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Guideline

Clinical Guidelines for the Prevention and Management of Oral and Dental Complications in Pediatric Oncology Patients: A Narrative Review

Babak Abdolkarimi[1], Ali Amanati[2,3]*, Nahid Derikvand[4], Niki Panahi[5], Sepideh Mirzaei[5]

[1]Department of pediatric, Hakim children hospital, Tehran university of medical science, Tehran, Iran.
[2]Clinical Research Development Center, Amir Oncology Hospital, Shiraz University of Medical Sciences, Shiraz, Iran.
[3]Professor Alborzi Clinical Microbiology Research Center, Shiraz University of Medical Sciences, Shiraz, Iran.
[4]Department of Periodontics, Bo.c., Islamic Azad University, Borujerd, Iran.
[5]Azad Islamic university, science and research branch, Tehran, Iran.

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Abstract

Background: Oral complications are among the most frequent and debilitating adverse effects of cancer therapy in pediatric patients. Chemotherapy, radiotherapy, and hematopoietic stem cell transplantation can result in acute manifestations such as mucositis, infections, bleeding, and pain, as well as long-term sequelae including dental developmental abnormalities, craniofacial growth disturbances, and xerostomia. Comprehensive oral care is therefore a critical component of supportive oncology management.

Objectives: This narrative review aims to summarize current evidence regarding oral and dental care strategies for pediatric oncology patients, focusing on preventive assessment, hygiene maintenance, management of treatment-related complications, and long-term follow-up.

Methods: Relevant literature was reviewed to consolidate clinical recommendations and evidence-based strategies for oral care in children undergoing oncology treatment. The review highlights practical approaches for pre-treatment dental evaluation, in-treatment oral hygiene and infection control, and post-treatment follow-up, with integration of levels of evidence where available.

Results: Pre-treatment dental assessment and elimination of infectious foci significantly reduce oral and systemic complications. During active therapy, gentle oral hygiene practices, fluoride use, antiseptic rinses, and careful management of pain and infection are essential. Oral mucositis remains the most common dose-limiting complication, and preventive strategies such as cryotherapy, keratinocyte growth factors, and low-level laser therapy demonstrate strong supporting evidence. Post-treatment follow-up should include regular dental visits, ongoing preventive care, and monitoring for late sequelae such as dental developmental anomalies and xerostomia.

Conclusions: Structured oral care, encompassing pre-treatment assessment, active therapy management, and long-term follow-up, is essential to minimize morbidity and improve quality of life in pediatric oncology patients. Evidence-based interventions, particularly for mucositis prevention and caries management, provide a foundation for standardized clinical practice and highlight areas for future research.

Keywords:

Pediatric oncology
Oral care
Dental management
Mucositis
Chemotherapy
Radiotherapy
Supportive care

* Corresponding Author:
Ali Amanati
E-mail: Dr.amanati14@gmail.com

1. INTRODUCTION

Oral and dental health in children undergoing chemotherapy and radiotherapy is a critical component of their overall survival and well-being. Maintaining oral hygiene during cancer treatment significantly reduces the risk of oral diseases throughout the therapeutic period. The purpose of this systematic review is to develop a comprehensive dental guideline for managing oral health in immunosuppressed pediatric oncology patients.

The present clinical guideline is designed primarily for dental professionals who provide care to pediatric cancer patients receiving chemotherapy or radiotherapy. However, it is also beneficial for specialists in hematology and related medical fields. When confronted with cancer patients presenting with oral complications, clinicians can refer to these guidelines to effectively diagnose and manage the patient's condition.

Using this guideline familiarizes practitioners with the appropriate approach to assessing and treating oncology patients who experience oral and dental complications.

This review summarizes available guidelines and literature regarding oral health in pediatric oncology patients, including periodic dental examinations, home-based dental care, oral hygiene practices, preventive dentistry (diet counseling, fluoride therapy, fissure sealants), prevention of dental injuries, avoidance of deleterious oral habits, caries-risk assessment, and management of dental caries in children.

Optimal oral care in pediatric oncology requires a multidisciplinary approach involving oncologists, nurses, social workers, nutritionists, dentists, and other healthcare professionals to support the child before, during, and after treatment.

Children undergoing chemotherapy or radiotherapy are prone to numerous oral complications due to secondary immunodeficiency. These may include oral pain, mucosal edema, ulceration, bleeding, taste disturbances, secondary infections (e.g., candidiasis, herpes simplex virus), dental caries, salivary gland dysfunction (e.g., xerostomia), neurotoxicity, mucosal fibrosis, osteoradionecrosis, soft-tissue necrosis, temporomandibular dysfunction (such as trismus), craniofacial abnormalities, dental developmental disturbances, and graft-versus-host disease (GVHD)–associated oral lesions.

Therefore, all pediatric cancer patients should undergo thorough oral examinations at baseline and periodically throughout cancer treatment. Preventive dental interventions significantly reduce the risk of oral complications. Both the child and their parents must be educated about acute side effects, and all care should be individualized based on the patient's medical history, current treatment protocol, and immunologic status. Regular dental consultation is essential.

1.2. Purpose of the Guideline

The American Academy of Pediatric Dentistry (AAPD) emphasizes the crucial role of pediatric dentists in the care of children with cancer. Their expertise is essential in identifying, preventing, stabilizing, and managing oral and dental complications that may negatively affect the child's quality of life before, during, and after cancer therapy.

Dental interventions in oncology patients must be performed promptly and efficiently, taking into account the patient's medical status, treatment protocol, and current health condition.

Chemotherapy, radiotherapy, and hematopoietic cell transplantation (HCT) can cause both acute and long-term adverse effects on the oral cavity. Moreover, due to compromised immune function, oral infections or soft-tissue trauma can interfere with cancer treatment, increasing morbidity, mortality, and hospitalization costs.

For these reasons, it is essential that pediatric dentists are fully informed about the patient's medical background, cancer treatment plan, and current oral health status before initiating dental care.

2. Oral Care Guidelines for Pediatric Oncology Patients: A Literature-Based Review

2.1. Methods

This manuscript was developed as a narrative review and literature-based clinical guideline focusing on oral and dental care in pediatric oncology patients.

A comprehensive literature search was conducted in the following electronic databases: PubMed, Medline, Embase, Scopus, Web of Science, Cochrane Library, CINAHL, ProQuest, and Google Scholar, as well as regional databases including SID and MagIran.

Search terms included combinations of the following keywords:

pediatric cancer, pediatric oncology, chemotherapy, radiotherapy, hematopoietic stem cell transplantation, oral complications, mucositis, xerostomia, oral hygiene, pediatric dentistry, and dental care.

The search was limited to:

- Human studies
- English or Persian language
- Publications from the last 10 years

- Pediatric population (0–18 years)

Relevant international clinical guidelines (AAPD, MASCC/ISOO, Children's Oncology Group) were also reviewed.

Articles were selected based on relevance to clinical oral health management in children with cancer. When high-level evidence was unavailable, recommendations were formulated based on expert consensus and alignment with established international guidelines.

2.2. Recommendation:

2.2.1. Oral and Dental Care in Pediatric Oncology Patients

Oral health is an integral component of supportive care in pediatric oncology, as the oral cavity serves both as a potential source of systemic infection and a target organ for treatment-related toxicity. Antineoplastic therapies, including chemotherapy, radiotherapy, and hematopoietic stem cell transplantation, exert profound effects on oral tissues, predisposing children to acute complications such as mucositis, infection, bleeding, and pain, as well as long-term sequelae including dental developmental disturbances and craniofacial growth abnormalities. Consequently, structured oral and dental care before, during, and after cancer therapy is essential to reduce morbidity and improve quality of life in this vulnerable population.

2.2.2. Pre-treatment dental assessment

Evidence consistently supports the implementation of comprehensive dental evaluation prior to the initiation of oncology therapy to reduce oral infectious complications during treatment (Level of Evidence: A). This assessment should encompass a complete head and neck examination, evaluation of intraoral soft tissues, and detailed analysis of dental, periodontal, and oral hygiene status. Radiographic assessment is a critical adjunct to clinical examination, with panoramic radiography recommended for all pediatric oncology patients to evaluate dental development, periapical pathology, and jaw integrity (Level of Evidence: A). Additional periapical or bitewing radiographs may be obtained selectively based on clinical findings, such as suspected caries or odontogenic infection (Level of Evidence: B).

Elimination of existing and potential sources of oral infection before immunosuppressive therapy remains a cornerstone of preventive care. Emergency dental procedures should be completed whenever feasible prior to chemotherapy or radiotherapy (Level of Evidence: A). Teeth with pulpal involvement are generally recommended for extraction to prevent acute exacerbations during periods of neutropenia (Level of Evidence: A), whereas restorative treatment and removal of severely decayed primary teeth may be undertaken when time constraints and medical status permit (Level of Evidence: B). Orthodontic appliances and local irritants should be removed to reduce mucosal trauma and secondary infection risk (Level of Evidence: B). Preventive measures, particularly topical fluoride therapy, are strongly recommended to enhance enamel resistance and mitigate the increased risk of caries associated with hyposalivation and dietary changes during cancer therapy (Level of Evidence: A).

Hematologic parameters play a decisive role in determining the safety of dental interventions. Most consensus-based recommendations suggest postponing elective dental procedures until the absolute neutrophil count exceeds 1000/μL and platelet levels are above 75,000/μL (Level of Evidence: A). In patients with central venous catheters or significant neutropenia, antibiotic prophylaxis may be considered following interdisciplinary consultation (Level of Evidence: B). Additionally, a healing interval of approximately 10 days after oral surgery is advised prior to the initiation of intensive chemotherapy (Level of Evidence: B).

2.2.3. Oral care during active oncology treatment

During active cancer therapy, oral care strategies aim to minimize treatment-related complications, prevent opportunistic infections, and preserve the integrity of developing dentition (Level of Evidence: A). Maintenance of oral hygiene remains a fundamental component of supportive care. Gentle tooth brushing two to three times daily with a soft-bristled toothbrush and pediatric fluoride toothpaste is recommended, with modifications such as brush softening or the use of end-tufted or foam-tipped brushes in patients with mucosal sensitivity (Level of Evidence: A–B). When toothpaste is poorly tolerated, brushing with saline, sterile water, or sodium bicarbonate solutions may serve as acceptable alternatives (Level of Evidence: B).

Dental flossing may be continued in patients with intact oral mucosa; however, it should be discontinued in the presence of active mucositis to avoid tissue trauma and bleeding (Level of Evidence: A–B). Regular mouth rinsing with normal saline is widely recommended to maintain oral cleanliness and comfort (Level of Evidence: A). Sodium bicarbonate solutions may provide additional benefit in patients experiencing xerostomia (Level of Evidence: B). Chlorhexidine 0.12% remains one of the most commonly used agents for the management of gingivitis, oral ulcers,

and secondary infection, although its use should be discontinued if mucosal irritation or burning develops (Level of Evidence: A). Fluoride mouth rinses or gels are particularly important in children at high risk of caries or those receiving head and neck radiotherapy (Level of Evidence: A).

Pain and infection control are integral to oral management during oncology treatment. Paracetamol or metamizole are preferred analgesics, while non-steroidal anti-inflammatory drugs are generally avoided due to bleeding risk (Level of Evidence: A). Antibiotic therapy should be individualized based on renal function and coordinated closely with the oncology team (Level of Evidence: A). Importantly, oral pain in the absence of overt dental pathology may reflect chemotherapy-induced neurotoxicity, particularly in patients treated with vinca alkaloids, and should be interpreted cautiously.

2.2.4. Post-treatment oral care and long-term follow-up

Following completion of oncology therapy, continued oral care is essential to detect late complications and maintain long-term oral health. Ongoing use of soft-bristled toothbrushes, fluoride toothpaste, and daily flossing when tolerated is recommended (Level of Evidence: A–B). Fluoride mouth rinses or gels should be prescribed based on individual caries risk, particularly in patients with persistent xerostomia (Level of Evidence: A).

Regular dental follow-up, typically every four to six months, is strongly recommended to monitor dental development, caries progression, periodontal health, and late effects of cancer therapy (Level of Evidence: A). Patients with risk factors such as xerostomia, trismus, or a history of moderate to severe mucositis may require more frequent evaluations (Level of Evidence: B).

2.2.5. Oral mucositis

Oral mucositis remains one of the most prevalent and debilitating complications of pediatric oncology treatment and is a major dose-limiting factor in chemotherapy and radiotherapy. Preventive strategies supported by strong evidence include cryotherapy, keratinocyte growth factors, benzydamine hydrochloride mouthwash, and low-level laser therapy (Level of Evidence: A). Other interventions, such as sodium bicarbonate rinses and sucralfate suspension, may offer symptomatic relief, although the supporting evidence is moderate (Level of Evidence: B). Adjunctive therapies including aloe vera, honey, and glutamine have been explored, but current evidence remains limited and inconsistent (Level of Evidence: C).

Management of established mucositis should follow the World Health Organization's stepwise approach to pain control and incorporate supportive oral care, appropriate analgesia, and nutritional support when oral intake is compromised (Level of Evidence: A).

3. Dental Management Prior to Cancer Therapy: Evidence-Based Recommendations

3.1. Priority Determinants for Urgent Dental Intervention

Pulp involvement, active infection, and uncontrolled pain are primary indicators for urgent dental care. Immunocompromised patients are particularly vulnerable to sepsis and other life-threatening complications (Level of Evidence: 2a).

3.2. Root Canal Treatment (Permanent Teeth)

Endodontic treatment should ideally be completed at least one week prior to cancer therapy to allow tissue healing. When single-visit treatment is not feasible, prophylactic antibiotics may be administered, with definitive treatment delayed until hematologic parameters stabilize (Level of Evidence: 2b–5).

3.3. Teeth with Poor Prognosis and Surgical Extractions

Non-restorable or heavily compromised teeth should be extracted before therapy to prevent infection. Extractions should be performed carefully to avoid sharp bony edges (Level of Evidence: 2b–5).

3.4. Management of Infected Teeth

Antibiotic therapy should be guided by sensitivity testing whenever possible to control odontogenic infections (Level of Evidence: 2b). Hidden infections may be asymptomatic during immunosuppression; dental radiographs are recommended for detection (Level of Evidence: 4).

3.5. Patients Receiving Bisphosphonates

High-risk patients are susceptible to medication-related osteonecrosis of the jaw (MRONJ) and may require inpatient dental management (Level of Evidence: 2a).

3.6. Deciduous Teeth and Third Molars

- Natural exfoliation is preferred for primary teeth; extraction, if necessary, should be done 10–14 days before therapy (Level of Evidence: 5).
- Third molar management is controversial; extraction is advised only if infection risk is significant (Level of Evidence: 4).

3.7. Pulpotomy and Pulpectomy in Children

These procedures may manage pulp and periapical infections in healthy children, but during immunosuppression, timing relative to cancer therapy must be considered (Level of Evidence: 5).

3.8. At-Risk Teeth

Teeth with prior restorations, curved roots, damaged molars, periodontal pockets >5 mm, or active infection should ideally be extracted three weeks before therapy; if not feasible, a minimum of 4–7 days is recommended (Level of Evidence: 4).

3.9. Orthodontic Appliances and Damaged Teeth

Fixed appliances should be removed in patients with poor oral hygiene, and debridement of infected tissues should be performed as indicated (Level of Evidence: 5).

3.10. Fluoride Toothpaste Recommendations

- Children <3 years: rice-sized amount.
- Children ≥3 years: pea-sized amount. During mucositis, switch to neutral toothpaste if irritation occurs (Level of Evidence: 1b–5).

3.11. Surgical and Anesthesia Considerations

All dental surgeries should be performed in hospital settings under specialist supervision with hematology consultation. Deep injections carry a high bleeding risk and should be avoided; superficial anesthesia is generally safe. General anesthesia may be indicated for complex or pediatric cases (Level of Evidence: 5).

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Conflict of interest

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Ethical statement

This study is a narrative review and did not involve any intervention on human participants or animals; therefore, ethical approval was not required.

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