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Drugs Used in Pediatric Dentistry: A Review

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ABSTRACT

Drugs are prescribed for various dental issues in children, dosage differs in children when compared to adults. Drugs include analgesics, antibiotics, sedatives and other drugs. A pediatric dentist most be aware of use and dosage of drugs for an efficient practice. This review aims to give information on various drugs commonly used in pediatric dentistry

Keywords: Drugs; pediatric dentistry, dental drugs, antibiotics, analgesics.

INTRODUCTION

A drug can be defined as any substance or product that is used or is intended to be used to modify or explore physiological system or pathological states for the benefit of the recipient. (WHO,1966). Infection and pain remain a major problem in pediatric dental practice, and their rational treatment with drugs is of prime importance. Dentists prescribe several categories of medications to manage a variety of oral diseases and conditions. Among these conditions are bacterial, fungal, and viral infections and pain. Drugs need to be carefully prescribed for children. The dosage and mode of administration varies when compared to adults. Drugs used in pediatric dentistry are classified into

- Drugs for infection control: Antibiotics.
- Drugs for pain control:

a) Non-steroidal anti-inflammatory drugs

b) Opioid analgesics.

c) Local anesthetics.

- Drugs for Conscious sedation
- Drugs for General anesthesia.
- Drugs for medical emergencies.
- Drugs as nutrition supplement.

DOSE CALCULATION

Dose calculation is done in pediatric dentistry based on the weight, body surface area and age of the child. The rule governing calculation of pediatric doses for newborns and young infants with a normal lean body mass and normal body development is Clark's Rule. For toddlers use Fried's Rule, and for older children Young's Rule is used.

Young's rule (for 1 to 12 years):

$$\text{Pediatric dose} = \frac{\text{Age (in years)} \times \text{adult dose}}{\text{age}+12}$$

Fried's Rule (for Infants and Children up to 1 to 2 Years):

Pediatric dose = age (in months) x adult dose

150

Clarke's rule:

Pediatric dose = weight (in pounds) x adult dose

150

Mobile applications are available these days to calculate drug doses in pediatric dentistry

ANTIBIOTICS

An antibiotic is a chemical substance produced by various species of microorganisms (bacteria, fungi, and actinomycetes) that suppress the growth of other microorganisms and may eventually destroy them. Antibiotics are the most commonly prescribed drugs in children. Intraoral puncture wounds and lacerations that appear to have been contaminated by extrinsic bacteria, debris foreign body, open fractures, and joint injury have an increased risk of infection and should be managed by systemic antibiotics. If acute odontogenic abscess with diffuse swelling is associated with pyrexia within the last 24 h, it indicates a systemic response to the infection; antibiotics should be prescribed in such cases. The choice of an antibiotic depends on the following factors: A. Host related factors: Age, Renal and hepatic function, Local factors B. Pathogen related factors C. Drug factors: Spectrum of activity, Type of activity, Compliance by the patient, Cost consideration.

ANTIBIOTIC	PEDIATRIC DOSAGE	USES
Amoxicillin	Children up to 10 years > 40 kgs - 125– 250 mg every 8 hours Children up to 10 years < 40 kgs - 20 – 40 mg/kg daily in divided doses every 8 hours or 25 - 45 mg/kg daily in divided doses every 12 hours Maximum dosage for Children: 2 g/day Infants < 3 months old - Maximum of 30 mg/kg daily in divided doses	• For the treatment of pulpal, periapical and periodontal infection. • Upper respiratory tract infection due to Streptococci, Pneumococci and H. influenza • Infection of skin and soft tissues due to streptococci and susceptible staphylococci.
Cephalosporins	**Cephalexin** 25-100 mg/kg/ day every 6-8 hours Available forms: Tablet 125mg, 250 mg and 500mg, Capsule 250 mg, 500 mg and 750 mg, Oral Suspension 125 mg/5ml and 250 mg/5ml. **Cefadroxil** 30-40 mg/kg/day in 2 divided doses Available forms: Tablet 1g, Capsule 500 mg, Oral suspension 250 mg/5 ml and 500 mg/5 ml **Cefixime** 8 mg/kg/day in 2 divided doses for children weighing < 12 years. Available forms: Tablet 400 mg, Chewable Tablet 100 mg and 200 mg and Oral suspension 100 mg/5 ml, 200 mg/5 ml and 500 mg/5 ml.	They are indicated for the prophylaxis and treatment of infections for children who are allergic to penicillin group of drugs.
Metronidazole	30 mg/kg/day in 3 divided doses Age 7 - 10 years: 300 mg in three divided doses Age 3 – 7 years: 200 mg in three divided doses Age 1 – 3 years: 150 mg in three divided doses Maximum dosage for Children: 2 g/day	Acute necrotizing ulcerative gingivitis (Vincent's Stomatitis) • Pericoronitis and pericoronal abscess • Chronic aggressive periodontitis • Periapical and periodontal abscess • Dent alveolar abscess • Cellulitis and Space infections • Osteomyelitis • Infected sockets • Gastro-duodenal ulcers caused by Helicobacter pylori • Surgical prophylaxis
Amoxicillin and clavulanic acid	For Severe infections 45mg/kg/day every 12 hours Or 40 mg/kg/day every 8 hours For less severe infections 25 mg/kg/day every 12 hours Or 20 mg/kg/day every 8 hours Maximum dosage: For children < 40 kg, 1000	used for a variety of pediatric infectious diseases.

	- 2800 mg Amoxicillin/ 143 - 400 mg Clavulanic acid	
Triple Antibiotic Paste [Metronidazole, Ciprofloxacin, and Minocycline.]	Metronidazole 500 mg, Ciprofloxacin 200 mg, and Minocycline 100 mg (3 mix used in1:1:1 ratio)	Regenerative endodontic treatments, In healing of large peri radicular lesions, Killing common endodontic pathogens from necrotic/infected root canals in vitro, In order to sterilize the infected root dentine, especially the deep layers , Traumatized immature tooth with a periapical lesion.

ANTI-FUNGALS AGENTS

- The anti-fungal agents are important in immune compromised patients, children with rampant caries, angular cheilitis
- Drugs for oral candidiasis are: Nystatin (mycostatin ,1lac U /g oint.), Ketoconazole (nizral, funginoc 2% oint)

ANTI VIRAL AGENTS

- The antiviral drugs are important due to a high prevalence of herpetic infections in children.
- This is one of the most common infections transferred from children to the pediatric dentistry.
- Most common antiviral agent is Acyclovir [herpex 200 mg tab, 3% eye oint., 5% skin cream]

ANALGESICS

Analgesic is a drug that relieves pain by acting in the central nervous system or on peripheral pain mechanisms. Widely prescribed for pain relief, especially after a dental surgical procedures, pulpitis, gingival infections and periapical infections, dental extractions and teething. Analgesics can be broadly categorized as:

- Non-opioid analgesics: Acetaminophen and nonsteroidal anti-inflammatory drugs (NSAIDs).
- Opioid analgesics: μ opioid agonists and agonist-antagonist opioids.
- Adjuvant analgesics: a diverse group of drugs, with primary indications for conditions other than pain, with analgesic properties.

DRUG	PEDIATRIC DOSAGE
ASPIRIN	10 to 15mg/kg orally
IBUPROFEN	4 to 10mg/kg orally every 6 to 8 hours
DICLOFENAC	2 to 3 mg/kg/day orally in divided doses 2 to 4 times daily
KETOROLAC	5mg every 4-6 hours
PARACETAMOL	90mg/kg/day Orally
TRAMADOL	1-2 mg/kg oral/ i.m./ slow i.m. infusion 4-6 hourly

American Academy of Pediatric Dentistry recommendation to prescribe analgesics in children

- For Mild / Moderate Pain, Acetaminophen [10 to 15mg/kg/dose] or Acetaminophen + 0.5-1mg Codeine/kg/dose]
- For Moderate/Severe Pain, Acetaminophen + 0.1-0.2mg Hydrocodone/kg/dose] or Acetaminophen + 0.05-0.2 mg Oxycodone/kg/dose]

LOCAL ANESTHETICS

Local anesthesia has been defined as a loss of sensation in a circumscribed area of the body caused by a depression of excitation in nerve endings or an inhibition of the conduction process in peripheral nerves without inducing a loss of consciousness. They are classified into topical and injectable. The clinical uses of local anesthetics in pediatric dental practice may be divided into:

a. Surface anesthesia.
b. Infiltration anesthesia.
c. Field block
d. Nerve block
e. Intraligamentary.

f. Intra pulpal.

Lidocaine is the most commonly used local anaesthetic agent in pediatric dentistry. It is an amide type of agent having rapid onset of action and producing more profound anesthesia. Maximum recommended dose :4.4 mg/kg without adrenaline :7mg/kg with adrenaline, Duration of Pulpal anesthesia :60 min, soft tissue anaesthesia:2-3 hours.

GENERAL ANESTHETIC AGENTS

A combination of inhalation and intravenous anesthetics, often with opioids added for pain relief and neuromuscular blockers for muscle paralysis, is called balanced anesthesia.

DRUG	
Halothane	causes unconsciousness but provides little pain relief; often administered with analgesics. Has a pleasant smell and is therefore often the anaesthetic of choice when mask induction is used with children
Nitrous oxide	Used with other drugs as thiopental to produce surgical Anesthesia. The fastest induction and recovery time. Safest inhalation anaesthetic because it does not slow respiration or blood flow to the brain. relatively weak anaesthetic, not suited for major surgery. may be used alone for dental Anesthesia, should not be used as a primary agent in more extensive procedures.
Ketamine	Useful in anesthetizing children, patients in shock, and trauma casualties in war zones where anesthesia equipment may be difficult to obtain.

DRUGS FOR MEDICAL EMERGENCY

The use of pharmacological measures for behavior management and the uncooperative nature of substantial majority of the patients, puts the pediatric dentistry practice at a greater risk. These drugs can prove to be *life-saving* when a situation arises. A practice requires a complete set of emergency drugs.

EMERGENCY	DRUGS
Emergency pain relief	Morphine sulphate
Bronchial asthma, respiratory distress	Atropine Metaproterenol Epinephrine bitartrate Aromatic ammonia
Cardiac issues	Nitroglycerine
Convulsions	Diazepam, midazolam
Allergic reactions and anaphylaxis	Diphenhydramine, chlorpheniramine, Methylprednisolone, Epinephrine
Hypoglycaemia	50% dextrose in water, glucagon, Candy, fruit juice, sugar
Opioid overdose	Naloxone

CONCLUSION

It is important to know the correct dosage of drugs in pediatric patients. Proper side-effects and contraindications should be known before administering the drug. It is always better for pediatric dentist to keep oneself updated regarding the drugs to be used in pediatric dental practice.

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