Emergency Preparedness in Pediatric Dentistry A Comprehensive Review

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***Abstract*—In pediatric dental practice, emergencies don't happen every day, but when they do, things can escalate quickly because of children's unique needs. What starts as a minor incident in the dental chair can suddenly become serious—even life-threatening—if not handled properly. That's why every dentist treating kids needs solid preparation: thorough risk assessment, clear step-by-step management plans, and a well-stocked emergency kit ready to go. This review pulls together current knowledge on pediatric dental emergencies—how to classify them, manage them effectively, and prevent them whenever possible—all with the goal of keeping young patients safe.**

***Index Terms*—Pediatric emergencies, Dental practice, Risk assessment, Management plans, Emergency kit, Patient safety**

I. INTRODUCTION

Medical emergencies which are life-threatening can and do occur in the dental office. Most of the recommendations for treating medical emergencies in the dental office are oriented towards the adult patient (1) (18), leaving specific guidance for pediatric cases somewhat sparse. But children aren't just small adults—they have different physiology, smaller body sizes, and unique pharmacological responses that require adjusted drug dosages and tailored supportive care. Pediatric dentists must be ready to handle medical crises involving not just their young patients, but also any accompanying adults who might experience an emergency during a visit.[1]

Every pediatric dentist has a professional duty to minimize medical complications during dental treatment. Before starting any procedure, a thorough medical history and proper evaluation of the child's overall health are essential. When medical complications exist, consulting with the patient's physician helps determine necessary precautions or modifications to the planned treatment. Sometimes, high-risk situations require dental procedures to be performed in a hospital setting where more support is available.[1] Though rare, pediatric medical emergencies happen suddenly and progress rapidly because children's physiological systems are still developing. Syncope remains the most common medical emergency in dental practice overall, though it occurs more frequently in adults than in children [19]. Pediatric dental emergencies specifically include acute oral problems requiring immediate attention: dental trauma, acute infections, uncontrollable bleeding, facial swelling, and severe dental pain. These conditions disrupt normal physiological or behavioral functioning, and without prompt treatment, complications quickly develop.[20]

II. RISK ASSESSMENT

When providing dental treatment outside a regular clinic setting, careful risk assessment becomes even more critical. Since medical emergencies can strike anywhere, emergency drugs must be readily available at the treatment site, or the dentist should carry a portable emergency drug kit. The type of dental

procedure matters—some treatments like routine examinations carry less risk than others. A thorough review of the patient's medical history helps identify potential complications before they occur.

Based on the patient's condition and available facilities, dentists may need to bring additional emergency medications. Dentists must also consider their own safety while fulfilling their responsibility to provide care outside the usual dental practice setting.[22]

III. COMMON PEDIATRIC DENTAL EMERGENCIES

Pediatric dental emergencies fall into several broad categories: respiratory, cardiovascular, neurological, and allergic emergencies.

Respiratory Emergencies

1. Acute Asthmatic Attack

Prevalence

Asthma ranks as one of the most common chronic respiratory conditions in children and occasionally presents as a medical crisis in the dental clinic. Anxiety, allergens, or treatment related stress can trigger an acute attack.[1][23]

Typical Signs

An acute asthma attack typically shows up as shortness of breath, audible wheezing, persistent coughing, chest tightness, prolonged exhalation, rapid heart rate, and in severe cases, a bluish skin discoloration (cyanosis) caused by airway blockage.[1][19]

Management

Stop dental treatment immediately and position the patient sitting upright. Administer a short-acting bronchodilator inhaler like albuterol right away. If symptoms continue, provide supplemental oxygen and consider giving epinephrine, then call for urgent medical help.[1][19]

Pediatric Consideration

For mild cases, use the child's personal inhaler and supplement with oxygen. Severe cases require epinephrine 1:1000 given subcutaneously (0.125–0.25 cc for children, 0.25–0.5 cc for adults), semi-upright positioning, oxygen therapy, and prompt medical evaluation.[1]

2. Total Airway Obstruction

Prevalence

Airway obstruction is rare but represents a genuine life-threatening emergency in dental practice. It usually results from aspirating or swallowing dental materials, blood, or foreign objects. Children face higher risk because of their narrower airways and less developed protective reflexes.[1][24]

Typical Signs

Common signs include choking, coughing, wheezing, difficulty breathing, and laryngeal spasm. Complete obstruction can lead to cyanosis and loss of consciousness.[1]

Management

Immediately work to relieve the obstruction by suctioning the oral cavity and attempting to remove any visible foreign body from the airway. If that doesn't work, perform back blows, chest thrusts, and the Heimlich maneuver as appropriate. Oxygen therapy and emergency airway management may become necessary in life-threatening situations.[1][24]

Pediatric Consideration

Prevention works best: use rubber dams, throat packing, proper chair positioning, and adequate assistance during procedures to minimize aspiration or airway obstruction risk in children.[25]

3. Choking

Choking is a relatively common emergency in dental settings, often caused by aspiration or ingestion of

dental materials like restoration fragments, temporary fillings, orthodontic brackets, or crowns.[22]

Typical Signs

Clinical features include sudden breathing difficulty, coughing, inability to speak or cry, clutching at the neck, bluish skin color, and possible loss of consciousness. Signs may be more subtle in infants.[22]

Management

Management depends on how severe the airway obstruction is. If the patient can cough effectively, encourage continued coughing. For complete obstruction, perform back blows and abdominal thrusts (Heimlich maneuver) in children over 1 year old. For infants, use back blows followed by chest thrusts instead. If the patient becomes unconscious, begin CPR immediately.[22]

Pediatric Consideration

Children face increased risk because of their smaller airways and still-developing protective reflexes. Avoid abdominal thrusts in infants under 1 year due to the risk of internal organ damage.[22]

Cardiovascular Emergencies

Prevalence

Cardiovascular problems in pediatric patients are uncommon but can pose serious risks during dental procedures. Children have unique heart characteristics—their hearts are less adaptable and may not respond well to sudden changes in oxygen demand or blood
pressure.[21]

Typical Signs

Common indicators of cardiovascular distress in children include:

- Rapid or irregular heartbeat
- Breathing difficulty or shortness of breath
- Cyanosis (bluish skin discoloration)
- Weakness or unusual lethargy
- Dizziness or fainting spells

Management

Managing cardiovascular emergencies in the dental office involves:

- Continuously monitoring vital signs
- Administering supplemental oxygen if respiratory distress is present
- Positioning the child appropriately (usually lying flat)
- Initiating basic life support (BLS) protocols when necessary
- Calling emergency medical services for advanced care if the situation doesn't improve

Pediatric Consideration

Trendelenburg positioning (legs elevated), oxygen administration, loosening tight clothing, applying a cold towel to the forehead, and using ammonia as a respiratory stimulant can all be helpful.[1]

Neurological Emergencies

1. Epileptic Seizure

An epileptic seizure involves sudden abnormal brain activity causing loss of consciousness and convulsions. Causes include head injury, epilepsy, brain tumors, poisoning, electric shock, drug withdrawal, heat stroke, snake or scorpion bites, hyperventilation, and high fever. Predisposing factors

include lack of oxygen, metabolic disorders, congenital defects, trauma, toxins, and degenerative brain diseases.[24]

Management involves placing the patient in a safe position, loosening any tight clothing, and maintaining an open airway. After the seizure ends, allow the patient to rest and observe them until they fully recover. If a seizure lasts longer than 4 minutes, urgent medical care and intravenous diazepam may be required.[1]

Pediatric Consideration

Place the child on the floor to prevent injury, loosen tight clothing, and arrange for physician assessment.[1]

Allergic Reactions

Prevalence

Neurological disorders affect approximately 0.8 to 10.7% of children.

1. Anaphylactic Reaction

Anaphylaxis occurs when histamine releases from mast cells, causing blood vessel dilation, tissue swelling, increased secretions, and potentially life-threatening airway obstruction. Common dental allergens include antibiotics, pain medications, local anesthetics, latex gloves, and acrylic resins.[19]

Signs and Symptoms

Symptoms may include itching, rash, hives, swelling, wheezing, breathing difficulty, low blood pressure, dizziness, irregular heartbeat, and cardiac arrest. Symptoms typically progress from skin reactions to respiratory problems and finally cardiovascular involvement.[19]

Emergency Management

Stop dental treatment immediately, call for help, provide oxygen, and assess airway, breathing, and circulation. Epinephrine is the primary drug—it reverses airway constriction and raises blood pressure. Administer it using an EpiPen injected into the outer thigh, and repeat every 15 minutes if needed.[1][19]

Pediatric Consideration

Give epinephrine 1:1000 intravenously or into the tongue (0.125–0.25 cc for children, 0.5 cc for adults), plus oxygen and intramuscular Benadryl (25–50 mg for children or 50–100 mg for adults), followed by hospital admission.

2. Mild or Delayed Allergic Reactions

Mild reactions cause itching, hives, runny nose, or minor swelling. Treatment includes removing the allergen and giving diphenhydramine (Benadryl) at 1 mg/kg for children or 25– 50 mg for adults every 6 hours for 24–48 hours.[19]

Pediatric Consideration

For mild reactions, give oral Benadryl (25–50 mg for children, 50–100 mg for adults) under physician guidance. For moderate reactions, give Benadryl intramuscularly (25–50 mg for children, 50–100 mg for adults), again under medical supervision.[1]

Diabetic Ketoacidosis (DKA)

Prevalence

Diabetic Ketoacidosis (DKA) is a severe, common complication when type 1 diabetes (T1D) first appears in children globally, with prevalence rates ranging from 15% to 80%.

1. Diabetic Acidosis

In diabetic individuals with insufficient insulin, the body compensates by producing ketones, leading to ketosis, which shows up clinically as diabetic acidosis. Diabetic patients, especially those with infections like an acute dental abscess, face higher risk for this reaction.[1]

Symptoms

Symptoms of diabetic acidosis develop gradually, making sudden occurrences in a dental office relatively uncommon. Along with a diabetes history, patients may show excessive thirst, frequent urination, general malaise, loss of appetite, sweet-smelling (fruity) breath, and nausea. In advanced stages, patients may experience dizziness, unusually deep breathing, and ultimately loss of consciousness.[1]

Treatment

If a dental professional notices these symptoms after evaluating a diabetic patient, immediately refer the patient to medical personnel. Keep the patient warm, place them in a supine position, give oxygen, and provide supportive care as needed.[1]

Pediatric Consideration

Keep the child warm until they reach the hospital.[1]

Local Anesthetic Systemic Toxicity (LAST)

Prevalence

Local anesthetic systemic toxicity (LAST) in children is extremely rare, occurring at an estimated rate of 0.76 cases per 10,000 procedures.

Although local anesthetic toxicity is uncommon in adults, children are more vulnerable due to their lower body weight and immature physiological development. Most adverse reactions occur within 5–10 minutes after injection without a vasoconstrictor and approximately 30 minutes when a vasoconstrictor is present.

Local anesthetic toxicity results from elevated blood levels of the anesthetic agent, which may occur due to:

- Administering doses exceeding recommended maximums
- Accidental injection into blood vessels
- Repeated injections in short succession
- Unusual patient responses (idiosyncratic reactions)
- Drug interactions, especially with sedatives

Management

Local anesthetic toxicity can often be prevented by proper injection technique, including aspirating before and during slow injection to avoid hitting blood vessels. Among oral injections, inferior alveolar nerve blocks show the highest incidence of positive aspiration (11.7%), followed by mental nerve blocks (5.7%).

Clinicians must know the maximum recommended dosage based on the patient's body weight. If topical lidocaine is used, include it in the total calculated dose, as it can also enter the bloodstream. After administering the anesthetic, carefully monitor the patient for any signs of toxicity, since early detection and prompt management are essential for successful outcomes.[19]

Pediatric Consideration

Provide supportive care until the child reaches the hospital.[1]

IV. EMERGENCY EQUIPMENT AND MEDICATIONS

Office staff should always have necessary emergency medications and equipment readily available to handle any potential crisis. Staff must know exactly where emergency supplies are located. Emergency medications and equipment should be organized in clearly labeled boxes placed in the designated emergency response area. Ready-made emergency packs are available commercially for dentists and medical professionals, including mobile crash carts.

For emergency packs, it's important to store all included medications and equipment in an easily

accessible location. Crash carts come with pre-organized placement—for instance, the first two drawers typically contain emergency medications, both injectable and oral forms.

In most emergencies, ensuring the brain and heart receive enough oxygen is vital, so oxygen will be provided in most situations except cases of hyperventilation. Face masks are used for unresponsive patients to cover the face and deliver oxygen. For patients breathing on their own, bag-valve-mask devices are utilized.[19]

Oxygen Delivery Equipment

Oxygen masks should be available for non-breathing patients in both adult and pediatric sizes. Oxygen must be supplied through a portable unit equipped with an E-size cylinder capable of delivering more than 90% oxygen at a flow rate of 5 L/min for at least 60 minutes. For convenient transport and accessibility, the oxygen cylinder is generally attached to the emergency crash cart. The dentist should regularly check the oxygen tank to ensure pressure and volume are at appropriate levels.

Suction Equipment

Although suction devices are usually present in the treatment area, a portable suction unit is helpful when emergencies occur elsewhere in the dental office, such as the waiting room. It allows effective removal of fluids or vomitus from the patient's airway.

Automated External Defibrillator (AED)

An AED is used during cardiac arrest to deliver an electric shock that restores normal heart rhythm. Cardiopulmonary resuscitation using basic life support (BLS) is most effective when defibrillation occurs within 3–5 minutes after collapse. Defibrillators come in manual, automatic, and semi-automatic types. Manual defibrillators require a trained individual to interpret the cardiac rhythm displayed on a monitor or rhythm strip.

Automated and semi-automated Automated External Defibrillators (AEDs) analyze a patient's heart rhythm and guide the rescuer on whether defibrillation is needed. They instruct the rescuer to deliver a shock if ventricular tachycardia or ventricular fibrillation is detected, or to continue CPR if no pulse is present. The AED should have both adult and pediatric paddles. It must be placed in a clearly accessible location within the dental office so dentists and staff can quickly locate and use it during an emergency. (19)

Pulse Oximeter and Blood Pressure Monitor

Although pulse oximeters are commonly present in dental clinics where sedation or general anesthesia is administered, they're also valuable for monitoring CPR effectiveness. A pulse oximeter measures the patient's pulse rate and blood

oxygen saturation percentage.

Continuous oxygen monitoring is essential for patients receiving sedation, as it helps identify and correct any reduction in oxygen levels caused by sedative medications.[19]

V. MANAGEMENT OF MEDICAL EMERGENCIES

PABC Approach

Position (P)

Place the patient in a supine position with their legs elevated 10–15 cm above heart level to enhance blood flow to the brain. In cases of breathlessness or chest pain, a semi-sitting position is advisable.

Airway (A)

Make sure the patient's airway is clear and air can flow freely into the lungs.

Breathing (B)

Assess the patient's breathing using the look, listen, and feel technique. If the patient isn't breathing, initiate rescue breathing (mouth-to-mouth or bag-valve-mask). Oxygen saturation can be accessed via pulse oximeter.

Circulation (C)

Ensure circulation by feeling for the carotid pulse. If no pulse is felt within 10 seconds, start chest compressions (CPR). The compression-to-ventilation ratio is 30:2 for a single rescuer, and 15:2 for two rescuers in children.

Definitive Therapy (D)

Once you've stabilized the patient using the PABC approach, provide the specific care required for the particular medical emergency at hand.[21]

VI. CONCLUSION

Emergency preparedness for pediatric dentistry is comprehensive, including routine training and emergency simulation drills. A culture of preparedness goes beyond simply stocking supplies and equipment—it builds team confidence and improves team cohesion. Through careful identification of risks and implementation of well-designed emergency protocols specifically targeting children, dental practitioners can effectively address the unique threats associated with pediatric dental emergencies.

REFERENCES

[1] Goepferd SJ. Medical emergencies in the pediatric dental patient. Pediatr Dent. 1979; 1:2:115-121.

[2] Grouse, V. L.: "Dental Treatment of the Patient with Cardio- vascular disease," in Current Therapy in Dentistry, Vol. 5, ed. Goldman, H. M., Gilmore, H. W., Irby, W. B., and Olsen, N. A., St. Louis: The C. V. Mosby Company,1974.

[3] Grouse, V. L.: "Resuscitation Preparation and Equipment in the Dental Office," in Current Therapy in Dentistry, Vol. 5, ed. Goldman, H. M., Gilmore, H. W., Irby, W. B., and Olsen, N. A., St. Louis: The G. V. Mosby Company, 1974, pp. 464-469.

[4] Donaldson, D., and Wood, W. W.: "Recognition and Control of Emergencies in the Dental Office," J Can Dent Assoc 41:228, 1975.

[5] Frame, J. N.: "An Emergency Drug Cabinet for Use in General Dental Practice," Br Dent J, 132:363, 1972.

[6] Freeman, N. S., King, R. A., Plezia, R. A., and Shearer, H. T.: "Office Emergencies: An Outline of Causes, Symptoms, and Treatment," J Am Dent Assoc, 94:91,1977

[7] Funke, F. W.: "Diagnosis and Treatment of Common Systemic Emergencies," in Current Therapy in Dentistry, Vol. 5

[8] Glauda, W. M., Henefer, E. P., and Super, S.: "Non-fatal Ana- phylaxis Caused by Oral Penicillin: Report of a Case," J Am dent assoc ,90:156,1975

[9] Harrison, J. B.: "Faints and Spells," Dent Clin North Am, 17:461,1973

[10] Hendler B.H.,L.F."common medical emergencies a dilemma in dental education,"J am dent assoc,91:575,1975

[11] Irby, W. B., and Baldwin, K. H.: Emergencies and Urgent complications in dentistry,st.louis:the C.V.mosby company 1965

[12] McCarthy, F. M.: Emergencies in Dental Practice, Prevention and Treatment, Philadelphia: W. B. Saunde company,1972

[13] McGimpsey, J. G.: "Fainting in the Dental Surgery," Br Dent J, 143:53, 1977. Perks, E. R.: "The Diagnosis and Management of Sudden Col- lapse in Dental Practice," Br Dent J, 143: Pt. 1, 196-200; Pt. 2, 235-237; Pt. 3, 307-310; 1977.

[14] Perks, E. R.: "The Diagnosis and Management of Sudden Col- lapse in Dental Practice," Br Dent J, 143: Pt. 1, 196-200; Pt. 2, 235-237; Pt. 3, 307-310; 1977.

[15] Schizatschky, M.: "Basic Emergency Kit," Quintessence Int, 3: 71, 1975.

[16] Zetz, M. R.: "Some Observations on Dental Office Emergen cies," In Current Therapy in Dentistry, Vol. 6, ed. Goldman, H. M., Gilmore, H. W., Irby, W. B., and McDonald, R. E., St. Louis: The C. V. Mosby Company, 1977, pp. 417-423.

[17] "Recognition and Treatment of Emergencies in the Dental Office," in Accepted Dental Therapeutics, 36th ed, Chicago: American Dental Association, 1975, pp. 1833.

[18] Staples, A. F.: "Cardiopulmonary Crises in the Dental Office," Dent Clin North Am, 17:473, 1973.

[19] Steven Schwartz, DDS; Jayakumar Jayaraman, BDS, MDS, FDSRCS, MS, PhD. Management of Pediatric Medical Emergencies in the Dental Office.

[20] Droub Kushari, Wassan AlManie, Khalid Alshehri, Abeer Alanazi, Suzan Sangoura, Rayan Bader, Nouf Alahmri, Yazeed Alzamel, Mshari Almohamdi, Asmaa Mazi, Eman Al-Khater. An Overview of Pediatric Dental Emergencies. JOURNAL OF HEALTHCARE SCIENCES Volume 3 Issue 12 2023.

[21] M. Shanthi. PEDIATRIC EMERGENCIES - A SYSTEMATIC REVIEW. ASIAN PACIFIC JOURNAL OF HEALTH SCIENCES, 2014;1:2:90-95.

[22] Sin M, Edwards D, Currie C, Corbett I. Prevalence of medical emergency events in primary dental care within the UK. Br Dent J. 2023; 235:9:721-726. doi:10.1038/s41415-023-6444-y
[23] Varoni EM, Rigoni M, Lodi G, et al. medical emergencies in dental practice: A nationwide web-based survey of Italian dentists. Heliyon. 2023; 9:3:e13910. Published 2023 Feb 23. doi: 10.1016/j.heliyon. 2023.e13910
[24] Jyoti Zingade, Garish Kumar, Pavan K Gujjar. Medical Emergencies in Dentistry: A Review.
[25] Jevon P. Medical emergencies in the dental practice poster: revised and updated. Br Dent J. 2020; 229:2:97-104. doi:10.1038/s41415-020-1789-y
[26] Management of Medical Emergencies. THE REFERENCE MANUAL OF PEDIATRIC DENTISTRY.
[27] Wallace CK, Hind V. Guide to paediatric medical emergencies. Br Dent J.2019; 227:9:783-789. doi:10.1038/s41415-019-0856-8
[28] 28.Atherton GJ, McCaul JA, Williams SA. Medical emergencies in general dental practice in Great Britain. Part 1: Their prevalence over a 10-year period. Br Dent J 1999 23; 186 (2): 72-79.
[29] Atherton GJ, Pemberton MN, Thornhill MH. Medical emergencies: the experience of staff of a UK dental teaching hospital. Br Dent J. 2000; 188 (6): 320-324.
[30] Clark A. Preparing for emergencies: resuscitation guidelines for general dental practice. Prim Dent J. 2014;3(1):58-63. doi:10.1308/205016814812136020
[31] Fast TB, Martin MD, Ellis TM. Emergency preparedness: a survey of dental practitioners. JADA. 1986; 112(4):499-501.
[32] Girdler, N.M., Smith, D.G. Prevalence of emergency events in British dental practice and emergency management skills of British dentists. Resuscitation. 1999; 41 (2): 159-167.