



ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2023; 9(3): 80-83
© 2023 IJADS
www.oraljournal.com
Received: 10-05-2023
Accepted: 13-06-2023

Gabriela García Alvarez
Master of Sciences Student,
Universidad Autonoma De Nuevo
Leon, Facultad de Odontología,
Monterrey, Nuevo Leon, CP 64460,
Mexico

Laura Elena Villarreal García
Professor, Universidad Autonoma De
Nuevo Leon, Facultad De
Odontología, Monterrey, Nuevo Leon,
64460 ZIP, Mexico

Sonia Martha Lopez Villarreal
Professor, Universidad Autonoma De
Nuevo Leon, Facultad De
Odontología, Monterrey, Nuevo Leon,
64460 ZIP, Mexico

Osvelia Esmeralda Rodriguez Luis
Professor, Universidad Autonoma De
Nuevo Leon, Facultad De
Odontología, Monterrey, Nuevo Leon,
64460 ZIP, Mexico

Juan Carlos Medrano Rodriguez
Professor, Universidad Autónoma de
Zacatecas, Ciencias De la Salud,
Unidad Académica De Medicina
Humana, Zacatecas, Zacatecas

Nubia Maricela Chavez Lamas
Professor, Universidad Autónoma de
Zacatecas, Ciencias De la Salud,
Unidad Académica De Odontología y
Ciencias de la Salud, Zacatecas,
Zacatecas

Ana Karen Gonzalez Alvarez
Professor, Universidad Autónoma De
Zacatecas, Ciencias De la Salud,
Unidad Académica de Odontología y
Ciencias de la Salud, Zacatecas,
Zacatecas

Juan Manuel Solis Soto
Professor, Universidad Autonoma De
Nuevo Leon, Facultad De
Odontología, Monterrey, Nuevo Leon,
64460 ZIP, Mexico

Corresponding Author:
Gabriela García Alvarez
Master of Sciences Student,
Universidad Autonoma De Nuevo
Leon, Facultad de Odontología,
Monterrey, Nuevo Leon, CP 64460,
Mexico

Antibiotic therapy in pediatric dentistry

Gabriela García Alvarez, Laura Elena Villarreal Garcia, Sonia Martha Lopez Villarreal, Osvelia Esmeralda Rodriguez Luis, Juan Carlos Medrano Rodriguez, Nubia Maricela Chavez Lamas, Ana Karen Gonzalez Alvarez and Juan Manuel Solis Soto

DOI: <https://doi.org/10.22271/oral.2023.v9.i3b.1787>

Abstract

Introduction: Antibiotics in pediatric dentistry are drugs used to prevent and treat bacterial infections in children.

Objective: To analyze the most recent literature on the use of antibiotic therapy in pediatric dentistry, its use in dental infections, dental traumatology, and facial cellulitis and as antibiotic prophylaxis.

Methodology: Articles on the use of antibiotic therapy in pediatric dentistry were analyzed in the databases PubMed, Scopus and Google Scholar with emphasis on the last 5 years. The keywords used were: "antibiotics", "dental infection", "dental traumatology", "facial cellulitis", and "antibiotic prophylaxis".

Results: The use of antibiotics in dental infections is only indicated when there are systemic signs of infection, in dental traumatology they are only recommended in cases of avulsion of permanent teeth and in lesions that may have been contaminated, they are also recommended in cases of facial cellulitis and as antibiotic prophylaxis in immunosuppressed patients or those with systemic diseases.

Conclusion: Nowadays the use of antibiotics in pediatric patients is very controversial, this is due to their inadequate use and the increase in bacterial resistance in recent years, for this reason, it is important that the pediatric dentist has knowledge of their adequate use in order to carry out correct prescription and administration and thus minimize bacterial resistance.

Keywords: Antibiotics, dental infection, dental traumatology, facial cellulitis, antibiotic prophylaxis.

1. Introduction

The overuse of antibiotics and the emergence of antibiotic-resistant bacterial strains is a worldwide concern [1-3].

It has been shown that 80% of all antibiotic prescriptions that are used before outpatient procedures are unnecessary, as risk factors were not present and lead to antibiotic overuse [3, 4].

Due to the overuse of antibiotics, the degree of antibiotic resistance is so great that some bacterial species are resistant to the full range of currently available antibiotics [5, 6].

Other complications associated with inappropriate antibiotic prescribing in the pediatric population are: the risk of developing diabetes in children, due to sugary medications, and the risk of developing allergy and/or asthma in children treated with antibiotics [7].

It is also believed that early antibiotic exposure modifies the gut microbiota, with subsequent long-term adverse effects such as obesity, infections with *Candida* species and photosensitivity [8].

It has also been found that amoxicillin exposure during early childhood may be associated with enamel development defects in both permanent first molars and upper central incisors [9-11].

The number of patients with antimicrobial resistance is increasing every day worldwide and this is due to the inadequate use of antibiotics in medical practice and their excessive use. For this reason, the aim of this study is to analyze the most recent literature on the use of antibiotic therapy in pediatric dentistry, its use in dental infections, dental traumatology, and facial cellulitis and in immunosuppressed patients or those with systemic diseases.

2. Materials and Methods

Articles on the subject published through the PubMed, SCOPUS and Google Scholar databases were analyzed, with emphasis on the last 5 years. The quality of the articles was evaluated using guidelines, i.e., identification, review, choice and inclusion. The quality of the reviews was assessed using the measurement tool for evaluating systematic reviews. The search was performed using Boolean logical operators and, or and not with the keywords: “Antibiotics”, “dental infection”, “dental traumatology”, “facial cellulitis”, and “Antibiotic prophylaxis”. The keywords were used individually, as well as each of them related to each other.

3. Results and Discussion

3.1 Dental infections

Current clinical guidelines and recent articles on antibiotic prescribing indicate that antibiotics should be prescribed only when needed for a bacterial infection and as an adjunct, not as an alternative to other interventions implemented to control the source of infection (e.g., pulp therapy, extraction, scaling and root planning) [1, 2, 12].

Bacteria can gain access to pulp tissue through caries, exposed pulp or dentinal tubules, cracks in the dentin, and defective restorations, so if a child presents with acute symptoms of pulpitis, treatment (i.e., pulpotomy, pulpectomy, or extraction, without the need for antibiotics, since in these cases, the lack of blood circulation in the root canal prevents antibiotics from reaching the area, i.e., they are ineffective in eliminating the microorganisms, so antibiotic therapy is neither indicated nor effective [13, 14]. In case of discrete and localized swelling, drainage alone is considered sufficient without the need for additional medication, it should be taken into account that the patient has no systemic signs of an infection, i.e., no fever, no facial swelling [3].

Evidence has shown that antibiotics have no effect on pain associated with dentoalveolar infection, for which analgesics/anti-inflammatory drugs are indicated and not antibiotics [4]. For edema and tenderness/heat, anti-inflammatory medications are prescribed and in cases of the presence of purulence, this should be resolved by pus drainage/debridement, however, if a patient presents with acute odontogenic abscess with diffuse swelling that is associated with pyrexia in the last 24 hours, this indicates that there is a systemic response to the infection; therefore, in these cases, antibiotics should be prescribed [1, 3, 8, 15].

In the results of recent literature it has been found that in pediatric patients with dental infection, the prescription of antibiotics is indicated in cases that present systemic signs of infection, however, if there are no systemic signs of infection antibiotics should not be indicated, since when the indicated dental treatment is performed, the infection will disappear.

3.2 Dental Trauma

When dental trauma occurs, factors related to host risk, such as age, systemic disease, comorbidities, malnutrition, and type of wound (e.g., laceration, puncture) are of great importance, as these should be evaluated to determine the risk of infection and subsequent need for antibiotics [1, 8].

Speaking about facial lacerations and puncture wounds after trauma, these may require topical antibiotic agents, in case of gingival and vestibular injuries of the teeth 0.12% chlorhexidine is prescribed for 4-5 days [16, 17]. It is recommended in children ≥ 8 years and adults to perform rinses with 15 millilitres of chlorhexidine 2 times a day, once after breakfast and once before bedtime for 30 seconds and

then expectorate [18, 19].

As for intraoral puncture wounds and lacerations that appear to have been contaminated by extrinsic bacteria, debris (e.g., dirt, soil, gravel), foreign bodies, open fractures and joint injuries, these tend to have a higher risk of infection, so they should be managed with systemic antibiotics [1] in addition, it is important to inquire in the clinical history about tetanus vaccination status, as this is a factor to consider when prescribing antibiotics [8].

As for the medication, it should be administered as soon as possible to obtain the best result [20].

In recent literature systemic antibiotics are recommended as adjuvant treatment for avulsed permanent incisors with an open or closed apex, on the other hand, in the case of luxation lesions in the primary dentition, antibiotics are not indicated, because there is limited evidence for their use, and there is no evidence that antibiotics improve the outcome of teeth with root fracture [16, 20, 21].

As for medication, as has been studied for many years, amoxicillin or penicillin is the drug of choice in dentistry because of its efficacy against oral flora and low incidence of adverse effects [20].

In the guidelines recently published by the American Academy of Pediatric Dentistry, they recommend tetracycline (doxycycline twice daily for 7 days) as an alternative to penicillin, because it exhibits antimicrobial, anti-inflammatory and antiresorptive properties, which makes its use appropriate for dental trauma, however, the age of the child should be taken into account in the systemic use of tetracycline due to the risk of discoloration in the developing permanent dentition, for which penicillin V or amoxicillin can be administered as an alternative in patients under 12 years of age [21].

Current recommendations on the prescription of antibiotics in dental trauma are based on factors related to the risk of the host, such as age, and the presence of a systemic disease, among other factors. Among the indications for use are in cases of patients with intraoral puncture wounds and lacerations that may have been contaminated, and in cases of dental avulsion of permanent teeth, on the other hand, its use is not indicated in cases of luxation injuries in primary dentition.

3.3 Facial cellulitis

Facial cellulitis of odontogenic origin (FCOO) refers to acute inflammation and infection of the subcutaneous tissue arising from an infected tooth and is of polymicrobial aetiology, characterized by highly virulent etiologic bacteria [22]. OCOF in children usually requires hospital admission for management, due to the potential for life-threatening complications, so providing definitive treatment for the dental source of infection is critical to reduce the length of hospital stay and resolve the infection, therefore, the use of antibiotic therapy should not be the mainstay of treatment, if not dental treatment [23-25]. For odontogenic infections with non-localized and progressive swelling and with manifestations of systemic involvement and septicemia are present such as fever, general malaise, asymmetry, facial swelling, lymphadenopathy, trismus, tachycardia, dysphagia, airway compromise, respiratory distress, emergency treatment and surgical intervention should be immediate, where medical treatment with intravenous antibiotic therapy contribute to faster healing, as for antibiotic therapy, it is recommended to administer broad-spectrum antibiotics, for which penicillin derivatives remain the empirical choice for odontogenic

infections, however, additional adjuvant antimicrobial therapy, such as metronidazole, may be considered for the involvement of anaerobic bacteria [11, 6, 26, 27]. Amoxicillin has been found in the literature to be the most commonly recommended antibiotic for short durations of 3 to 5 days in the presence of absorption in the presence of food in the stomach and better compliance of pediatric patients [6]. As for alternative antibiotics in penicillin-sensitive patients are metronidazole or azithromycin, which are administered for 3 days [1, 28].

At the hospital level, amoxicillin with clavulanic acid or intravenous clindamycin is frequently used [23, 25].

Recently published guidelines and articles on antibiotic therapy recommend the use of systemic antibiotics in cases of facial cellulitis of odontogenic origin. They also indicate that in cases in which the patient presents manifestations of systemic involvement, the patient should be referred to the hospital for intravenous antibiotic treatment, taking into account that definitive treatment for the dental source of infection should be provided as soon as possible since it is essential to reduce the length of hospital stay and resolve the infection.

3.4 Antibiotic prophylaxis

Prophylactic antibiotics are recommended when patients at high risk for adverse outcomes from bacteremia and infection undergo invasive oral/dental procedures [29, 19]. This is because of a person's ability to fight a simple infection, thus, the rationale for antibiotic prophylaxis is to reduce or eliminate transient bacteremia caused by invasive dental procedures [30, 31].

The American Academy of Pediatric Dentistry recommends antibiotic prophylaxis in all dental procedures involving manipulation of gingival tissue, the periapical region of teeth, or perforation of the oral mucosa [29], in patients with systemic conditions such as rheumatic heart disease, endocarditis, heart/orthopedic prostheses, or in patients with any type of immunocompromise: AIDS, cancer, autoimmune diseases, corticosteroid therapy, as well as in patients with immunocompromised diseases such as cyclic neutropenia, pancytopenia, uncontrolled diabetes, to name a few common ones, as well as, after solid organ transplantation/grafting (cardiac/renal/bone marrow/liver/bone) [8], however, antibiotic prophylaxis is not recommended for anesthetic injections through non-infected tissue, taking dental radiographs, placement of orthodontic appliances or removable prostheses, adjustment of orthodontic appliances, placement of orthodontic brackets, loosening of primary teeth, and bleeding from trauma to the lips or oral mucosa [29].

The decision to use antibiotic prophylaxis should be made on an individual basis, and it is appropriate to discuss the risk and susceptibility to bacteremia-induced infections in the child [32].

The antibiotic of choice is amoxicillin at a dose of 50 mg/kg (maximum 2g) 30-60 minutes before the dental procedure [29, 33].

The American Heart Association no longer recommends clindamycin for prophylaxis of infective endocarditis due to severe and frequent reactions, therefore, doxycycline is recommended as an alternative for patients who are allergic to penicillin, cephalosporin and macrolide, and the indicated dose is in children < 45 kg, 2.2 mg/kg and in children > 45 kg, 100 mg, however, it is known that the use of tetracyclines in children under 8 years of age can cause discolouration in the developing permanent dentition, due to the risk of

discolouration, for such reason, a study was recently conducted on the use of tetracyclines. In this study they found that short-term use (less than 21 days) of doxycycline has not been associated with tooth discolouration in children under eight years of age; however, more specialized future studies are expected for its indication in pediatric patients [33, 34]. For penicillin-allergic patients, azithromycin has been found to be one of the safest antibiotics, but there are risks of cardiac complications, including cardiotoxicity, so care should be taken in which patients to indicate; the recommended dose is 15 mg/kg orally [29, 35]. As for patients allergic to penicillin or ampicillin and who are unable to take oral medication, Cefazolin or ceftriaxone 50 mg/kg Intramuscular or intravenous is recommended [29].

Nowadays, the use of prophylactic antibiotics in patients with systemic conditions is very controversial, so the decision to use them should be made individually in each patient. Current guidelines recommend antibiotic prophylaxis in the therapeutic approach involving manipulation of gingival tissue or perforation of the oral mucosa, on the contrary, its use is not recommended in anaesthetic injections through non-infected tissue, taking dental radiographs, placement and adjustment of orthodontic appliances, detachment of primary teeth and bleeding from trauma to the lips or oral mucosa.

4. Conclusions

The inadequate use of antibiotic therapy and the increase in bacterial resistance in pediatric patients has increased in recent years, so it is important for pediatric dentists to be aware of its adequate use. Among the indications in the recent literature, it has been found that the use of antibiotics in dental infections is only indicated when systemic signs of infection are present, in dental traumatology it is only recommended in cases of avulsion of permanent teeth and in lesions that may have been contaminated, they are also recommended in cases of facial cellulitis and as antibiotic prophylaxis in immunosuppressed patients or those with systemic diseases.

5. References

1. American Academy of Pediatric Dentistry. Use of antibiotic therapy for pediatric dental patients. The Reference Manual of Pediatric Dentistry. Chicago, ILL.: Pediatric Dent; c2022. p. 495-9.
2. Ahsan S, Hydrie MZI, Hyder Naqvi SMZ, Shaikh MA, Shah MZ, Jafry SIA. Antibiotic prescription patterns for treating dental infections in children among general and pediatric dentists in teaching institutions of Karachi, Pakistan. *PLoS One*. 2020;15(7):e0235671.
3. Segura-Egea JJ, Gould K, Şen BH. Antibiotics in Endodontics: A review. *Int. Endod J*. 2017;50(12):1169-1184.
4. Aidasani B, Solankis M, Khetarpal S, Ravi Pratap S. Antibiotics: Their use and misuse in paediatric dentistry. A systematic Review. *Eur J Paediatric Dent*. 2019;20(2):133-8.
5. Lewis MA. Why we must reduce dental prescription of antibiotics: European Union Antibiotic Awareness Day. *Br Dent J*. 2008;205(10):537-8.
6. Dar-Odeh N, Fadel HT, Abu-Hammad S, Abdeljawad R, Abu-Hammad OA. Antibiotic Prescribing for Oro-Facial Infections in the Paediatric Outpatient: A Review. *Antibiotics (Basel)*. 2018;7(2):38.
7. Yallapragada SG, Nash CB, Robinson DT. Early-life exposure to antibiotics, alterations in the intestinal microbiome, and risk of metabolic disease in children and

- adults. *Pediatr Ann.* 2015;44(11):e265–9.
8. Goel D, Goel GK, Chaudhary S, Jain D. Antibiotic prescriptions in pediatric dentistry: A review. *J Family Med Prim Care.* 2020 Feb 28;9(2):473-480.
 9. Faustino-Silva DD, Rocha AF, da Rocha BS, Stein C. Use of Antibiotics in Early Childhood and Dental Enamel Defects in 6-12-year-old Children in Primary Health Care. *Acta Odontol Latinoam.* 2020;33(1):6-13.
 10. Mihaş E, Matricala L, Chelmuş A, Gheţu N, Petcu A, Paşca S. The Role of Chronic Exposure to Amoxicillin/Clavulanic Acid on the Developmental Enamel Defects in Mice. *Toxicol Pathol.* 2016;44(1):61-70.
 11. Hong L, Levy SM, Warren JJ, Broffitt B. Amoxicillin use during early childhood and fluorosis of later developing tooth zones. *J Public Health Dent.* 2011;71(3):229-235.
 12. Cope AL, Francis NA, Wood F, Chestnutt IG. Antibiotic prescribing in UK general dental practice: A cross-sectional study. *Community Dent. Oral Epidemiol.* 2016;44(3):145-53.
 13. Fluent MT, Jacobsen PL, Hicks LA. Considerations for responsible antibiotic use in dentistry. *J Am Dent Assoc.* 2016;147(8):683-6.
 14. Adewumi AO. Oral surgery in children. In: Nowak AJ, Christensen JR, Mabry TR, Townsend JA, Wells MH, eds. *Pediatric Dentistry Infancy through Adolescence.* 6th ed. St Louis, Mo.: Elsevier; c2019. p. 399-409.
 15. Ramasamy A. A review of the use of antibiotics in dentistry and recommendations for rational antibiotic usage by dentists? In. *Arabic J Antimicrob Agents.* 2014;4:1.
 16. Bourguignon C, Cohenca N, Lauridsen E. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 1. Fractures and luxations. *Dent Traumatol.* 2020;36:314-330.
 17. Andreasen FM, Kahler B. Diagnosis of acute dental trauma: the importance of standardized documentation: a review. *Dent Traumatol.* 2015;31(5):340-349.
 18. American Academy of Pediatric Dentistry. *Useful Medications for Oral Conditions.* *Pediatr. Dent.* 2018;40(6):506-512.
 19. Buonavoglia A, Leone P, Solimando AG. Antibiotics or no antibiotics that is the question: An Update on Efficient and Effective Use of Antibiotics in Dental Practice. *Antibiotics (Basel).* 2021;10(5):550.
 20. Fouad AF, Abbott PV, Tsilingaridis G. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 2. Avulsion of permanent teeth. *Dental Traumatology.* 2020;36(4):331-42.
 21. American Academy of Pediatric Dentistry. *Useful Medications for Oral Conditions.* Chicago, ILL: *Pediatr Dent*; c2019.
 22. Giunta Crescente C, Soto de Facchin M, Acevedo Rodriguez AM. Medical-dental considerations in the care of children with facial cellulitis of odontogenic origin. A disease of interest for paediatricians and pediatric dentists. *Arch Argent Pediatric.* 2018;116(4):e54-e553.
 23. Ritwik P, Fallahi S, Yu Q. Management of facial cellulitis of odontogenic origin in a paediatric hospital. *Int. J Paediatr Dent.* 2020 Jul;30(4):483-488.
 24. Abdul Satar H, Yaakub A, Md Shukri N, Ahmad Tajudin LS. Orbital Cellulitis Secondary to Dental Abscess in Children. *Cureus.* 2021;13(4):14392.
 25. Taub D, Yampolsky A, Diecidue R, Gold L. Controversies in the management of oral and maxillofacial infections. *Oral Maxillofac Surg Clin North Am.* 2017;29(4):465-473.
 26. Thikkurissy S, Rawlins JT, Kumar A, Evans E, Casamassimo PS. Rapid treatment reduces hospitalization for pediatric patients with odontogenic-based cellulitis. *Am J Emerg Med* 2010;28(6):668-72.
 27. American Academy of Pediatrics. Group A Streptococcal Infections. In: Kimberlin DW, Barnett ED, Lynfield R, Sawyer MH, eds. *Red Book: 2021-2024 Report of the Committee on Infectious Diseases.* Elk Grove Village, Ill.: *Pediatr Dent*; c2021. p. 694-915.
 28. Holmes CJ, Pellecchia R. Antimicrobial Therapy in Management of Odontogenic Infections in General Dentistry. *Dent. Clin North Am.* 2016;60(2):497-507.
 29. American Academy of Pediatric Dentistry. *Antibiotic prophylaxis for dental patients at risk for infection. The Reference Manual of Pediatric Dentistry.* Chicago, ILL.: *Pediatr Dent*; c2022. p. 500-6.
 30. Daly CG. Antibiotic prophylaxis for dental procedures. *Aust Prescr* 2017;40(5):184-8.
 31. Sharif JM, Raja Shahardin RZ, Sockalingam G. Pattern of antibiotic prophylaxis practice for dental procedures in children with congenital heart disease. *J Indian Soc. Pedod Prev Dent.* 2020;38(2):126-131.
 32. Laufaurie GI, Noriega LA, Torres CC. Impact of antibiotic prophylaxis on the incidence, nature, magnitude, and duration of bacteremia associated with dental procedures: A systematic review. *J Am Dent Assoc.* 2019;150(11):948-59.
 33. Wilson WR, Gewitz M, Lockhart PB. Prevention of Viridans Group Streptococcal Infective Endocarditis: A Scientific Statement from the American Heart Association [published correction appears in *Circulation.* 2021 Aug 31;144(9):e192] [published correction appears in *Circulation.* 2022 Apr 26;145(17):e868]. *Circulation.* 2021;143(20):e963-e978.
 34. Stultz JS, Eiland LS. Doxycycline and tooth discolouration in children: changing of recommendations based on evidence of safety. *Ann Pharmacother.* 2019;53(11):1162-1166.
 35. Zeng L, Xu P, Choonara I. Safety of azithromycin in paediatrics: A systematic review and meta-analysis. *Eur J Clin Pharmacol* 2020;76(12):1709-1721.

How to Cite This Article

Alvarez GG, Garcia LEV, Villarreal SML, Luis OER, Rodriguez JCM, Lamas NMC, *et al.* Antibiotic therapy in pediatric dentistry. *International Journal of Applied Dental Sciences.* 2023;9(3):80-83.

Creative Commons (CC) License

This is an open-access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 International (CC BY-NC-SA 4.0) License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.