



ORIGINAL RESEARCH

THE ROLE OF PROPHYLACTIC ANTIBIOTICS IN PEDIATRIC ORAL SURGERY: A SYSTEMATIC LITERATURE REVIEW

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ABSTRACT

The use of prophylactic antibiotics in pediatric oral surgery has been a subject of considerable debate within the medical community. This systematic literature review aims to evaluate the effectiveness, risks, and current recommendations associated with the use of prophylactic antibiotics in pediatric patients undergoing oral surgical procedures. A comprehensive search of relevant databases was conducted to identify studies assessing the outcomes of prophylactic antibiotic administration in pediatric oral surgery, including infection rates, complications, and overall surgical success. The findings suggest that while prophylactic antibiotics may reduce the risk of postoperative infections in certain high-risk pediatric populations, their routine use in all pediatric oral surgeries is not universally recommended. This review discusses factors influencing the decision to administer antibiotics, including the type of procedure, the patient's health status, and existing guidelines. The results highlight the importance of tailored antibiotic use to balance the benefits of infection prevention with the risks of antibiotic resistance and adverse effects. Further research is needed to establish definitive protocols that can guide clinical practice in pediatric oral surgery.

Keywords: Antibiotics, Infection, Pediatric, Prophylaxis, Surgery

INTRODUCTION

Pediatric oral surgery is a specialized field that involves the diagnosis and surgical management of various conditions affecting the teeth, jaws, and associated structures in children¹. Oral surgical

procedures in pediatric patients range from routine extractions of primary teeth to more complex interventions, such as the removal of impacted teeth or treatment of congenital or acquired abnormalities².

Given the delicate nature of pediatric patients' developing immune systems, preventing postoperative infections is a significant concern. This has led to the widespread use of prophylactic antibiotics in pediatric oral surgery, aimed at reducing the risk of infection and promoting faster healing³.

Prophylactic antibiotics are defined as antibiotics administered prior to a surgical procedure to prevent infections. The primary rationale for their use in oral surgery is to counteract the potential for bacterial contamination during surgical interventions, particularly in procedures where there is significant exposure of the mucosa or bone⁴. The need for prophylactic antibiotic therapy is particularly emphasized in patients with underlying medical conditions, such as those with compromised immune systems or those undergoing extensive surgeries. In these cases, the use of antibiotics is often considered a standard practice to avoid postoperative infections, which could lead to more severe complications⁵.

However, the routine use of prophylactic antibiotics in pediatric oral surgery is not without controversy. A growing body of evidence suggests that antibiotics may not always be necessary for every surgical procedure and that their indiscriminate use may contribute to the development of antibiotic resistance, a significant public health concern⁶. Antibiotic resistance occurs when bacteria evolve to resist the effects of drugs that once killed them, leading to infections that are more difficult to treat. Additionally, antibiotics can cause adverse side effects, such as gastrointestinal disturbances or allergic reactions, which may complicate the postoperative recovery process. Therefore, it is crucial to carefully evaluate the need for prophylactic antibiotics in each case⁷.

Current guidelines on the use of prophylactic antibiotics in pediatric oral surgery vary between different medical organizations. They are often based on expert consensus rather than high-quality randomized controlled trials. The American Academy of Pediatric Dentistry (AAPD) and the American Dental Association (ADA) have published guidelines outlining the conditions under which antibiotics should be used, with a primary focus on high-risk patients and specific surgical procedures. For example, children undergoing invasive procedures, such as the removal of impacted teeth, or those with certain medical conditions, such as heart disease or diabetes, may benefit from prophylactic antibiotics to reduce the risk of infection⁸.

Despite these recommendations, there is a lack of consensus on the broader application of prophylactic antibiotics in pediatric oral surgery. The current literature on this subject presents conflicting findings regarding the efficacy of antibiotics in preventing infection in routine pediatric oral surgeries⁹. Some

studies indicate that prophylactic antibiotics are beneficial in preventing postoperative infections. In contrast, others suggest that the incidence of infection is low enough in healthy children undergoing routine procedures that antibiotics may not be necessary. Moreover, the risk of antibiotic resistance associated with their overuse adds another layer of complexity to the decision-making process¹⁰.

This systematic literature review aims to critically examine the role of prophylactic antibiotics in pediatric oral surgery, assessing the effectiveness, risks, and current guidelines. By synthesizing evidence from various studies, this review seeks to provide insights into when and why antibiotics should be used in pediatric oral surgery, with a focus on optimizing patient care while minimizing potential harm.

METHODOLOGY

This systematic literature review aims to evaluate the role of prophylactic antibiotics in pediatric oral surgery by synthesizing findings from relevant studies. The methodology followed a structured approach, including clear inclusion and exclusion criteria, a comprehensive search strategy, data extraction, and quality assessment. Below is an outline of the methodology used to gather and analyze the data for this review.

Search Strategy:

A comprehensive search was conducted across multiple electronic databases, including PubMed, Google Scholar, Cochrane Library, and Scopus, to identify studies on the use of prophylactic antibiotics in pediatric oral surgery. The search terms included combinations of "prophylactic antibiotics," "pediatric oral surgery," "infection prevention," "postoperative infection," "children," and "oral surgery." The search was limited to articles published in English, and no date restrictions were applied to ensure a broad capture of relevant studies.

Inclusion Criteria:

Studies included in the review met the following criteria:

- **Population:** Pediatric patients (ages 0-18) undergoing oral surgical procedures.
- **Intervention:** Administration of prophylactic antibiotics prior to or during the oral surgery.
- **Outcome Measures:** Studies reporting postoperative infection rates, complications, or antibiotic-related adverse events.
- **Study Design:** Randomized controlled trials (RCTs), cohort studies, case-control studies, and systematic reviews were included.
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- **Language:** Articles written in English.

Exclusion Criteria:

Studies were excluded if:

- They involved adult patients or did not specify pediatric populations.
- They focused on dental procedures not involving surgery (e.g., routine cleanings or non-invasive procedures).
- They lacked sufficient data on infection outcomes or complications.
- They were not peer-reviewed or were unpublished conference abstracts.

Data Extraction:

For each study included in the review, the following data were extracted:

- **Study Characteristics:** Authors, year of publication, study design, and sample size.
- **Patient Characteristics:** Age range, medical history, and type of oral surgical procedure.
- **Intervention:** Type of prophylactic antibiotic administered, dosage, and timing of administration.
- **Outcomes:** Postoperative infection rates, complications, adverse effects, and the conclusions drawn by the study authors.

Quality Assessment:

Each study was assessed for methodological quality using appropriate criteria based on the study design:

- **Randomized Controlled Trials (RCTs)** were assessed using the Cochrane Risk of Bias Tool, evaluating factors such as randomization, blinding, and attrition bias.
- **Cohort and Case-Control Studies** were assessed using the Newcastle-Ottawa Scale, which evaluates selection bias, comparability, and outcome assessment.
- **Systematic Reviews** were assessed using the AMSTAR (A Measurement Tool to Assess Systematic Reviews) checklist, which evaluates the comprehensiveness and transparency of the review process.

Final Selection of Studies:

Six studies were ultimately selected for inclusion in this review based on the above criteria. These studies were chosen for their relevance to the topic, the quality of the methodology, and the comprehensiveness of the data they provided regarding the role of prophylactic antibiotics in pediatric oral surgery.

The Prisma Flowchart of the study is shown in Figure 1.

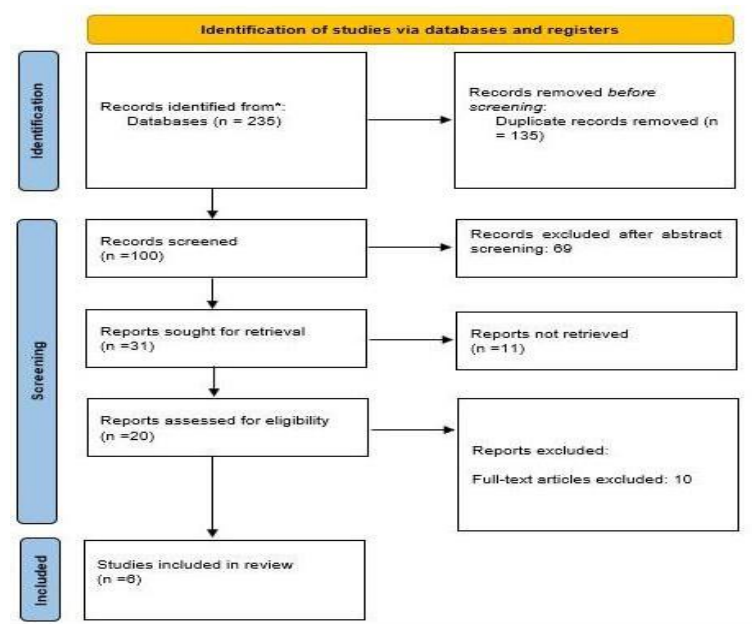


Figure 1. The Prisma Flowchart of the study

Review

The role of prophylactic antibiotics in pediatric oral surgery reveals an ongoing shift in clinical practice and research towards more conservative and evidence-based approaches. Traditionally, antibiotics have been widely used in dental and oral surgical procedures to prevent infection. Still, recent studies suggest that their routine use, particularly in pediatric patients, may not always be necessary. Research from various studies underscores the importance of individualized patient care, where antibiotics are prescribed based on specific risk factors, rather than as a standard practice⁸⁻¹².

Table 1. Literature Review of the study

Authors	Reference Number	Year	Journal Name	Findings
Rademacher, W. M. H., Walenkamp, G. H. I. M., Moojen, D. J. F., Hendriks, J. G. E., Goedendorp, T. A., & Rozema, F. R. (2017)	9	2017	Acta Orthopaedica	This systematic review emphasizes that antibiotic prophylaxis is not recommended for preventing periprosthetic joint infections prior to dental procedures. Updated guidelines from the Dutch Orthopaedic and Dental Societies recommend against routine use, instead advocating for reliance on other infection control measures.
Autore G, Bernardi L, Ghidini F, La Scola C, Berardi A, Biasucci G, Marchetti F, Pasini A, Capra ME, Castellini C, et al. (2023)	10	2023	Antibiotics	This guideline discusses the prevention of urinary tract infections in pediatric patients through the administration of antibiotics. The study emphasizes the importance of structured protocols and evidence-based recommendations for antibiotic prophylaxis, with a focus on reducing infection risk in children with urinary tract conditions.

<p>Cuevas-Gonzalez, María Verónica PhD, Cuevas-Gonzalez, Juan Carlos PhD, Espinosa-Cristóbal, León Francisco PhD, et al. (2023)</p>	<p>11</p>	<p>2023</p>	<p>Medicine</p>	<p>This study systematically reviews the use of antibiotics as prophylactic therapy in oral surgery, highlighting a lack of sufficient evidence for their routine use. The authors advocate for a more cautious approach, calling for updated strategies in clinical practice and suggesting alternative infection control methods in oral surgery.</p>
<p>Vidović Juras D, Škrinjar I, Križnik T, Andabak Rogulj A, Lončar Brzak B, Gabrić D, Granić M, Peroš K, Šutej I, Ivanišević A. (2024)</p>	<p>12</p>	<p>2024</p>	<p>Dentistry Journal</p>	<p>This article examines the diverse practices in dental antibiotic prophylaxis and emphasizes the importance of evidence-based recommendations for antibiotic use before dental procedures. The study evaluates different approaches in practice and stresses the need for further research to establish uniform protocols.</p>
<p>Esposito S, Sgarzani R, Bianchini S, Monaco S, Nicoletti L, Rigotti E, Di Pietro M, Opri R, Caminiti C, Ciccia M, et al. (2022)</p>	<p>13</p>	<p>2022</p>	<p>Antibiotics</p>	<p>This study uses the RAND/UCLA Appropriateness Method to assess the necessity of surgical antimicrobial prophylaxis for pediatric patients undergoing plastic surgery. It provides a consensus among experts, emphasizing the guidelines for when antibiotics should be administered to prevent infections during post-surgical recovery.</p>

<p>Cuevas-Gonzalez, María Verónica PhD, Cuevas-Gonzalez, Juan Carlos PhD, Espinosa-Cristóbal, León Francisco PhD, et al. (2023)</p>	<p>11</p>	<p>2023</p>	<p>Medicine</p>	<p>This study systematically reviews the use of antibiotics as prophylactic therapy in oral surgery, highlighting a lack of sufficient evidence for their routine use. The authors advocate for a more cautious approach, calling for updated strategies in clinical practice and suggesting alternative infection control methods in oral surgery.</p>
<p>Vidović Juras D, Škrinjar I, Križnik T, Andabak Rogulj A, Lončar Brzak B, Gabrić D, Granić M, Peroš K, Šutej I, Ivanišević A. (2024)</p>	<p>12</p>	<p>2024</p>	<p>Dentistry Journal</p>	<p>This article examines the diverse practices in dental antibiotic prophylaxis and emphasizes the importance of evidence-based recommendations for antibiotic use before dental procedures. The study evaluates different approaches in practice and stresses the need for further research to establish uniform protocols.</p>
<p>Esposito S, Sgarzani R, Bianchini S, Monaco S, Nicoletti L, Rigotti E, Di Pietro M, Opri R, Caminiti C, Ciccia M, et al. (2022)</p>	<p>13</p>	<p>2022</p>	<p>Antibiotics</p>	<p>This study uses the RAND/UCLA Appropriateness Method to assess the necessity of surgical antimicrobial prophylaxis for pediatric patients undergoing plastic surgery. It provides a consensus among experts, emphasizing the guidelines for when antibiotics should be administered to prevent infections during post-surgical recovery.</p>

Esposito S, Sgarzani R, Bianchini S, Monaco S, Nicoletti L, Rigotti E, Di Pietro M, Opri R, Caminiti C, Ciccia M, et al. (2022)	13	2022	Antibiotics	This study uses the RAND/UCLA Appropriateness Method to assess the necessity of surgical antimicrobial prophylaxis for pediatric patients undergoing plastic surgery. It provides a consensus among experts, emphasizing the guidelines for when antibiotics should be administered to prevent infections during post-surgical recovery.
Mooney, James F. et al. (2023)	14	2023	Journal of the Pediatric Orthopaedic Society of North America	This survey examines the common practices of post-surgical dental precautions and prophylaxis in pediatric patients undergoing oral surgery. It highlights a variety of practices within the pediatric orthopaedic community. It emphasizes the importance of proper dental care following surgery to prevent complications, with a special focus on the use of antibiotics.

Table 1 provides a summary of six studies related to antibiotic prophylaxis in pediatric oral surgery and infection prevention. It includes key details such as the authors, year of publication, journal name, and the central findings of each study. The studies, spanning from 2017 to 2024, emphasize the growing recognition that routine use of antibiotics for prophylaxis in pediatric oral surgery may not always be necessary, with several studies calling for more evidence-based approaches to antibiotic administration. Many studies emphasize the importance of updated guidelines and tailored clinical practices to ensure antibiotics are used appropriately, thereby reducing the risk of antibiotic resistance and improving patient outcomes. By highlighting the varying perspectives and recommendations, the table offers a comprehensive overview of current research on this critical aspect of pediatric surgical care. A key finding in the

literature is the lack of robust evidence supporting the routine use of antibiotics for prophylaxis in many pediatric oral surgeries. This has led to updated guidelines that recommend a more judicious approach, aimed at reducing the risk of antibiotic resistance and minimizing unnecessary interventions. Studies have highlighted that while antibiotics are essential in certain high-risk scenarios, such as for patients with compromised immune systems or those undergoing more complex surgeries, for many routine procedures, the risks associated with antibiotic use may outweigh the benefits¹¹⁻¹⁴.

Furthermore, the growing concern over antibiotic resistance in healthcare is influencing the way prophylactic antibiotics are prescribed, not just in pediatric oral surgery but across various medical and surgical disciplines. The call for updated clinical guidelines that prioritize the appropriate use of interventions based on a patient's health status, the

type of surgery, and evidence-based practices reflects a broader shift in medical research. As such, the role of prophylactic antibiotics is being reconsidered in light of new data, with an emphasis on patient safety, better infection control strategies, and more effective antibiotic stewardship. This evolving perspective is shaping the future of pediatric oral surgery, moving away from routine antibiotic use and towards more targeted, evidence-driven approaches.

Taken together, these studies underline the importance of individualized care in pediatric oral surgery. Prophylactic antibiotics appear to be beneficial in high-risk groups, such as those with underlying medical conditions or undergoing complex surgeries. However, for routine procedures in healthy children, the evidence supporting their widespread use is weak, and the risks of antibiotic resistance and side effects must be carefully considered. More research is needed to develop comprehensive guidelines that strike a balance between the need for infection prevention and the potential harms of overuse.

DISCUSSION

The use of prophylactic antibiotics in pediatric oral surgery is a longstanding practice, aimed primarily at preventing postoperative infections. In pediatric patients, the decision to use antibiotics prior to oral surgical procedures, such as tooth extractions, maxillofacial surgeries, and other invasive treatments, remains a topic of ongoing research and debate^{4,5}. While antibiotics have undoubtedly proven effective in reducing infection rates in certain high-risk populations, the growing concern over antibiotic resistance and adverse side effects has spurred calls for more cautious and evidence-based approaches⁶. Historically, prophylactic antibiotics have been administered routinely to all pediatric patients undergoing oral surgery. This was done with the assumption that it would reduce the risk of postoperative infections, which could lead to complications like delayed healing, prolonged recovery times, or even systemic infections. However, as the understanding of infection control and antibiotic resistance has evolved, so too has the approach to prophylaxis. Today, the use of prophylactic antibiotics in pediatric oral surgery is increasingly being scrutinized, with calls for more selective use based on individual patient characteristics and the nature of the surgery^{7,8}.

One of the primary considerations in determining the necessity of prophylactic antibiotics is the patient's risk profile. Children with pre-existing medical conditions, such as congenital heart defects, diabetes, or compromised immune systems, are more susceptible to postoperative infections and may

benefit from antibiotic prophylaxis.

The American Heart Association, for example, has guidelines recommending prophylactic antibiotics for children with specific cardiovascular conditions undergoing dental procedures. In these cases, the use of antibiotics is viewed as a preventive measure against more severe infections, such as infective endocarditis, which could have serious consequences⁵⁻⁷.

However, for healthy children undergoing routine oral surgeries—such as simple tooth extractions or minor soft tissue procedures—the benefits of prophylactic antibiotics are less clear. Studies have shown that the risk of infection following these procedures is relatively low, even in the absence of antibiotics. In fact, the overuse of antibiotics in these situations may expose children to unnecessary risks, including allergic reactions, gastrointestinal disturbances, and the development of antibiotic resistance. Antibiotic resistance is a growing concern in public health, as the misuse and overuse of antibiotics contribute to the emergence of drug-resistant bacteria, making infections more difficult to treat in the future⁴.

The evolving understanding of infection prevention and control also complicates the debate over the routine use of prophylactic antibiotics. Advances in surgical techniques, improved hygiene practices, and better postoperative care have all contributed to a decline in infection rates in pediatric oral surgeries. Furthermore, a more targeted approach, where antibiotics are prescribed only for high-risk patients or complex procedures, may be just as effective without the need for routine administration in every case. The evolving guidelines and expert opinions on the use of prophylactic antibiotics highlight the need for a more individualized approach to pediatric oral surgery. It is increasingly recognized that a "one-size-fits-all" approach may not be appropriate, and the decision to administer prophylactic antibiotics should be based on the patient's health status, the complexity of the procedure, and the presence of any risk factors that might predispose the child to infection.

CONCLUSION

In conclusion, while prophylactic antibiotics continue to play an important role in preventing infections in certain pediatric oral surgical procedures, their routine use in all cases is no longer considered standard practice. The trend in recent years has been toward a more selective, evidence-based approach, ensuring that antibiotics are used judiciously to maximize their benefits while minimizing potential harms. Further research is needed to develop clear and comprehensive guidelines for administering prophylactic antibiotics in pediatric oral surgery, taking into account both the risk of infection and the potential risks associated with

antibiotic use. This will help ensure that children receive the best care possible while preserving the effectiveness of antibiotics for future generations.

DECLARATIONS

No funding was received from any financially supporting body, and there was no associated grant number. No funder was involved in manuscript writing, editing approval, or decision to publish.

Consent for publication

Informed consent was obtained from every participant for documentation and examination.

Competing interests

The authors declare no competing interests.

Ethical approval

Ethical approval was granted by the Institutional Human Ethical Committee

Informed patient consent

All patients' clinical records were obtained with informed consent.

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