Revista Brasileira de Odontologia
Brazilian Journal of Dentistry
Associação Brasileira de Odontologia - Seção Rio de Janeiro
DOI: http://dx.doi.org/10.18363/rbo.v76.2019.e1711

Antibiotic Therapy in Pediatric Dentistry: Update for Dentistry

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• Conflicts of interest: none declared.

Abstract

Objective: the present study aims to describe the main factors involved in antibiotic therapy as management of odontogenic infections in pediatric dentistry. In view of the importance of a drug prescription based on criteria that guarantee the effectiveness of the treatment and patient safety, it is mandatory for all dentists to understand the parameters that guide this practice. **Materials and Methods:** literature review counting on one book and articles published in English and Portuguese available in the PubMed database, Virtual Health Library, Scielo and Google Scholar, published from 2009 to 2019. **Results:** in this context, penicillin make up the group of antibiotics most used today in Dentistry and, not unlike, in Pediatric Dentistry. These are safe drugs, with highly effective action and the ability to suppress the main microorganisms involved in odontogenic infections. For oral infections in the initial phase, being mild or of moderate intensity, amoxicillin is indicated, and in cases of greater severity, the drug combination of penicillin and metronidazole is the most common choice. In case of allergy, clindamycin, clarithromycin or azithromycin are prescribed. **Conclusion:** antibiotic therapy in pediatric dentistry requires knowledge of the dentist about the prescribed medications, as well as about the individualities of each patient, considering the conditions of the child's incomplete development.

Keywords: Antibiotics; Pediatric dentistry; Children; Drug prescriptions.

Introduction

The human oral cavity is an ecosystem capable of harboring microorganisms such as viruses, fungi and bacteria, and one of the habitats of the human body with the largest number of microorganisms.[1] The oral habitat can go through a situation of microbial imbalance in the presence of factors such as the presence of new microorganisms, tooth eruption or loss, frequent intake of carbohydrates or acidic drinks, changes in the immune system and others.[2]

Alteration of the oral bacterial flora can cause the two most frequent oral diseases, dental caries and periodontal diseases. When untreated, these diseases can progress to infectious conditions in the oral cavity and orofacial tissues. Depending on the conditions of each infectious process, therapeutic approaches can be considered such as drainage of purulent secretion and removal of the source of infection with endodontic treatment or extraction of the affected tooth, as well as considering the need for antibiotic therapy when there is rapid spread of the infection or signs of systemic infection.[3] In this context, antibiotic therapy is also considered for the prevention of infections, for example, dental prophylaxis in patients susceptible to infective endocarditis and for patients with compromised immune system.[4]

In the indication of antibiotic therapy, it should be considered that the individual response of each patient will depend on factors such as the presence of another pre-existing disease, age, height, body weight, nutritional condition, simultaneous use of other drugs, time of administration and stage of development, since, in children, for example, the stage of the life cycle is characterized by incomplete development of their organs and body tissues.[5]

In this context, it is essential to highlight that antibiotic prescriptions are often performed in a wrong way, either due to the wrong duration of drug treatment[6] or due to over-prescription, including for clinical situations not indicated for antibiotic therapy.[7] In addition, the use of antibiotics per se already represents a significant risk of adverse reactions ranging from colitis and mild allergies to cardiotoxicity and anaphylactic reactions.[6]

Considering the prescription of antibiotic therapy in Pediatric Dentistry, it should be understood that the child will not behave similarly to an adult, mainly due to its physiological and structural conditions that will manifest themselves as the child grows and develops.[8] Thus, the present study aims to describe the main factors involved in adequate antibiotic therapy as management of odontogenic infections in pediatric dentistry.

Material and Methods

Narrative literature review in PubMed, Virtual Health Library and Google Scholar databases. For search, we used the descriptors "Antibiotics"; "Pediatric Dentistry"; "Drug prescriptions" using the Boolean operator AND. We applied the full text filters, articles in English and Portuguese published between the years 2009 and 2019, seeking to draw a profile of the last 10 years on the subject, were excluded theses and dissertations, as well as articles that when analyzed were not suitable.

Results

Drug prescription should be based on the characteristics of each drug, for example, its mechanism of action, indications, contraindications, adverse effects and dosage, to obtain better results during drug therapy and, whenever possible, avoiding the occurrence of side effects on the patient.[9] Thus, it is necessary to carry out a correct prescription to also prevent the occurrence of bacterial resistance, considering that children treated with antibiotics may be more prone to colonization by resistant bacteria.[8]

Therefore, when prescribing drugs in pediatric dentistry, the drug with the least toxicity should be chosen, with the individualization of the drug dose according to the patient's particularities, such as age and body weight, as well as the severity of the infectious process. Following this orientation, penicillin is the antibiotics of first choice in the management of odontogenic infections in Pediatric Dentistry, due to their effectiveness and low toxicity[10] or even in cases of severe infection, the drug combination of Penicillin (Amoxil® - 10mg/kg, 8/8h) with Metronidazole (Flagyl® - 7.5mg/kg, 8/8h)[11] (Table 1). The duration of treatment should be 3 days, with clinical reevaluation before 72h of ending the treatment in order to decide to maintain or not of therapy.[10]

Therefore, antibiotic therapy will be indicated in clinical situations with the presence of signs of spread of the infection that can manifest with palpable lymph nodes, trismus, cellulitis or signs of a systemic character such as fever, lack of appetite, malaise, rapid spread of infection and persistent infectious conditions.[8]

Discussion

For all these cases, it is important to note that the most common administration in infant patients is the via route, with drugs in liquid form - drops, suspension, syrup - and those that are easier to ingest, and the rectal route may also be used in cases of ingestion difficulty.[8]

In situations of antibiotic prophylaxis, children at greatest risk are those with congenital or acquired valvular heart disease. It is suggested that in these cases, the cardiologist defines the child's risk level and the need for antibiotic prophylaxis prior to dental care. The following regimens for the prophylaxis of infective endocarditis in children are: standard regimen – oral Amoxicillin 50mg/kg, 1 hour before the procedure; for children allergic to penicillin – oral Clarithromycin or Azithromycin 15mg/kg, 1h before the procedure. For intramuscular (IM) or intravenous (IV) use - Ampicillin 50mg/kg, 30min before the procedure; in children allergic to penicillin - Clindamycin 20mg/kg, 30

Table 1. Antimicrobial agents indicated for the treatment of odontogenic infections in children.

Drug Group	Genetic Designation	Pharmacological Characteristics	Children's Dosages
Penicillin	Amoxicillin	Gram-positive, gram-negative bacteria and a large part of oral anaerobes. Achieves effectively higher and longer concentrations.	Children> 3 months old and up to 40kg: 20 to 40mg/kg/day (split 8/8h dose). > 40kg: 250 to 500mg, every 8h
	Amoxicillin + Clavulanic acid	Inhibits the beta-lactamase enzyme and increases the spectrum of action of amoxicillin. Indicated for cases of no improvement in the clinical characteristics within 48 hours of therapy with amoxicillin.	Children> 3 months old and up to 40kg: 25 to 45mg/kg/day (split dose of 12/12h). > 40kg: 500 to 875mg, 12/12h
Macrolides	Erythromycin	Indicated in mild infections, as an alternative to patients allergic to amoxicillin. May have gastrointestinal disturbances due to the irritating property of the antibiotic.	40 to 50mg/kg/day (split dose of 6/6h)
	Clarithromycin	Analogous to erythromycin, more effective against *Streptococcus, Staphylococcus* and anaerobic bacteria; less occurrence of gastrointestinal side effects.	7.5 to 15mg/kg/day (split dose of 12/12h)
	Azithromycin	Derived from erythromycin, similar to Clarithromycin; it has a long serum (40h) and tissue (60h) half-life, requiring only one dose daily. It can cause gastrointestinal effects.	10mg/kg/day (split dose of 12/12h)
Lincosamines	Clindamycin	It has excellent penetration into bone tissue, being indicated for bone infections, such as osteomyelitis and osteitis. May have side effects such as diarrhea and pseudomembranous colitis.	8 to 20mg/kg/day (split dose of 8/8h or 6/6h). >12 years old: 150 to 450mg, 6/6h.

Source: Adapted from: Rocha RG, Horliana ACRT, Borsatti MA, Adde CA, Peixoto IF. Terapêutica medicamentosa em odontopediatria. In: Guedes-Pinto AC. Odontopediatria. 9th ed. Rio de Janeiro: Santos, 2017. P. 721-38.[8]

min before the procedure.[10]

Considering the children's particularities, some antibiotics are contraindicated for this public because they do not have a spectrum of action against the microorganisms that cause odontogenic infections or because they present potentially serious adverse effects to child patients (Table 2).[11]

To calculate the antibiotic dose according to the child's body mass, the drug concentration should be considered for each kg of body weight of the child, as shown in Table 1. Thus, for a child with 20 kg of body weight, it indicates administration of 20 to 40mg/kg/day, depending on the severity of the infection. For the individualized dose, the schematic figure can be taken as a parameter (Figure 1).

Table 2. Antimicrobial agents contraindicated for administration to children.

Drug Group Not Recommended	Genetic Designation	Pharmacological Characteristics
Tetracycline	Tetracycline Oxytetracycline Doxycycline Minocycline	It should be avoided in children, pregnant or lactating women - risk of dental hypoplasia, tooth pigmentation and defective bone formations, in addition to hepatoxicity in the mother. Dental staining can occur with administration of the 5th month of intrauterine life at 6 to 7 years of age, even in therapeutic doses. Pigmentation can range from yellow to grayish-yellow, brown with orange tones.
Quinolones	Ciprofloxacino Levoflaxacino Ofloxacino Norfloxacin Nalidixic acid	They should be avoided due to possible occurrence of arthropathies.
Aminoglycosides	Streptomycin Kanamycin Gentamycin Neomycin (topical use)	They should be used with caution in children due to the risk of ototoxicity and nephrotoxicity.
Chloranfenicol	Patented medications Farmicetina® Quimecetina® Symptomicetin®	It can have more serious side effects than the infection itself, and can affect the bone marrow, showing anemia due to reduced iron absorption. They can develop thrombocytopenia and neutropenia. The reversal of these effects can be achieved with the suspension of the drug. The most serious reaction is bone marrow aplasia (pancytopenia), which can be fatal.

Source: Adapted from: Rocha RG, Horliana ACRT, Borsatti MA, Adde CA, Peixoto IF. Terapêutica medicamentosa em odontopediatria. In: Guedes-Pinto AC. Odontopediatria. 9th ed. Rio de Janeiro: Santos, 2017. P. 721-38[8] and Franco GCN, Cogo K, Rosalen PL. Terapêutica medicamentosa em Odontopediatria. In: Duque C, Caldo-Teixeira AS, Ribeiro AA, Ammari MM, Abreu FV, Antunes LAA. Odontopediatria: uma visão contemporânea. São Paulo: Santos, 2013. P. 98-114.[11]

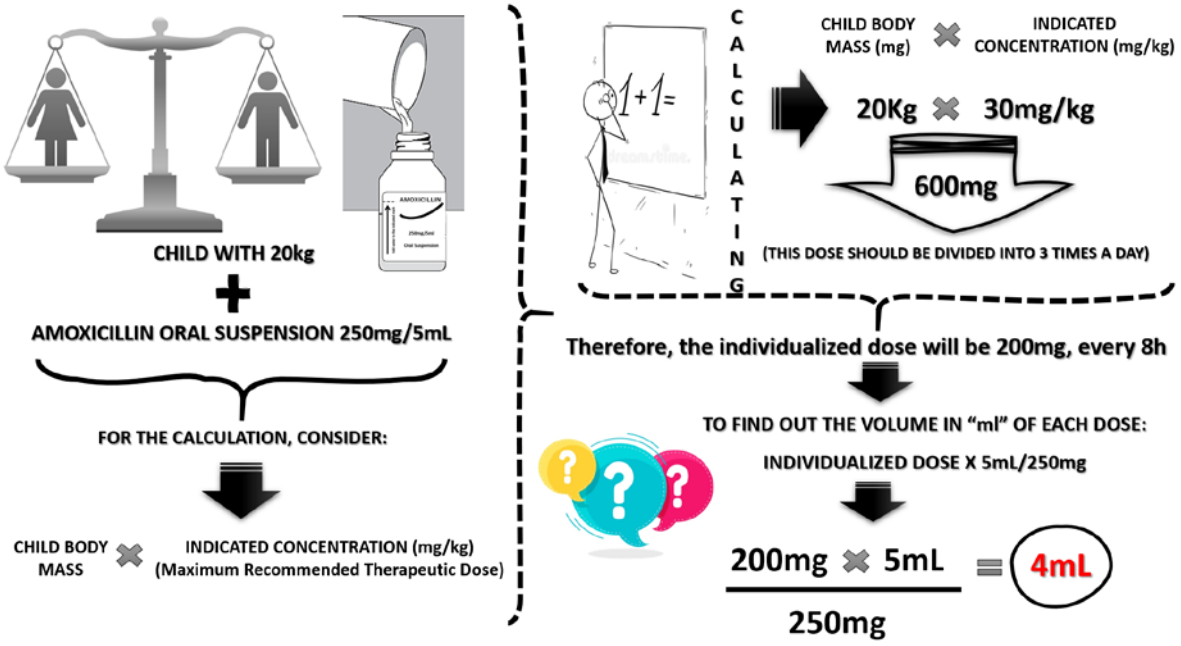

Figure 1. Calculation example for obtaining an individualized dose of amoxicillin. * Calculation performed considering the presentation of amoxicillin in oral suspension 250mg/5ml.

Conclusion

The prescription of medication in Pediatric Dentistry should consider the conditions of the child's development, which is still incomplete, and should not be considered a small adult. Antibiotic administration is recommended for infectious cases with systemic involvement or in cases with impaired child defense mechanisms, considering the peculiarities of each child and the severity of the infection.

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Submitted: 08/30/2019 / Accepted for publication: 12/31/2019
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