

REVIEW ARTICLE

Emergency and Basic Life Support in DentistrySanti Anggraini¹, Ahmad Jamaluddin², Norhayati binti Mohamad Amin³**ABSTRACT**

Dental emergencies represent a critical challenge requiring high preparedness, clinical competence, and an organized response system to prevent morbidity and mortality. This review aims to explore the prevalence of dental emergencies in Indonesia, highlighting epidemiological, systems-based management approaches, pharmacology, and medicolegal aspects. The findings indicate that the prevalence of dental emergencies continues to increase, along with changes in patient demographics, especially the elderly population with complex medical comorbidities, and advances in medical technology. Protocol-based approaches, such as the modified ABCDE for dentistry, have improved the effectiveness of emergency diagnosis and intervention. Integration of modern technologies, such as digital imaging and telemedicine, also accelerates clinical response. In addition, the implementation of a coordinated referral system and interdisciplinary collaboration have been shown to strengthen clinical outcomes. In the pharmacological realm, management of adverse reactions to local anesthetics and selection of safe anesthetic agents are top priorities to minimize the risk of complications. Medicolegal aspects also receive special attention, with a focus on the implementation of informed consent, comprehensive documentation, and risk management protocols to reduce litigation. This review article provides evidence-based recommendations to improve the quality of dental emergency management, including the need for ongoing education and training for dental practitioners. With a holistic, evidence-based approach and interdisciplinary collaboration, the impact of dental emergencies on patient health can be significantly minimized, improving the standard of dental care in Indonesia.

Keywords: Dental emergencies, systemic management, emergency pharmacology

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INTRODUCTION

Emergency in dental practice is a clinical situation that requires immediate and appropriate treatment to prevent serious morbidity or even death. In the last decade, the complexity of dental services has increased significantly, in line with the development of invasive procedures and the use of various pharmacological agents that can trigger emergency conditions. Recent studies

show that around 3.5-7% of all visits to hospital emergency departments are related to dental and oral problems, with severity varying from mild to life-threatening¹. This phenomenon emphasizes the importance of the readiness and competence of dentists in dealing with emergency situations. The development of technology and increasing patient expectations for dental care have presented new challenges in the management of dental emergencies. A comprehensive survey

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conducted in 2022 revealed that 68% of dentists reported at least one medical emergency in their practice during the past year, with allergic reactions, syncope, and hypertensive crises being the most frequent cases. These data underline the urgency of a thorough understanding of emergency management protocols and the need for an organized response system in modern dental practice.

Global demographic shifts, particularly the increasing population of elderly and individuals with complex medical conditions, have given a new dimension to the urgency of emergency management in dentistry. Recent studies have shown that approximately 25% of patients seeking dental care have at least one chronic medical condition that may increase the risk of complications during treatment². This creates challenges for dental practitioners in integrating comprehensive medical understanding with technical skills in dentistry. The legal and ethical aspects of managing dental emergencies have also undergone significant evolution. Health laws in various countries, including Indonesia, set specific standards on the obligations of dentists to provide emergency care. A study conducted by Citra Budi et al. revealed that unpreparedness in dealing with emergency situations can not only threaten patient safety but also have serious legal implications for practitioners. This emphasizes the importance of continuous updating of knowledge and skills³.

Advances in dental pharmacology and anesthesia techniques have brought new advances and risks to dental practice. A retrospective analysis conducted by Loho showed an increasing incidence of adverse reactions to local anesthesia and sedation, with 2.8% of cases requiring emergency intervention. The findings emphasize the importance of a thorough understanding of pharmacodynamics, pharmacokinetics, and protocols for managing drug complications in the dental setting⁴. Odontogenic infections remain one of the leading causes of emergency in dentistry, with the potential for life-threatening spread. Recent epidemiological data indicate that 8-12% of odontogenic infections progress to facial space infections requiring emergency care⁵. The complexity of the orofacial anatomy and the tendency for infections to spread rapidly require a timely and accurate diagnostic and therapeutic approach.

Dental and maxillofacial trauma is an important category in dental emergencies, with long-term implications on function and aesthetics. A multicenter study conducted by Dahong & Winarso reported a 23% increase in dental trauma cases during the pandemic period, with higher case complexity due to delays in seeking care. The findings emphasize the importance of effective trauma management protocols and an organized referral system. Management of patients with comorbid medical conditions in the dental emergency setting requires a coordinated multidisciplinary approach⁶. A recent study revealed that 15-20% of dental emergencies involve systemic complications that require collaboration with other medical specialists⁷. This emphasizes the importance of developing collaborative networks between health professions in emergency case management.

Finally, the development of information technology and telemedicine has opened up new opportunities in dental emergency management. The implementation of digital-based emergency communication systems and telemedicine has shown potential in improving access and quality of dental emergency services, especially in areas with limited access to specialist health facilities⁸. This innovation offers a potential solution to address gaps in dental emergency services, while creating new challenges in terms of regulation and standardization of practice.

METHODS

This study applied a qualitative descriptive approach based on a comprehensive literature review to analyze and integrate the latest findings on emergencies in dentistry. The research process was carried out systematically through a series of structured stages to ensure the validity and reliability of the analysis results. Literature exploration was carried out by accessing various reputable electronic databases, including PubMed/MEDLINE, Scopus, Science Direct, and Google Scholar. This search focused on relevant articles published during the period 2020 to 2024. The literature search strategy was designed using a combination of specific keywords such as “dental emergencies”, “emergency dentistry”, “dental trauma emergencies”, “odontogenic infection emergencies”, “medical emergencies in dental practice”, and “emergency management in dentistry”. The search was also enriched

with additional terms such as “prevention”, “management”, “protocol”, and “guidelines” to ensure a broad scope of perspectives. This process resulted in a total of 1,200 initial articles from various sources. Then, screening was conducted through the application of strict inclusion and exclusion criteria. Inclusion criteria included: (1) articles written in English or Indonesian, (2) articles published in peer-reviewed journals, (3) original research, systematic reviews, or meta-analyses, (4) articles published in the 2020-2024 period, and (5) articles whose main focus was on emergencies in dental practice. On the other hand, exclusion criteria included: (1) opinion or editorial articles, (2) single case reports, (3) articles that were not fully accessible, and (4) publications in languages other than English or Indonesian. Initial screening based on abstracts and titles reduced the number of articles to 350. Further screening by reading the full text of articles that met the criteria eliminated another 200 articles, so that 150 final articles were selected for further in-depth analysis. Each article that met the criteria was analyzed using a systematic content analysis approach. A structured data extraction matrix was used to identify the main themes, methodology used, key findings, and clinical implications of each article.

The analysis was conducted independently by two researchers to minimize interpretation bias, with a consensus discussion mechanism used to resolve disagreements. In addition, to ensure the quality and validity of the articles analyzed, a critical evaluation was performed using instruments appropriate to the study design. Observational studies were evaluated using the STROBE checklist, systematic reviews using the PRISMA checklist, and interventional studies using the CONSORT checklist. These assessments contributed to the final selection of articles and ensured that the data synthesis was based on credible and high-quality sources. Data synthesis was performed by integrating findings from various literature sources to produce a comprehensive perspective on emergencies in dentistry. The synthesis process included identifying patterns, trends, and relationships between concepts relevant to the study objectives. This approach also allowed for a comparative analysis of the different emergency management approaches reported in the literature.

Data obtained were then grouped into key themes,

such as epidemiology of dental emergencies, protocol-based management, the role of technology in emergency response, pharmacological aspects, multidisciplinary collaboration, and medicolegal considerations. These themes were presented in a structured narrative format supported by tables and diagrams to facilitate deeper understanding. To ensure objectivity and credibility of the results, triangulation of data sources was performed by comparing findings from different types of publications, including empirical studies, systematic reviews, and clinical guidelines. In addition, relevant secondary and grey literature were also used to gain broader context. Data from different sources were compared to ensure consistency and identify potential bias. The references used were systematically documented using Mendeley reference management software, which facilitates tracking and verification of sources. The documentation process included recording complete bibliographic details and organizing the references based on the identified themes.

Methodological limitations in this study are explicitly acknowledged to ensure transparency. Identified limitations include: (1) potential publication bias, due to the tendency to select only articles published in reputable journals, (2) limited access to some paid articles, which may limit the scope of the literature analyzed, and (3) potential language bias, as only articles in English and Indonesian were included. These limitations are noted to aid interpretation of the results and provide recommendations for further research. The results of the data synthesis indicate several important trends in emergency management in dentistry. This study also makes a significant contribution to the development of more effective and evidence-based emergency protocols. The conclusions and recommendations of this study are presented systematically to support practical implementation and guide future research in this area.

RESULTS AND DISCUSSION

A. Epidemiology and Classification of Emergencies in Dental Practice

Prevalence and Distribution of Cases: Comprehensive epidemiological analysis shows a significant increase in the frequency of dental emergencies. A multicenter study conducted by Eszwarra & Basabih of up to 3,500 dental practices in Asia Pacific revealed that 72% of dental

practices reported at least one serious emergency in the past year. Demographic distribution showed that 45% of cases occurred in the age group 55-70, with a predominance in patients with medical comorbidities. Major risk factors included a history of cardiovascular disease (38%), uncontrolled diabetes mellitus (27%), and coagulation disorders (15%). The increase in invasive dental procedures and changing demographic profiles of patients contribute to the complexity of emergency management.

Emergency Categorization: The current classification system divides dental emergencies into two main categories: medical emergencies in a dental setting and pure dental emergencies. Hasan, Pradana & Bachtiar developed a scoring system to determine the severity, taking into account vital signs, level of consciousness, and potential life-threatening complications. Medical emergencies dominate (65%) with the main manifestations being cardiovascular complications and allergic reactions, while pure dental emergencies (35%) are dominated by acute infection and trauma¹⁰.

B. System-Based Emergency Management

Initial Evaluation and Stabilization: The application of the ABCDE (Airway, Breathing, Circulation, Disability, Exposure) protocol in emergency management in dental practice has undergone significant modifications to improve its clinical relevance. Anderson et al. reported that the use of a modified dental emergency assessment protocol, known as the Modified Dental Emergency Assessment Protocol (MDEAP), successfully increased the accuracy of the initial diagnosis by 78% and accelerated the response time by 45%¹¹. The MDEAP integrates the basic principles of the ABCDE protocol with a special emphasis on orofacial aspects, such as the evaluation of airway patency related to oral cavity conditions and recording specific vital signs for early detection of life-threatening complications. This study was part of a multicenter study involving more than 200 dental clinics in North America and Europe, providing strong external validity to the findings.

The primary assessment technique in MDEAP focuses on a rapid evaluation of the patient's cardiorespiratory status considering the potential risk of airway obstruction due to bleeding, tissue edema, or foreign bodies in the oral cavity. This

assessment often includes the use of additional diagnostic tools, such as a pulse oximeter and a portable blood pressure monitor, to ensure accurate measurements. The secondary assessment includes a more detailed medical and dental history, including documentation of medication use, allergies, and comorbid conditions that may affect the choice of emergency intervention. This is important to reduce the risk of complications that may occur during the clinical procedure. Although the MDEAP protocol has been shown to be highly effective, its implementation requires intensive training.

In the context of systems-based emergency management, these findings demonstrate the importance of a multidimensional approach that combines evidence-based protocols, ongoing training, and the use of modern diagnostic technologies. Further research is needed to evaluate the adaptation of these protocols across different patient populations and clinical settings, particularly in developing countries with limited access to healthcare resources. The study by Anderson et al. noted that interactive simulation-based training increased protocol adherence rates by 85%, which directly impacted patient outcomes. Furthermore, the study provides strong evidence that a systematic, standardized assessment, such as the MDEAP, can reduce the number of diagnostic errors and improve the efficiency of emergency management in the modern dental setting¹¹.

Organized Response System: Developing an organized response system requires the integration of various essential components. Mulya & Fahrizal identified that the implementation of a structured emergency response team (ERT) increased the survival rate in serious emergency cases by 62%. This system includes specific role divisions, standard communication protocols, and efficient emergency logistics management. Regular evaluations and team-based simulations are essential components in maintaining system readiness¹².

C. Special Emergency Handling Protocol

Basic Life Support: Dental procedures may result in loss of airway patency related to primary pathology or complications of the procedure (e.g. bleeding, secretions, tissue swelling). Cardiac arrest in dentistry is usually associated with pre-existing comorbidities, procedural complications

or allergic reactions. All dental professionals should undergo annual practical training in the recognition and management of medical emergencies, including CPR, including basic airway management and use of an AED. Special protocols for cardiac arrest in dentistry include airway management by examining the patient's mouth and removing all solid materials from the oral cavity (e.g., retractors, suction tubes, tampons). Prevention of foreign body airway obstruction should precede positioning. Special protocols for chest compressions include reclining the dental chair to a full horizontal position and placing a stool under the backrest for stabilization. Chest compressions are started immediately with the patient supine in the chair. Over-the-head CPR techniques should be considered if access to both sides of the chest is limited. Specialized resuscitation equipment, including suction, oropharyngeal airway, self-pump bag with face mask, oxygen, and emergency medication kit, should be readily available¹³.

Cardiovascular and Respiratory Emergencies:

Cardiovascular emergency management has undergone significant updates with the integration of modern monitoring technology. Purwadi & Fatriadi reported that the use of automated external defibrillators (AEDs) in the dental setting increased survival rates in cardiac arrest cases by 45%¹⁴. Vasovagal syncope management protocols emphasize early identification of prodromal signs (e.g., pallor, cold sweats, and mild hypotension) to allow for preventive interventions, including repositioning the patient to a supine position with leg elevation. In addition, hypertensive emergency management in dental practice follows a stepwise algorithm that takes into account the patient's comorbid conditions, with continuous blood pressure monitoring and administration of oral or intravenous antihypertensives as clinically needed. The respiratory aspect of dental emergencies also plays an important role in ensuring patient stability.

Airway obstruction is often a major risk due to secretions, bleeding, or edema of orofacial tissues. The American Heart Association (AHA) protocol recommends the use of suction to clear the airway of secretions or material that may impair patency. Suction devices should be available in all dental offices performing invasive procedures for rapid response to potentially life-threatening complications. In addition,

oxygenation is a key element in supporting respiratory function in patients with acute respiratory distress. Oxygen administration via nasal cannula or face mask is recommended for patients with hypoxemia or decreased oxygen saturation. In emergency situations, such as acute bronchospasm or anaphylaxis, administration of inhaled bronchodilators followed by oxygen supplementation may help restore respiratory function¹⁵.

Recent studies have shown that emergency management involving timely oxygen administration improves clinical outcomes by up to 50% in complex cases^{16,17}. This protocol should be complemented by regular training for clinic staff to ensure efficient and standardized use of suction and oxygen equipment. In addition, the provision of oxygen saturation monitoring devices such as pulse oximeters is an important step to monitor patient response in real time. With an integrated, evidence-based approach, the management of cardiovascular and respiratory emergencies in the dental setting can significantly reduce the risk of patient morbidity and mortality.

Infectious Emergency: The approach to acute odontogenic infection requires a comprehensive assessment of anatomic spread and potential systemic complications.¹⁴ Developed a scoring system to stratify the risk of odontogenic infection, with 89% sensitivity in predicting the need for emergency surgical intervention. Management of spread of infection to the facial space integrates rapid diagnostic imaging with timely surgical intervention to prevent serious complications.

Trauma and Bleeding: Modern dentoalveolar trauma management protocols emphasize preservation of tissue vitality and functional reconstruction as top priorities. Dentoalveolar trauma involving avulsed teeth requires immediate attention to maximize the success of reimplantation. The use of tissue preservation media such as Hank's Balanced Salt Solution (HBSS) or cold milk has been shown to improve the viability of the periodontal ligament, which plays an important role in the prognosis of dental reimplantation. The application of digital imaging technology, including 3D radiography based on CBCT (Cone Beam Computed Tomography), allows for more accurate evaluation of the extent of injury and the position of vital structures. A study by Dahong & Winarso reported that the

integration of digital imaging in the diagnosis and treatment planning increased clinical success by 35%, especially in complex trauma cases involving alveolar bone fractures⁶.

Bleeding control in maxillofacial trauma cases involves a combination of local hemostasis techniques and structured systemic management. Local hemostasis is achieved using direct pressure, application of topical hemostatic agents, or suturing of the wound if necessary. Modern hemostatic agents such as fibrin sealants and collagen hemostatics have shown high efficacy in stopping active bleeding without inhibiting wound healing. In patients with coagulation disorders or those on anticoagulants, pre-treatment coagulation status evaluation is essential to prevent hemorrhagic complications. A study by Purwadi & Fatriadi highlighted that a multidisciplinary approach, involving consultation with a hematologist for high-risk patients, can reduce the incidence of massive bleeding by up to 40%¹⁷.

In addition, a systematic hemorrhage management protocol includes continuous monitoring of the patient's vital signs to detect signs of hypovolemic shock. The use of crystalloid solutions and blood transfusion, if necessary, are integral parts of systemic management in cases of severe trauma. The role of a multidisciplinary team, including maxillofacial surgeons, anesthesiologists, and emergency nurses, is essential to ensure a holistic and evidence-based approach. With an integrated approach, the prognosis of patients with dentoalveolar and maxillofacial trauma can be significantly improved, as noted by a recent study by Qalbi et al. showed a 45% increase in treatment success when this protocol was consistently applied⁵.

D. Pharmacological Aspects in Dental Emergencies

Adverse Reactions Management: A comprehensive analysis of adverse reaction management in dental practice revealed significant patterns in the frequency and complexity of cases. A multicenter study done by Putri & Krisnawati involving 3,000 dental emergencies showed that adverse reactions to local anesthetics accounted for 35% of the total emergency events. Reported manifestations ranged from mild reactions such as urticaria to anaphylactic shock requiring emergency intervention.¹⁸ The

standard protocol for anaphylaxis management includes administration of epinephrine via an auto-injector, accompanied by a continuous vital sign monitoring system. This approach has been shown to reduce morbidity by up to 65% in severe cases. In the context of local anesthesia complications, a recent study identified that 28% of cases were due to improper injection technique, 22% due to anesthetic overdose, and 50% were related to patient predisposing factors that were not detected during initial screening⁸. Pre-anesthesia assessment (preoperative assessment) is a crucial step in preventing these complications. This procedure includes collecting comprehensive medical information, including history of allergies, medication use, and comorbid conditions such as coagulation disorders or cardiovascular disease. This assessment also involves selecting an anesthetic agent tailored to the patient's risk profile.

In clinical practice, anesthesia administration, including sedation, is often performed by dentists who have specialized training in local anesthesia management. However, for procedures requiring general anesthesia or deep sedation, an anesthesiologist is usually involved to ensure safety and manage potential complications. Collaboration between dentists and anesthesiologists is key in high-risk procedures, especially in patients with complex medical conditions. Drug interactions are a major concern, especially in patients with polypharmacy. Thorough screening of medication history and consultation with primary care physicians are essential steps in preventing potentially harmful side effects. Research shows that the use of evidence-based protocols in anesthesia screening and administration can reduce the incidence of complications by up to 40%. With a systematic and collaborative approach, the risk of anesthesia complications in dental practice can be minimized, significantly improving patient safety and quality of care.

Emergency Pharmacology

Evaluation of emergency pharmacology practices revealed the importance of a systematic approach in the selection and administration of emergency medications. Widiyanto et al. explained that the availability of a standard emergency formulary and accurate dosage calculation protocols increased treatment effectiveness by 75%. The

study identified five categories of essential medications that should be available in the dental setting: vasopressors, antihistamines, bronchodilators, corticosteroids, and sedative antagonists¹⁹. A digital-based therapeutic effect monitoring system showed increased accuracy in tracking patient response and early detection of adverse events. The implementation of an electronic monitoring system has been shown to increase the safety of emergency medication use by 55% and speed up response time to changes in patient conditions.

E. Multidisciplinary Referral and Collaboration System

Referral Criteria and Mechanism

Analysis of the dental emergency referral system done by Mustika et al. identified that the implementation of standardized referral criteria improved transfer timeliness and patient outcomes by 62%. A pre-referral stabilization protocol that included airway, breathing, and circulation (ABC) management and structured documentation was shown to reduce complications during transfer by 45%²⁰. An integrated electronic documentation system facilitated more effective transfer of information between referring facilities, with data accuracy reaching 95% compared to a manual system of only 78%. Standardization of emergency documentation formats and use of patient transfer checklists improved the completeness of clinical information and continuity of care.

Interdisciplinary Coordination

Study done by Sari et al. regarding the effectiveness of interdisciplinary collaboration in dental emergency management, it was revealed that the implementation of a structured communication system between specialists improved patient outcomes by 58%. The formation of a multidisciplinary emergency response team involving dentists, emergency physicians, and related specialists has been shown to reduce response time and improve the quality of treatment. A structured post-emergency follow-up system, including short-term and long-term monitoring protocols, showed a 40% reduction in secondary complications²¹. The integration of telemedicine into the follow-up system allows early detection of complications and timely intervention.

F. Legal Aspects and Service Quality

Standard Procedures and Documentation

Evaluation of the implementation of a quality management system in the dental emergency setting studied by Ashari & Sjaaf revealed that standardization of protocols and documentation increased adherence to clinical guidelines by 85%²². A system of periodic clinical audits and evaluation of measurable indicator-based outcomes facilitated the identification of areas for improvement and the development of evidence-based protocols. An electronic health record (EHR) specifically designed for dental emergencies improved documentation accuracy by 70% and facilitated trend analysis and identification of complication patterns. The system also supported the ongoing clinical audit process and evaluation of service quality.

Medicolegal Considerations

Analysis of the medical legal aspects of dental emergencies done by Kumalasari identified that the implementation of a structured emergency consent system reduces the risk of litigation by 65%. Risk management protocols that include pre-treatment assessment, comprehensive documentation, and effective communication with patients and families have been shown to increase legal protection for practitioners and institutions²³. The development of a legal protection framework that includes incident handling protocols, reporting systems, and periodic review mechanisms increases institutional readiness to face medical challenges. The implementation of this system has been shown to reduce the frequency of malpractice claims by up to 55% and increase effective case resolution.

CONCLUSION

The conclusion of this study shows that dental emergencies are an important aspect that requires high preparedness, clinical competence, and an organized response system to protect patient safety. Dental emergencies involve a wide spectrum of problems, ranging from syncope, dentoalveolar trauma, anaphylactic reactions, to odontogenic infections that can develop into life-threatening systemic conditions. The complexity of these cases is increasing with the growth of the elderly population and patients with medical comorbidities, which requires a multidisciplinary approach for effective

management. Protocol-based management approaches, such as the modified ABCDE for dental practice, have been shown to improve diagnostic accuracy and efficiency of emergency interventions. The integration of modern technologies, including digital imaging systems, the use of automated defibrillators (AEDs), and telemedicine, has strengthened diagnostic capabilities and accelerated clinical response in emergency situations. In the pharmacological aspect, management of adverse reactions to local anesthetics and sedation is a top priority.

Careful pre-anesthetic assessment and selection of appropriate anesthetic agents based on the patient's risk profile have been shown to be effective in reducing the incidence of complications by up to 40%. A standardized emergency formulary system, complemented by clear drug administration protocols, plays a

key role in improving the safety and efficiency of emergency treatment. In addition, legal and ethical dimensions are integral elements in the management of dental emergencies. The implementation of proper informed consent, structured documentation, and an audit-based risk management system have helped reduce the potential for litigation and increase patient confidence in dental health services. Therefore, emergency management in dentistry requires a combination of clinical competence, modern technology, and interdisciplinary collaboration supported by evidence-based regulations. With this holistic approach, the negative impact of dental emergencies on patient morbidity, mortality, and quality of life can be significantly minimized, providing optimal service standards in the field of dental health.

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