy.[9] The study reported that more than half of the participants experienced oral conditions that interfered with their daily activities, particularly

eating.

Transitioning from mucosal to hard-tissue conditions, dental caries represents another major oral complication affecting children undergoing cancer therapy. Dental caries is a multifactorial, biofilm-driven disease characterized by dynamic cycles of demineralization and remineralization of tooth structure, influenced by diet, oral microbiome composition, and host factors.[10,11] Cancer and cancer therapy have been reported to shift the oral microbiome toward cariogenic bacteria such as *Streptococcus mutans* and *Lactobacillus spp.* which initiate and promote the progression of dental caries.[12] In addition, cancer therapy can lead to xerostomia and alterations in saliva composition, reducing its buffering capacity and increasing tooth susceptibility to demineralization.[10,13] These factors collectively increase the child's risk of developing dental caries.

The clinical relevance of these changes and their impact on the quality of life of children has been explored primarily in high- and upper-middle-income countries. In a cross-sectional study conducted in Turkey, 99 children were evaluated: 49 diagnosed with acute lymphoblastic leukaemia (ALL) or acute myelocytic leukaemia (AML) who were undergoing cancer therapy, and 50 healthy controls. Oral health status was assessed using the Simplified Oral Hygiene Index (SOHI) and the Decayed, Missing, and Filled Teeth (DMFT/dmft) index, while OHRQoL was measured using the validated Turkish version of the Early Childhood Oral Health Impact Scale (ECOHIS-T). The study found that oral health and self-care were significantly compromised among children with cancer compared to their healthy peers, indicating the adverse effects of cancer and its treatment on OHRQoL.

While self-reported measures provide insight into children's lived experiences, this approach has been underutilized in paediatric oncology, particularly in resource-limited settings.[14] Consequently, there is limited literature on the prevalence of oral mucositis and dental caries and their impact on OHRQoL in children undergoing cancer therapy, especially in low- and middle-income countries (LMICs).[15] This paucity of evidence may stem from the historical neglect of oral health within the global health agenda, particularly in LMICs.[16] Contributing factors include a shortage of oral health professionals, a scarcity of OHRQoL studies among paediatric oncology populations, and limited oral health knowledge among non-dental healthcare providers.[17–19] An

OHRQoL framework therefore complements conventional diagnostic measures by encompassing the emotional, functional, and social dimensions of oral health. This patient-centred perspective deepens understanding of the child's lived experience and informs policies aimed at improving the quality of oral healthcare for children undergoing cancer treatment.

Against this background, the present study was conducted as part of a larger cross-sectional study at the paediatric oncology wards of Kenyatta National Hospital in Kenya. The study aimed to assess the impact of oral mucositis and dental caries on the OHRQoL of children undergoing cancer therapy. Amplifying children's voices regarding their own OHRQoL during cancer therapy is therefore essential to guide holistic, patient-centred cancer care.

Research Question: What is the association between oral mucositis, dental caries, and oral health-related quality of life (OHRQoL) among hospitalized children undergoing cancer treatment at Kenyatta National Hospital, Kenya?

MATERIALS AND METHODS

This descriptive, cross-sectional, hospital-based study was nested within a larger study conducted at Kenyatta National Hospital (KNH) in Nairobi, Kenya (Ethics approval Ref. No. P796/10/2021).[10] KNH is a national referral and teaching hospital equipped to provide comprehensive cancer care, including surgery, chemotherapy, and radiotherapy. The study was conducted in the paediatric oncology wards of KNH.

Considering the study design, a subset of 31 hospitalized children aged 8-12 years who were undergoing cancer therapy were selected from the 102 participants enrolled in the larger study, whose sample size had been determined using Cochran's formula.[10,20] This age group was chosen because children within this range are cognitively capable of providing reliable self-reports.[21,22] Parental or guardian consent was obtained for each participant, with child assent provided. All eligible hospitalized children within this age range were purposively included. Children who were critically ill or in medical isolation at the time of recruitment were excluded.

Data was collected using two primary methods: a structured questionnaire and clinical examination to assess for oral mucositis and dental caries. Each child first completed the Child Perceptions Questionnaire ($CPQ_{8–10}$), which assessed oral health-related quality of life across

four domains: oral symptoms, functional limitations, emotional well-being, and social well-being.[23] The total score in each oral health domain was summed to determine the overall OHRQoL score, with higher scores indicating worse OHRQoL. The $CPQ_{8–10}$ was used for participants aged 8-12 years to maintain a single child self-report instrument and ensure analytical uniformity in a small cohort. Prior work demonstrates very strong concordance between $CPQ_{8–10}$ and $CPQ_{11–14}$ and supports the feasibility of using one measure across adjacent child age bands, with comparable psychometric performance.[24]

Subsequently, the Principal Investigator (PI) conducted an oral examination to assess for oral mucositis, dental caries, and oral hygiene status under field conditions using natural light. Oral mucositis was assessed by gentle retraction of the lips and buccal tissues, and its presence and severity were graded using the WHO Oral Mucositis Scale (1979).[25] **Figure 1** below illustrates the various grades of severity of oral mucositis. Dental caries was assessed by visualization and tactile examination using the WHO Oral Health Assessment Form for Children (2013) and recorded using the dmft index for primary teeth and the DMFT index for permanent teeth.[26] Teeth were dried with gauze prior to inspection, and dental caries was identified by the presence of white chalky lesions, visible cavitation, or evidence of previous dental treatment such as dental restorations or extractions. Oral hygiene was determined by quantifying plaque deposits using disclosing tablets on the lingual and buccal aspects of the teeth and scored on six index teeth based on the Silness and Löe Plaque Index and the modified Quigley-Hein Plaque Index by Turesky et al.[27,28] Medical information, including age, sex, type of malignancy, diagnostic details, treatment regimen, and prior dental care, was retrieved from hospital records after clinical assessment. This approach ensured that the PI remained blinded to each participant's medical background during clinical examination, thereby minimizing diagnostic bias.

All clinical diagnoses and findings were recorded by the principal investigator (PI), who had been calibrated by one of the study supervisors, a paediatric dentist. Inter- and intra-examiner reliability were assessed using Cohen's Kappa (κ) statistic. The inter-examiner κ values for oral mucositis, dental caries, and dental plaque were 0.90, 0.82, and 0.86, respectively. The corresponding intra-examiner κ values were 0.96, 0.90, and 0.85, indicating strong consistency and reproducibility of the PI's clinical assessments.

Data analysis was performed using IBM SPSS Statistics version 25. Descriptive statistics were used to summarize participants' presence of oral mucositis, dental caries experience, and oral health-related quality of life (OHRQoL) scores. Multivariable linear regression models were applied to determine the relationships between oral mucositis, dental caries, and OHRQoL. Pearson's product-moment correlation coefficient was used to assess the association between OHRQoL, oral mucositis, dental caries, and while Spearman's rank-order correlation was employed to evaluate the relationship between oral mucositis severity and the four subdomains of OHRQoL. Results were reported with 95% confidence intervals. Tables and graphs were used to present the findings visually.

RESULTS

Participant characteristics

A total of 31 children participated in the study. Most study participants (71%, N=22) were male. The mean participant age was 10.3 ± 1.25 years. The study participants were all referrals from various hospitals in Kenya, with most (25.5%, N=26) being from Nairobi.

Cancer diagnosis and treatment modalities

The most prevalent cancer was Acute Lymphocytic Leukaemia (19.4%, N=6). Cancer therapy modalities available at KNH during the study included chemotherapy, radiotherapy, and surgery. Most patients (77.4%, N=24) were undergoing chemotherapy as a standalone treatment, while the remainder were receiving chemotherapy in combination with radiotherapy and/or surgery.

Oral mucositis

Oral mucositis was observed in 35.5% of participants. Among those affected, 19.4% (N=6) had Grade I mucositis, 12.9% (N=4) had Grade II, and 3.2% (N=1) had Grade III, indicating varying degrees of severity. None of the children manifested Grade IV oral mucositis.

Dental caries

The prevalence of dental caries 64.5%. The mean DMFT was 0.48±1.21 SD and 2.23 ± 2.75 SD for female and male participants, respectively. The amount of dental plaque was used to indicate oral hygiene status. Most participants (64.5%, N=20) had moderate plaque deposits, with mean scores of 3.56 ± 1.42 for females and 3.59 ± 0.91 for males.

OHRQoL

OHRQoL scores were calculated from the Child Perception Questionnaire (CPQ_{8-10}) and all participants answered the questionnaire with no assistance required for interpretation of questions. Regarding the state of the mouth and teeth, the study participants described them as either 'poor,' 'okay,' 'good', or 'very good'. Regarding oral (soft tissue) health, 32.3% (N=10) of the children rated it as 'very good', 45.2% (N=14) as 'okay', 12.9% (N=4) as 'poor', while 9.7% (N=3) did not specify. In terms of dental (teeth) health, 38.7% (N=12) rated it as 'very good', 16.1% (N=5) as 'good', and 45.2% (N=14) as 'okay'. No child indicated the condition of their teeth as 'poor'. The responses concerning functional and emotional well-being, limitations, oral symptoms, and social well-being were broadly categorized into three options: often, sometimes, and never as presented in **Table 1**.

Oral mucositis severity had a significant association with emotional well-being ($p = 0.006$), oral symptoms ($p = 0.017$), and social well-being ($p = 0.002$). Generally, OHRQoL had a significant negative association with oral mucositis ($r=- 0.498$, $p=0.004$), resulting in a decline in OHRQoL, as illustrated in **Figure 2**.

Dental caries did not have a statistically significant association with emotional well-being ($p = 0.943$), functional limitation ($p = 0.776$), oral symptoms ($p = 0.53$), and social well-being ($p = 0.273$). Overall, OHRQoL had no statistically significant correlation with dental caries ($p=0.604$) as presented in **Table 2**.

DISCUSSION

Children undergoing cancer therapy commonly experience adverse oral effects related to both the cancer and its treatment, with oral mucositis and dental caries being the most frequently observed oral conditions.[29,30] The present study evaluated the impact of oral mucositis and dental caries on the oral health–related quality of life (OHRQoL) of children aged 8-12 years undergoing cancer therapy at Kenyatta National Hospital (KNH) in Kenya.

In the present study, Acute Lymphoblastic Leukaemia (ALL) was identified as the most common childhood cancer, and chemotherapy was the predominant treatment modality among participants. These findings align with global epidemiological patterns reported by Namayandeh et al. (2020), who demonstrated that leukaemia is the most prevalent malignancy among children aged 0-14

years worldwide.[31] Chemotherapy remains the cornerstone of treatment for paediatric ALL and is widely recognized as the standard of care in both high- and low-resource settings.[32,33] Given global epidemiological patterns of childhood cancers, understanding how cancer and cancer therapy affect children's daily lives becomes essential. While clinical examinations identify objective oral conditions, they may not fully capture the child's subjective experience of pain, discomfort, and social impact.

Accordingly, this study adopted a dual approach, combining clinical oral examinations with self-reported data from children aged 8-12 years using the Child Perceptions Questionnaire (CPQ_{8-10}), to provide both objective and subjective perspectives of oral health.[23,24] All children were able to complete the questionnaire independently and did not require assistance in interpreting the items, reinforcing their cognitive ability to provide reliable self-reports on their health.[21] This is particularly important because assessments of children's quality of life have traditionally relied on proxy reports from caregivers or clinicians, which often differ from the child's own perception. In some cases, parents tend to overestimate the impact of oral conditions on their child's quality of life, perceiving symptoms such as pain or aesthetic concerns as more distressing than the child reports.[34] Conversely, clinicians often underestimate the broader psychosocial effects of oral conditions, focusing primarily on clinical severity rather than functional or emotional burden. A systematic review of paediatric quality-of-life studies, reported that clinician-rated assessments correlated poorly with child self-reports, particularly for subjective outcomes such as pain, anxiety, and social discomfort.[35] However, experts report that children as young as six years can reliably express a range of emotions.[21] Consequently, their ability to articulate their own sense of well-being provides a valuable subjective insight into how oral health influences their everyday life.

In this study, participant-reported OHRQoL data provided valuable insight into how oral complications from cancer therapy affect children's well-being. Oral Mucositis was negatively correlated to OHRQoL ($p=0.004$), indicating that oral mucositis was associated with poorer quality of life. Children in the study experiencing oral mucositis had physical and emotional distress. These findings are similar to preceding studies, confirming that oral mucositis worsens quality of life in children with cancer through oral pain, difficulty in mastication and speech.[8,35,36] Additionally, in severe cases children have an increased risk of hospitalization, malnutrition and interruption of cancer therapy.[36] Importantly, children in the present study expressed a desire to

interact with their peers despite these painful oral effects, suggesting that peer engagement may serve as an important psychosocial coping mechanism during cancer treatment.

While oral mucositis had a clear and significant negative association with OHRQoL, the same pattern was not observed for dental caries in this study. Dental caries did not show a negative correlation with the OHRQoL among the study participants. When a child lives with a chronic and potentially painful condition, such as cancer, they may disregard dental pain since oral health is lower in the priority spectrum of other health conditions. Additionally, the study findings may have been influenced by participants' recall bias and the dynamic nature of dental caries, where pain may occur and later resolve if the tooth becomes necrotic. Therefore the episodic nature of dental caries pain, which can emerge and later subside when a tooth becomes necrotic or treated, may further obscure associations with OHRQoL.[37]

Medically compromised children with complex health conditions are at increased risk of poor oral health because their multiple medical needs often take precedence over routine oral health care.[38,39] Consistent with this, all children in the present study exhibited visible plaque accumulation and poor oral hygiene, highlighting how hospitalization and the prioritization of systemic treatment over oral care can exacerbate neglect of daily oral hygiene practices.

CONCLUSION

Incorporating oral health-related quality of life (OHRQoL) measures into childhood cancer care provides a holistic approach to evaluating patient well-being, emphasizing emotional, social, and functional dimensions alongside clinical outcomes. This approach adds an important dimension to assessing health status and monitoring treatment effects in paediatric oncology. The present study contributes foundational evidence for developing effective oral care protocols for children undergoing cancer therapy, particularly in LMICs. This study had some limitations. The use of $CPQ_{8–10}$ beyond its original validation range (to include 11-12-year-olds) is a limitation. A single instrument was used to avoid splitting a small sample across two tools ($CPQ_{8–10}$ and $CPQ_{11–14}$), which would have reduced statistical power and complicated analysis. The decision is partly supported by evidence of high convergence between CPQ versions across overlapping ages.[24] Second, the small sample size limits generalizability of the findings to broader paediatric oncology populations. Third, dental caries may have been underdiagnosed since radiographic assessment

was not performed, potentially missing non-cavitated or interproximal lesions. The findings in this study highlight the need for multidisciplinary cancer care that address both the physical and psychosocial aspects of oral complications related to cancer and its therapy, thereby enhancing treatment tolerance and overall quality of life. Integrating oral healthcare workers within the oncology care team is strongly recommended to improve early detection, prevention, and management of oral complications, ultimately enhancing the well-being of children with cancer.

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FIGURES

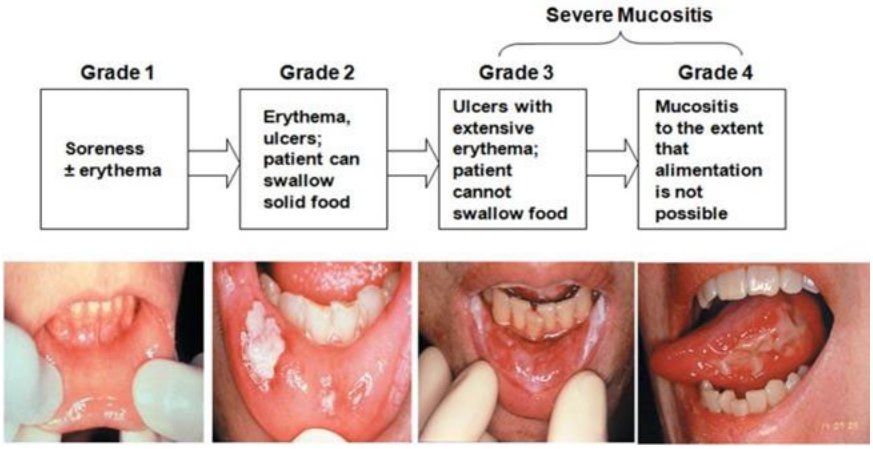

Figure 1. WHO Oral Toxicity Scale. Adapted from: World Health Organization

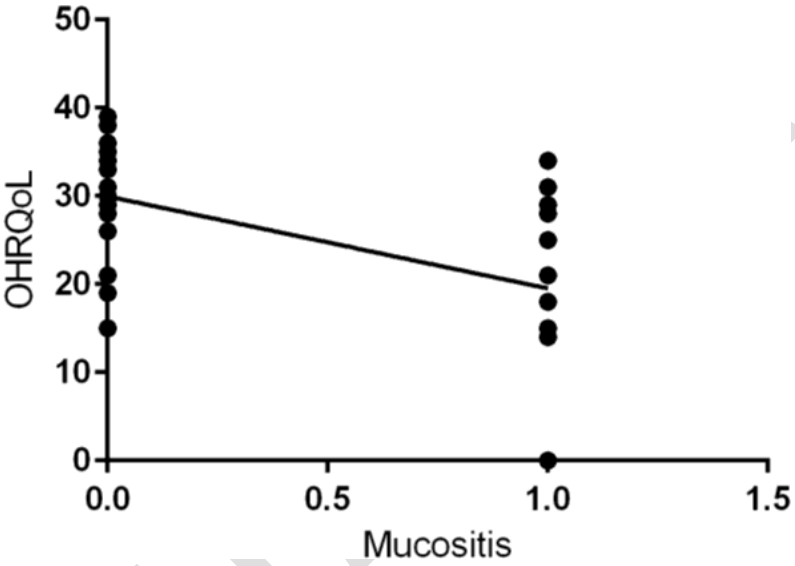

Figure 2. Linear Regression Model

TABLES

Table 1. Responses to quality of life domains related to oral health

	Category	n	%
Emotional well-being			
Upset due to mouth or teeth	Often	7	22.6
	Sometimes	8	25.9
	Never	16	51.6
Unhappy because of mouth or teeth	Often	9	29.1
	Sometimes	4	12.9
	Never	18	58.0
Functional limitation			
Difficulty chewing or biting food like meat	Often	11	35.5
	Sometimes	6	19.4
	Never	14	45.2
Needed more time to finish a meal than others	Often	7	22.6
	Sometimes	9	29.0
	Never	15	48.4
Oral symptoms			
Teeth or mouth pain	Often	10	32.3
	Sometimes	8	25.8
	Never	13	41.9
Food stuck on teeth	Often	6	19.4
	Sometimes	17	54.8
	Never	8	25.8
Social well-being			
Missed school due to teeth or mouth-related pain or appointments	Often	26	83.9
	Sometimes	0	0.0
	Never	5	16.1
Not talking to other children because of your mouth or teeth	Often	5	16.2
	Sometimes	4	12.9
	Never	22	71.0

Table 2. The relationship between dental caries and oral mucositis with OHRQoL

	Pearson's r (n=31)	p-value
Oral Mucositis	-0.498	**0.004***
Dental Caries	-0.097	0.604

* significant at 0.05