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REVIEW

Oral and Dental Management in Children With Congenital Neutropenia

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ABSTRACT

Individuals with neutropenia or defective neutrophil disorders exhibit significantly increased susceptibility to oral infections and dental complications compared to the general population. Despite the elevated risk profile associated with these conditions, comprehensive and standardized dental care guidelines for affected individuals remain limited. Optimal management requires a multidisciplinary approach that incorporates pre-procedural risk stratification, individualized treatment planning, and appropriate post-procedural care strategies. There is a pressing need for well-controlled clinical studies to evaluate the efficacy of prophylactic antibiotic regimens and granulocyte colony-stimulating factor in mitigating infection risks in this vulnerable population. However, the rarity and heterogeneity of neutrophil disorders pose substantial challenges to the development of evidence-based protocols. Risk assessment must be individualized, tailored to individual patient profiles, considering factors such as the degree of neutropenia, prior history of infections, and the nature of planned dental procedures. Here, we review and summarize guidelines for dental management in patients with congenital neutrophil disorders and propose the need for targeted, evidence-based clinical studies to ensure safe and effective care.

1 | Introduction

The immune system is broadly classified into two fundamental categories: the innate (nonspecific) immune system and the adaptive (specific) immune system. The innate immune system serves as the body's first line of defense, providing a rapid but nonspecific response to invading pathogens. This system includes physical barriers such as the skin and mucosal membranes, as well as immune cells such as phagocytes, namely, neutrophils and macrophages, that function by engulfing and neutralizing microbial invaders. The innate immune system also produces antimicrobial proteins, such as defensins, which contribute to the direct elimination of pathogens. Beyond its immediate defensive role, the innate immune system plays a crucial role in initiating and shaping the adaptive immune response. This is achieved through antigen presentation, the release of cytokines that activate adaptive immune cells, and the induction of inflammation. Inflammatory processes not only recruit additional immune cells to infection sites but also enhance antigen presentation and T-cell activation, thereby facilitating a robust and targeted adaptive immune response [1].

Neutrophils constitute approximately 50%–70% of circulating white blood cells (WBC) and represent the predominant granulocyte population. As rapid responders in the innate immune system, neutrophils provide essential protection against bacterial and fungal pathogens, typically mobilizing within minutes to hours of infection onset. Beyond microbial defense, they also contribute to tissue repair, angiogenesis, and wound healing, particularly at mucosal and cutaneous sites [1–3]. Neutrophil production occurs in the bone marrow, which serves as both the primary site of granulopoiesis and the major neutrophil reservoir [2]. Congenital defects in granulopoiesis, though rare, may manifest in infancy or early childhood, leading to chronic neutropenia due to impaired neutrophil development [4]. Neutropenia is classified by absolute neutrophil count (ANC): agranulocytosis (ANC <200/mm^3), severe neutropenia (ANC <500/mm^3), moderate neutropenia (ANC 500–1000/mm^3), and mild neutropenia (ANC 1000–1500/mm^3) [5]. This stratification correlates with infection risk and can guide clinical management; however, profound neutropenia may not always predispose to infection [6].

The oral cavity, which includes the tongue, gums, cheeks, palate, and teeth, contains a variety of microbes, mainly bacteria but also viruses and fungi. The microbiota differs depending on the region. Not surprisingly, then, it is a frequent site of infection and inflammation in individuals with either quantitative or qualitative neutrophil defects. Despite the clinical significance, there remains a paucity of evidence-based guidelines for the dental management of patients with congenital neutropenia.

2 | The Oral Cavity

Teeth are specialized anatomical structures critical for mechanical digestion. Each tooth comprises several layers: enamel, a highly mineralized outer surface; dentin, a softer, bone-like matrix beneath the enamel; and tooth pulp, a central chamber containing vascular, neural, and connective tissue components. The pulp extends into the root canal, which communicates with periodontal tissues via the apical foramen [7].

Cementum, a calcified layer covering the tooth root, functions in anchoring the tooth to the jawbone. This attachment is mediated by the periodontal ligament (PDL), a collagenous connective tissue that links the cementum to the alveolar bone, providing both structural support and limited mobility during mastication [8, 9] (Figure 1).

The periodontium comprises the supporting structures of the tooth and includes four principal components: the gingiva, PDL, cementum, and alveolar bone [10]. The gingiva is the soft tissue that overlies the alveolar bone and serves as a protective barrier against microbial invasion. Clinically healthy gingiva presents as pink in color and is subdivided into two regions: free gingiva, located above the alveolar crest, and the attached gingiva, which is bound to the underlying alveolar bone and cementum via dense collagen fibers (Figure 1B). The gingival sulcus is a shallow groove at the junction between the tooth surface and the gingival epithelium [8, 11]. The PDL is a specialized connective tissue composed primarily of fibroblasts, which synthesize collagen fibers that anchor the cementum to the alveolar bone. This structure provides mechanical stability and permits minor physiologic tooth mobility during mastication (Figure 1C). Cementum is a mineralized tissue covering the tooth root, facilitating attachment to the periodontal tissues. The alveolar bone supports the dentition and is covered by gingival tissue. It consists of several bone types. The outer and inner surfaces are composed of dense cortical plates, while the space between them contains cancellous bone, characterized by irregular sponge-like spaces. The tooth socket is lined by the lamina dura, a thin, compact bone structure to which the PDL fibers are inserted [12].

Gingivitis represents the initial inflammatory response of the gingival tissues to microbial plaque accumulation near the gingival sulcus. This condition typically manifests in later childhood and is often characterized by a T lymphocyte-dominant infiltrate. Most cases are mild, reversible, and transient; however, in the absence of intervention, gingivitis may progress to periodontitis, a chronic and irreversible inflammatory condition involving the entire periodontium, including the alveolar bone. The progression of periodontal disease occurs in distinct stages. In early lesions, vascular changes increase the volume of the gingival crevicular fluid, and neutrophils are recruited to the site. As inflammation advances, neutrophil-mediated degradation of collagen fibers facilitates the migration of additional immune cells, resulting in gingival erythema. In the later stages, B lymphocytes and other leukocytes infiltrate the tissue, leading to the formation of a pocket epithelial layer prone to bleeding upon probing. These pockets promote biofilm accumulation, creating a niche for pathogenic bacteria and increasing the risk of secondary infection (Figure 1A) [11, 12].

The teeth and periodontium are supported by a dedicated vascular and lymphatic network essential for nutrient delivery, waste product removal, and immune surveillance. The superior alveolar artery supplies the maxillary teeth and associated supporting tissues, while the inferior alveolar artery serves the mandibular teeth and periodontium. Additional vascularization is provided by branches of the facial and lingual arteries, which contribute to the perfusion of the gingiva and other oral structures [13]. Lymphatic drainage of the oral cavity is regionally organized. The submental and submandibular lymph nodes drain lymph from the mandibular teeth, lower lip, and floor of the mouth. The jugulodigastric lymph nodes drain the maxillary teeth, upper oral cavity, and tongue [14]. The deep cervical lymph nodes serve as a collection point for lymph from both upper and lower regions, including the cheeks, soft palate, and tonsillar area [15, 16].

The anatomical and physiological organization of the oral cavity is intricately designed to promote efficient digestion, protect against infections, and support oral and overall health. Any disruption to these processes can predispose to serious, potentially life-threatening infections, particularly in pathologic neutropenic patients.

3 | Non-Pathologic Forms of Neutropenia

Not all cases of neutropenia constitute a disease state. Benign ethnic neutropenia is commonly observed in individuals of African and Middle Eastern descent and is strongly associated with the absence of the Duffy antigen on erythrocytes. Affected individuals typically present with an ANC between 1000 and 1500/mm^3 but are not at increased risk for infection [17].

In pediatric populations, the most frequent cause of neutropenia is transient, viral-induced suppression in otherwise healthy children [18]. Many preschool-aged children exhibit chronic benign neutropenia, a condition of unclear etiology that may

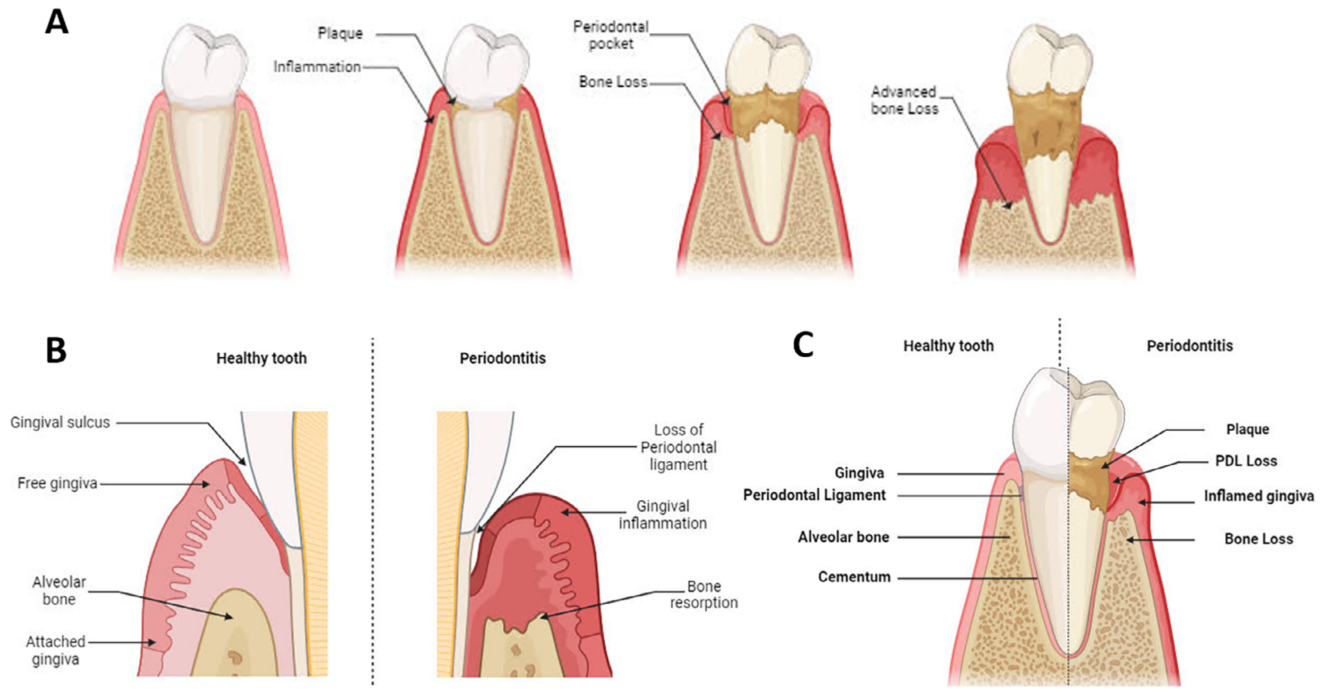

FIGURE 1 | Anatomy of the tooth and surrounding tissues. (A) The progression of periodontal disease. From left to right, a healthy tooth develops plaque and inflammation, which is followed by the formation of a periodontal pocket and early bone loss. In the advanced stage, the tooth experiences severe bone loss, potentially leading to tooth mobility and, if untreated, tooth loss. (B) Comparison of the attached and free gingiva: the left side shows normal gingiva, while the right side displays significant gingivitis and bone resorption. (C) On the left side, which shows normal tooth anatomy, in contrast to the right side, which shows loss of the periodontal ligament, bone resorption, gingivitis, and plaque. Created with https://BioRender.com.

overlap with autoimmune neutropenia associated with anti-neutrophil antibodies. This form typically presents as early as 6 months of age and may persist into early childhood [6]. It is often discovered incidentally through routine complete blood count (CBC) testing. Affected children are generally asymptomatic or may experience mild, self-limiting infections. Physical examination and growth parameters are usually normal. Neutropenia often resolves spontaneously, with neutrophil counts returning to normal by approximately 5 years of age. While treatment is rarely required, regular monitoring may be recommended to reassure caregivers and clinicians that the condition does not predispose them to severe or recurrent infections [19].

4 | Pathologic Forms of Neutropenia

Neutropenia can be broadly categorized as either congenital (primary) or acquired (secondary), acute or chronic, and pathogenic or non-pathogenic, based on the underlying etiology.

Congenital neutropenia denotes a group of rare genetic disorders characterized by persistently reduced neutrophil counts from birth. Common forms include severe congenital neutropenia, cyclic neutropenia, and Shwachman–Diamond syndrome. These disorders differ in genetic basis, clinical phenotype, neutrophil nadir levels, frequency and severity of bacterial infections, and associated risk of comorbidities, including hematologic malignancies. Management strategies vary accordingly and are individualized based on disease subtype, phenotype presentation, and clinical severity [20–22].

A special consideration, dyskeratosis congenita (DC) or short telomere disorder, is a rare genetic syndrome associated with bone marrow failure and increased susceptibility to malignancies. Clinically, DC is defined by a triad of abnormal skin pigmentation, dysplastic nails, and leukoplakia [23–25]. The underlying pathology involves mutations leading to telomerase deficiency, resulting in accelerated telomere shortening. Telomere attrition in DC contributes to oral and dental abnormalities, including increased prevalence of dental caries, periodontitis, root blunting, and enamel thinning. Additionally, patients frequently exhibit a reduced root-to-crown ratio due to abnormal oral tissue development and compromised enamel integrity. These structural and developmental defects contribute to heightened vulnerability to oral health and complications in this population [24]. In individuals with DC or Fanconi anemia, head and neck cancers may worsen oral infections during or after treatment [26–28].

Certain inborn errors of immunity (IEI) linked to neutropenia contribute to periodontal disease through non-infectious inflammatory mechanisms. IEIs comprise over 400 genetically distinct disorders caused by mutations affecting immune regulation and function. The International Union of Immunological Societies classifies these disorders into 10 principal categories, including congenital defects of phagocyte number or function, which involve reduced phagocyte counts or impaired phagocytic activity. Neutropenia is a prominent feature within this category. Mutations in genes such as *WAS*, *LAMTOR2*, *SMARCD2*, and *SBDS* exemplify these defects [29–31]. Functional impairment of phagocytes in affected individuals predisposes them to severe bacterial infections. Hence, numerous reports discuss the frequent findings of periodontal disease, oral ulcers (Figure 2), poor

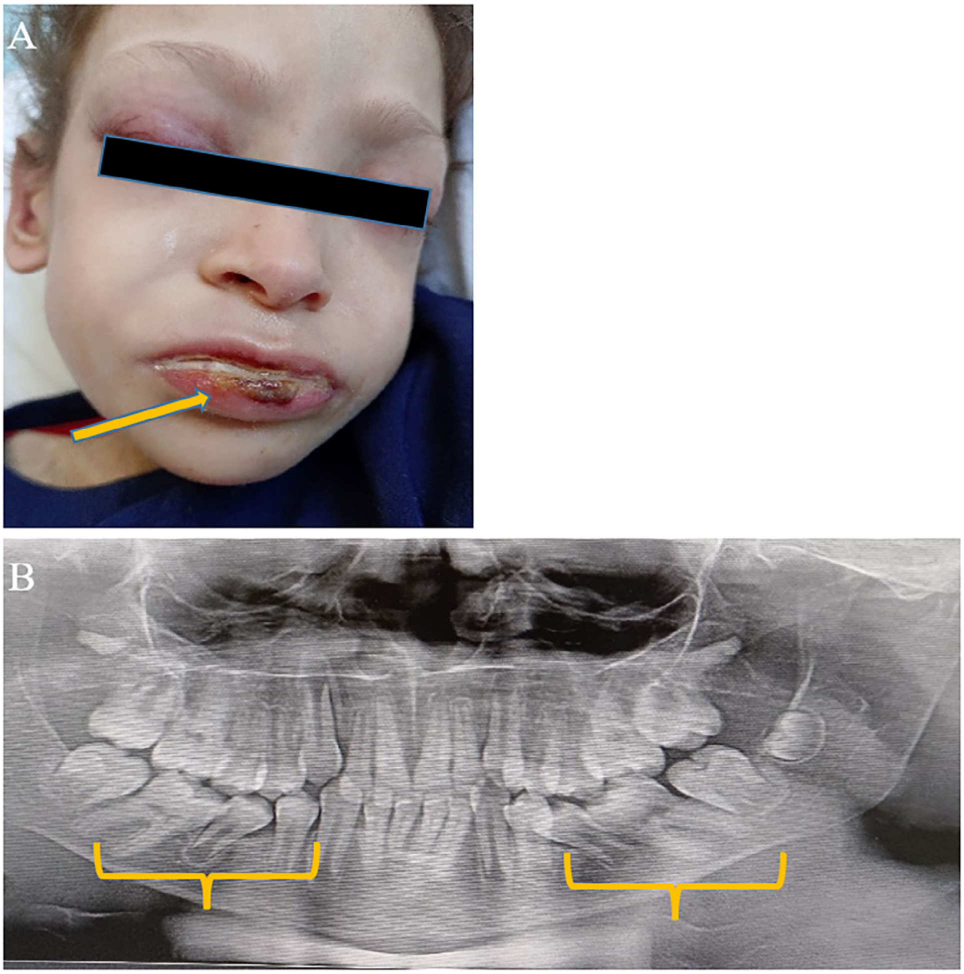

FIGURE 2 | Oral complications in a patient with congenital neutropenia. A 9-year-old male adopted child with congenital neutropenia due to an unidentified cause was first noted to have an ANC less than 500 at 1 year of age. Despite treatment with G-CSF, his granulocyte count has not increased. (A) Severe, chronic lip (arrow) and oral ulcers (unable to show) have impaired his ability to open his mouth for eating and drinking. (B) Panoramic dental x-ray. Dentition status: Presence of a complete permanent dentition, which appears premature for the patient's age. Caries risk assessment: No radiographic evidence of dental caries is present, likely attributed to the patient's history of PEG tube feeding, which reduces direct food contact with the oral cavity, thus minimizing caries risk. Occlusion analysis: Malocclusion is evident (indicated by braces), notably affecting the premolars. Contributing factors may include premature loss of primary molars and abnormal eruption patterns, potentially due to underlying systemic health conditions. Used with permission from the patient's legal guardian.

dentition, and dental caries in this patient population (Figure 1) [2, 32].

A normal ANC does not necessarily indicate adequate neutrophil function. While neutrophil quantity is often emphasized in infection diagnosis and management, certain rare neutrophil dysfunctions can result in severe, life-threatening infections despite normal neutrophil numbers. In these conditions, neutrophils lack the vital properties required for effective microbial defense. Patients with neutrophil functional defects frequently present with oral manifestations similar to those seen in neutropenia, including mucosal ulcers, gingivitis, and periodontitis. Disorders such as leukocyte adhesion deficiency type 1 (LAD-1), Chediak–Higashi syndrome (CHS), chronic granulomatous disease (CGD), and warts, hypogammaglobulinemia, infections, and myelokathexis syndrome (WHIM) illustrate the dissociation between neutrophil count and function [33, 34].

5 | Management Considerations for Patients With Neutropenia

For over four decades, congenital neutropenia and its correlation with bacterial infections posing life-threatening risks have been reported [35]. Despite extensive clinical experience, standardized consensus guidelines for prophylactic treatment in this patient population remain lacking [36]. Due to limited evidence, management typically occurs on a case-by-case basis, guided by input from primary care physicians, dentists, and other healthcare professionals [36]. With the increasing recognition of individuals presenting with congenital or acquired, transient or chronic neutropenia, critical questions have emerged regarding optimal dental care management. These include: Should all patients with congenital neutropenia receive prophylactic antibiotics prior to dental procedures?; When is granulocyte colony-stimulating factor (filgrastim) indicated?; Are additional preventive strategies effective in reducing infection risk? This review outlines current prevention and treatment strategies for neutropenic patients receiving dental care, beginning with identifying the key microbial threats they face.

6 | Oral Microbiota

The oral microbiota consists of a diverse community of microorganisms that inhabit the oral cavity. While generally considered normal, not all patients exhibit identical oral microbiota. Within the oral environment, bacteria vary in their distribution [37]. The composition of oral microbiota is influenced by systemic diseases, which can disrupt microbial homeostasis and promote an increase in cariogenic bacteria, such as *Streptococcus mutans* and various *Lactobacillus* species [37, 38].

The oral cavity hosts hundreds of bacterial species. Factors including neutropenia, gingival injury, and invasive dental procedures increase susceptibility to infections and may shift the microbiota toward pathogenic dominance [22, 32]. Patients with inherited neutropenia exhibit elevated risks for dental caries and infectious complications, particularly following invasive oral interventions [36]. Despite the recognized infection risk, randomized controlled trials assessing antimicrobial prophylaxis in this population are lacking. Consequently, decisions regarding antimicrobial therapy depend on multidisciplinary collaboration between dental and medical providers [36, 39].

7 | Dental Procedures and Infection Risk Stratification

The risk of bacterial infection associated with dental procedures can be stratified based on the type of intervention and surgical technique utilized [40]. This classification facilitates individualized risk assessment and enables healthcare providers to tailor procedural strategies accordingly.

Adherence to sterile technique is critical in minimizing the introduction of pathogens and preventing postoperative infectious complications. Procedures involving contaminated or infected sites carry a higher risk and may necessitate additional precautions, including the use of prophylactic antimicrobial agents and enhanced sterilization protocols. Risk-based customization of surgical and infection control measures enhances patient safety, optimizes procedural outcomes, and supports improved recovery trajectories [40, 41].

8 | Orthodontic Braces and Infection Risk in Neutropenic Patients

Orthodontic braces are effective for improving dental alignment, but are associated with an increased risk of oral complications, particularly in patients with neutropenia [42]. Brackets and wires can induce microtrauma to the gingiva, lips, and oral mucosa, leading to ulcerations and potential sites for microbial entry. These lesions, combined with challenges in maintaining adequate oral hygiene, increase the risk for bacterial and fungal infections. Additionally, broken or displaced wires can cause bleeding and further compromise mucosal integrity [43]. As an alternative, clear aligners may offer a more patient-friendly option. Aligners are removable, less abrasive to soft tissues, and typically easier to clean, reducing the likelihood of infection [44, 45]. Severely crowded teeth can make oral hygiene more difficult, in which case, orthodontic treatment with braces or clear aligners may be beneficial. However, it is important to note that once teeth are more closely aligned, whether from braces or aligners, food may become more easily trapped between them, potentially complicating oral hygiene efforts. Therefore, an individualized care plan is essential to determine the most appropriate approach for each patient, with the goal of optimizing both alignment and overall oral health.

9 | Preventive Dentistry in Patients With Neutropenia

Preventive dental care is a cornerstone in the management of patients with neutropenia. Early establishment of effective oral hygiene reduces the risk of oral and systemic complications. In otherwise healthy children, risk factors for dental caries include frequent consumption of sugar-containing snacks and beverages, inadequate fluoride exposure, low socioeconomic status, plaque accumulation, enamel defects, and lack of maintenance dental visits. Preventive oral health interventions start at a young age with supervised dental brushing, routine pediatric dental evaluations to provide education and address emerging issues [22, 39]. These efforts help minimize the need for invasive procedures later in life.

A pediatric dental risk assessment tool, which categorized patients into low-, moderate-, or high-risk groups, was developed. High-risk indicators include low caregiver health literacy, special healthcare needs, frequent sugar intake, enamel defects, multiple caries, and visible plaques. In contrast, protective factors include adequate fluoride use, daily brushing, and consistent dental care visits [46]. However, a tailored risk assessment tool for neutropenic patients has not yet been developed.

Standard practice emphasizes prevention and prompt management of dental diseases [32]. Neutropenic patients require a rigorous oral hygiene regimen, including twice-daily gentle brushing with a soft toothbrush and avoidance of aggressive flossing to minimize gingival trauma. The American Academy of Pediatric Dentistry recommends periodic dental evaluations every 6 months; however, high-risk patients may benefit from shorter intervals (i.e., every 3 months), based on clinical needs [39].

Fluoride use remains a key preventive strategy. Methods include professional topical applications, fluoridated drinking water, and fluoride-containing toothpaste. High-risk neutropenic patients may require professional fluoride treatments at shorter intervals [39]. These plaque control measures are essential for maintaining oral health and minimizing the risk of complications (Table 1) [47].

Antimicrobial mouthwashes are effective in reducing plaque accumulation and preventing oral infections by lowering bacterial load in the oral cavity. Over the years, various forms of

TABLE 1 | Measures of dental care in congenital neutropenic patients.

Measure	Description	Purpose	Frequency
Dental check-ups	Comprehensive evaluation	• Address dental problems early • Educate patients and families	Every 3 months[a]
Oral health care	Brushing, flossing, and using antimicrobial mouth rinses	• Prevent plaque accumulation • Lower the risk of oral infections	Daily routine
Cavity prevention	Evaluation of the gingiva and periodontium	• Detect gingival problems early • Prevent severe periodontal disease	Every 3 months[a]
Preventive treatments	Fluoride treatments and sealants	• Decrease the risk of cavities	Every 6–12 months
Plaque and tartar management	Professional dental cleaning and at-home care techniques	• Prevent plaque buildup • Decrease risk of gingivitis and periodontal disease	Every 3 months[a]
Infection prevention strategies	Guidelines to minimize the risk of infections, including antibiotics and sterile procedures	• To safeguard patients from infections during and following dental procedures	Based on individualized risk assessment
Patient and family education	Providing information to patients and caregivers	• Identify signs of infection • Manage oral health • Identify symptoms	Adherence to recommended practices
Treatment prophylaxis	Prophylactic antibiotics and/or G-CSF	• Reduce the risk of infection	Prior to certain dental procedures[b]
Multidisciplinary care	Collaboration with hematologists and other specialists	• Integrate dental care with overall health management	Depending on the patient's overall health and dental plan

[a]Some patients may require more frequent visits and earlier visits depending on the patient's condition and risk factors.
[b]Treatment will vary based on the individual's risk assessment.

antiseptic mouthwashes have been studied for their efficacy in promoting oral health. Agents such as povidone-iodine [22, 48], chlorhexidine [48, 49], hydrogen peroxide [46, 48], and triclosan [49, 50] have demonstrated significant antiseptic properties. Regular use of these rinses can prevent gingival inflammation, reduce biofilm formation, and support periodontal health. By limiting oral bacterial translocation into the bloodstream, antiseptic mouthwashes contribute to improved systemic health [49].

10 | Decision-Making in Antimicrobial Prophylaxis

Antimicrobial prophylaxis was introduced nearly 70 years ago [51] and is now reserved for patients at high risk of severe bacterial infections. However, widespread use has contributed to antibiotic resistance and other adverse effects [41]. Currently, for patients with congenital neutropenia, substantive clinical research regarding antimicrobial prophylaxis prior to dental procedures is lacking. Therefore, guidelines derived from substantial supporting evidence are currently lacking [38]. Existing antimicrobial prophylaxis recommendations center on individuals receiving immunosuppressive therapy, those with acquired immunodeficiency (e.g., HIV), or recipients of hematopoietic stem cell transplant, but not congenital neutropenias. Although extrapolating from these populations is suboptimal, limited published evidence necessitates this approach [32]. The American Academy of Pediatric Dentistry recommends comprehensive dental management before initiating immunosuppressive or head and neck radiation therapy, ideally while the patient is still immunocompetent. Ongoing monitoring and preventive care are advised throughout the course of treatment [52].

Antibiotic prophylaxis may be guided by recommendations from the American Heart Association and collaborating professional societies. For mildly neutropenic patients, a single oral dose of amoxicillin (50 mg/kg, 30–60 min before the procedure) is commonly used. For patients unable to take oral medications, ampicillin (50 mg/kg intramuscularly [IM] or intravenously [IV]) or ceftriaxone (50 mg/kg IM or IV) is a reasonable alternative; those allergic to the penicillins may receive clindamycin (20 mg/kg) or azithromycin (15 mg/kg). For moderate to severe neutropenia, dental treatment should follow only after multidisciplinary assessment of procedural risks and benefits [32].

Current best practices emphasize individualized prophylaxis that balances infection prevention with the need to minimize antibiotic resistance and related complications [41]. In congenital neutropenia, antibiotic selection should account for the underlying disorder, prior antibiotic exposure, microbial resistance patterns, procedure type, infection history, and neutropenia severity (Table 1) [22, 32, 46, 53].

11 | Clinical Considerations for G-CSF in Dental Procedures

Effective oral hygiene depends on regular dental visits and adherence to home care practices [22]. From a hematologic perspective, neutrophils play a central role in controlling dental infections, dental caries, gingivitis, and periodontitis [5, 20].

Certain forms of neutropenia increase susceptibility to infections, particularly during dental or oral procedures. Due to the genetic and phenotypic heterogeneity of congenital neutropenias, infection risk varies widely, complicating standardized antibiotic prophylaxis protocols. Clinical decisions must consider disease subtype, infection history, and current ANC [46].

Breakthrough dental infections may still occur, requiring antibiotics and/or G-CSF. Introduced in the 1980s [20], G-CSF promotes neutrophil maturation [54] and has significantly reduced infection-related morbidity and antibiotic duration by approximately 70%, despite known side effects [55]. While G-CSF can raise neutrophil counts [54, 55], it does not fully eliminate infection risk in severe neutropenia, and some patients exhibit limited or no response (Figure 2) [55].

Choosing to administer G-CSF for a dental procedure necessitates careful evaluation of the patients' specific variables, including their history of infections, presence of antibiotic-resistant bacterial strains, the type of dental procedure, and the severity of neutropenia. Therefore, to optimize patient care and reduce the risk of infection-related morbidity, close collaboration between dentists and hematologists is crucial (Table 1) [36, 39, 55].

12 | Discussion

Despite the growing understanding of the systemic implications of congenital neutropenia, there remains a significant gap in the literature regarding the management of oral and dental manifestations [56]. Children with congenital neutropenia lack a robust immune defense, placing them at increased risk of oral infections, dental caries, and associated systemic complications [38, 51]. The limited number of studies focusing on dental complications such as severe periodontal disease, early tooth loss, and recurrent oral infections in patients with congenital neutropenia poses a challenge for clinicians seeking evidence-based guidelines for dental management in this population. The oral cavity harbors a substantial microbial load, making dental health a vital component of overall management in this population. Patients with either quantitative or qualitative neutrophil disorders are especially vulnerable to persistent oral disease and recurrent infections compared to the general population [5]. To reduce morbidity, dental management must be preplanned with clear, ongoing communication among the multidisciplinary care team. Maintaining good oral hygiene and ensuring regular dental follow-up are essential for preventing complications and improving long-term outcomes [39]. Preventive strategies, including early referral to dental specialists, tailored oral education, and increased surveillance, play a central role in mitigating risk.

For now, the decision to administer antimicrobial prophylaxis or G-CSF prior to dental procedures should be made through a multidisciplinary consultation, involving the patient's primary care provider, hematologist, infectious disease specialist, pharmacist, and dentist [38]. This team-based approach allows for individualized care that accounts for procedural invasiveness, neutropenia severity, infection history, and antimicrobial resistance patterns. We highlight the importance of good oral hygiene as a preventive measure followed by medical management such as G-CSF and/or antibiotics in preventing infection in these high-risk patients [5]. We did not find strong evidence-based guidelines in administering G-CSF and antibiotic prophylaxis for this population.

Ultimately, dentists, hematologists, and other clinicians need to assess the overall risk by combining the degree of the procedure's invasiveness with the severity of the neutropenia, as well as any other data pertinent to the individual's case. Ensuring early referrals to dental specialists, tailored educational initiatives regarding oral care, and ongoing vigilance in monitoring dental health are vital components of an effective management strategy.

13 | Recommendations and Future Directions

Evidence-based guidelines for dental management of patients with congenital neutropenia remain limited. Clinical decisions are often guided by expert opinion or extrapolated from studies involving broader immunocompromised populations. This lack of robust data limited the depth and scope of the present manuscript, as the available literature is fragmented and primarily confined to isolated case reports or small case series.

Future studies should investigate the progression of oral disease in patients with congenital neutropenia, assess the effectiveness of preventive dental strategies, and define the optimal timing and indications for interventions such as prophylactic antibiotics and G-CSF. Importantly, these investigations should stratify patients by genetic subtype and clinical history to support more individualized care.

Developing evidence-based risk categories would enable personalized treatment plans and help avoid both overtreatment and undertreatment. Such trials would not only improve clinical outcomes but also reduce unnecessary antibiotic use, thereby helping to address the broader issue of antimicrobial resistance.

In summary, the current optimal dental care plan for individuals with congenital neutropenia requires a personalized, preventive, and multidisciplinary approach. Advancing this field depends on rigorous, collaborative research to establish evidence-based guidelines and improve both clinical outcomes and quality of life for this high-risk population.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data sharing is not applicable to this article as no new datasets were generated or analyzed during the current study.

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