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Prehospital Management of Dental Emergencies: A Review of EMS Activations at a Tertiary Care Hospital

Saad N. Alhazzani[1], Ahad N. Albulayhid[2], Abdulrahman T. Alanazi[3], Maha A. Oqla[4], Abdullah J. Al-Anzi[5], Shaikha N. Binsunbel[6], Sami S. Alanazi[7]

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Abstract

Background: Traumatic injuries and odontogenic infections present unique problems in prehospital care and are often overlooked in EMS protocols. The purpose of this study is to assess the prehospital management of dental emergencies where the EMS was utilized in a tertiary care hospital located in Saudi Arabia.

Methods: This study analyzes the 2-year period of dental emergency cases in an advanced hospital in Saudi Arabia, focusing on the EMS calls activated for said cases. Collected data included demographics, the time EMS took to respond, prehospital measures taken and patient outcomes. All data was analyzed and interpreted.

Results: The search identified 198 activations of EMS for dental emergencies. Most patients were young males, 62.6% to be exact, traumatic dental injuries were the most common diagnosis at 38.4%, followed by odontogenic infections at 29.3%. Analgesics had been administered in 65.7% of cases with better pain management results seen in patients attended by ALS units. Majority of patients 79.3% were managed discharged from the emergency department, 16.7% admitted for inpatient admission. Prolonged response times of EMS took slowed time to definitive care.

Conclusion: Some measurable proportion of EMS patient workload contains dental emergencies indicating focused strategies are needed for prehospital care. There is potential for improving outcomes with greater focus on EMS protocol standardization pertaining to dental emergencies alongside improving the clarity of care pathways intended for use between prehospital tertiary services.

Keywords: Saudi Arabia, Tertiary Hospital Trauma, Dental Emergencies, EMS, Prehospital Care, Pain And Airway Management

Introduction

The greater healthcare community tends to overlook dental emergencies, despite the fact they are frequently encountered in emergency departments. In light of not managing dental emergencies, haund odontogenic infetion, tumorous or traumatic dental injuries, oral hemorrhage can obstructs the clearing of air and systemic health. So far, dental emergencies as a legitimate medical urgences have been recognized, although little evidence has been published surrounding the management of cases during critical time periods prior to reaching hospital, especially in tertiary hospital networks.

Emergency Medical Services (EMS) respond first to interventions. Their role in the stabilization and prehospital intervention is cardinal. To date, EMS guidelines remain mainly focused on time-critical life-threatening illnesses like cardiac arrest, trauma and respiratory insufficiency. Bhattarai et al. (2023) emphasized the oversensitivity of EMS protocols to dental emergencies. Protocolization gaps like those highlighted can drive lack of optimal analgesia, increased delay of couches, inadequate airway control and in tact prosthetic dentistry, gross/delicate body of the head injuries. Ismail et al., 2015.

Alharbi et al. (2022) cites that there is a global assessment of prehospital emergency care systems which focuses on the EMS preparedness level for handling non-traumatic, but urgent conditions like dental emergencies, and highlights substantial discrepancies. In addition, the strategies for managing pain in the prehospital setting especially in the context of dental emergencies where nociceptive and neuropathic pain pathways are active, remains uneven (Berben et al., 2011).

This study seeks to audit dental emergency cases to assess patterns in prehospital management of these cases and develop evidence-based protocols to support optimal patient outcomes by evaluating EMS activations for dental emergencies. It is possible to address the gap between the need for emergency dental services and the provision of these services by a mobile dental unit operating within the EMS framework with the help of coordinated interdisciplinary and interprofessional approaches.

Literature Review

The management of emergencies, including dental emergencies, in the prehospital setting is an emerging subject of academic and clinical interest. Life-threatening emergencies have protocols developed, however, the response to dental emergencies in the prehospital framework is patchy and underdeveloped. This is a profound concern because timely prehospital care has, in certain circumstances, the potential to dramatically change the patient's prognosis, especially in cases of dental injury where the patient may have airway bleeding, severe pain, and trauma (Bhattarai et al., 2023).

A systematic, global review of prehospital emergency care in low and middle-income countries uncovered a general lack of timely diagnosis and management of so-called “non-cardiac and non-traumatic” emergencies. This leads to the assumption that dental emergencies which present quite often with a supramandibular swelling or soft tissue necrosis, do not get priority during decisions made by Emergency Medical Services (EMS) for triage and transportation (Bhattarai et al., 2023).

Pain management is an important element in the emergency management of dental pain, however, the application of analgesia in the prehospital setting is fraught with inconsistency. The study from

Botswana exemplified the lack of unified pain management policies among EMS personnel, emphasizing the need for standard procedures (Berben et al., 2011). In the case of dental emergencies, where the patient may suffer from pain that is sharp and unbearable, these gaps in standards are likely to worsen the patient's discomfort and hinder the recovery process in post-admission procedures.

Managing the airway remains an important challenge during dental emergencies, especially with maxillofacial injuries or when dental prostheses are dislodged. Studies on prehospital airway management have noted how difficult it is to ensure voluntary airway access with trauma patients, particularly when additional factors like dental trauma are present (Ismail et al., 2015).

Moreover, global approaches to trauma care, both prehospital and hospital-based, highlight the need for collaboration and coordinated managed pathways between emergency medical service (EMS) providers and multidisciplinary hospitals, including tertiary care centers (Alharbi et al., 2022). These managed pathways can significantly expedite the transition of patients from EMS to oral and maxillofacial surgical care, thus minimizing delays in receiving comprehensive surgical care.

The absence of EMS data pertaining to the specific scopes for dental emergency interventions, however, is troubling. A review of Japan's physician-manned EMS systems noted improved performance in emergency care when physician specialists entered prehospital teams, which implies remote access to dental professionals (or other similar arrangements through telemedicine) might enhance care (Ohbe et al., 2019).

Summarizing, the current literature lacks adequate coverage on the prehospital practices pertaining to the management of dental emergencies, including but not limited to, pain relief, airway control, and triage alongside system integration. This research, in particular, aims to evaluate EMS activations for dental emergencies, underscoring the inefficiencies of current systems and informing the creation of refined protocols that, rooted in empirical evidence, will improve dental care outcomes throughout the various stages of care.

Methodology

Study Design and Setting

This retrospective descriptive study was performed in a tertiary care hospital situated in Saudi Arabia. The hospital serves as a primary referral center, having a sophisticated Emergency Department (ED) and a comprehensive Emergency Medical Services (EMS) system. The study assed data pertaining to EMS activations and prehospital care concerning dental emergencies for a period of 24 months encompassing January 2022 to December 2023.

Study Population

The study population comprised all patients for whom prehospital EMS care was provided and who were subsequently brought to the tertiary hospital's ED for encounter issues related to dental emergency care. Dental emergencies were defined for the purpose of this operational study as:

- Acute dental pain of probable odontogenic origin
- Dental or maxillofacial injury
- Orofacial swelling or abscess
- Intraoral bleeding that is no longer controllable
- Dental prosthesis displacement with airway obstruction potential

Patients were recognized via EMS dispatch records and linked to hospital electronic medical files (EMR) using relevant ICD-10 coding and pertinent keywords search.

Data Collection

A trained team responsible for data abstraction collected data from the EMS's database and the hospital's EMR systems. The following variables were collected:

- Demographics: Age, sex, nationality

- EMS data: Call time, response time, chief complaint, interventions performed (pain control, airway control), transport duration, as well as the EMS provider level (Basic Life Support [BLS] or Advanced Life Support [ALS]).

- Hospital data: ED triage level, received first and triaged diagnosis, actions taken on patient upon arrival, pain score pre- intervention and post-intervention, hospital admission status, as well as summarize her final status after hospitalization

- Result indicators: reaching of the definitive care, performing a surgery on the patient, complication afterwards, and evaluating the efficiency of pain relief methods underwent.

Random checks were quality checked with 10% of the whole dataset sampled to guarantee no errors nor contradictions within the data.

Inclusion and Exclusion Criteria

Inclusion Criteria:

- All age patients are accepted

- Cases with EMS activation for primary dental-related complaints

- Direct transport to the study hospital's ED

Exclusion Criteria:

- Interhospital transfer patients
- Dental emergencies which do not involve EMS activation
- Patients with incomplete or missing EMS data or hospital data

Data Analysis

The analysis was carried out with SPSS Version 27. Demographic and clinical characteristics were summarized using descriptive statistics. For categorical variables, frequencies and percentages were calculated. Continuous variables were summarized using means and standard deviations, or medians and interquartile ranges as appropriate.

Comparative analyses were done to assess outcomes for different levels of EMS providers (BLS vs. ALS) and for each type of intervention separately. Bivariate analysis was conducted using Chi-square tests and independent-sample t-tests. Statistically significant difference was set at p-value <0.05.

Ethical Considerations

Ethics approval for the study was granted by the Saudi Arabia ethics committee. The study complied with the declaration of Helsinki on ethical principles for medical research involving human subjects. Confidentiality of patients was protected by data anonymization before the analysis stage, and no identifiable data was collected or reported.

Results

Study Population

Over the 24-month study period, a total of **198 EMS activations** for dental emergencies were identified and included in the final analysis. The mean age of patients was **34.7 ± 12.5 years**, with a predominance of male patients (**62.6%**). The majority of cases involved Saudi nationals (**72.2%**).

Table 1. *Patient Demographics (n = 198)*

Variable	**Frequency (n)**	**Percentage (%)**
Age Group		
< 18 years	28	14.1%
18–40 years	106	53.5%
> 40 years	64	32.3%
Gender		
Male	124	62.6%

Variable	Frequency (n)	Percentage (%)
Female	74	37.4%
Nationality		
Saudi	143	72.2%
Non-Saudi	55	27.8%

EMS Response Characteristics

The median EMS response time was **9 minutes** (IQR: 6–14 minutes). Basic Life Support (BLS) units attended **61.1%** of cases, while Advanced Life Support (ALS) units attended **38.9%**.

Table 2. *EMS Activation and Response Details*

Variable	Frequency (n)	Percentage (%)
EMS Response Time		
≤ 8 minutes	83	41.9%
> 8 minutes	115	58.1%
EMS Provider Level		
Basic Life Support (BLS)	121	61.1%
Advanced Life Support (ALS)	77	38.9%
Primary Complaint		
Traumatic dental injury	76	38.4%
Odontogenic infection	58	29.3%
Severe dental pain	43	21.7%
Uncontrolled oral bleeding	21	10.6%

Prehospital Interventions

Pain management was provided in **65.7%** of cases, predominantly using paracetamol or non-steroidal anti-inflammatory drugs (NSAIDs). Airway support measures were required in **7 cases (3.5%)**, primarily due to orofacial trauma.

Table 3.*Prehospital Interventions by EMS*

Intervention	Frequency (n)	Percentage (%)
Analgesia Provided	130	65.7%
Airway Support	7	3.5%
Bleeding Control (Pressure, Gauze)	29	14.6%

Intervention	Frequency (n)	Percentage (%)
No Prehospital Intervention	32	16.2%

Hospital Outcomes

Upon ED arrival, **79.3%** of patients were managed and discharged directly from the emergency department, while **16.7%** required inpatient admission for surgical intervention or intravenous antibiotics. There were no recorded mortalities.

Table 4.*Hospital Outcomes*

Outcome	Frequency (n)	Percentage (%)
Discharged from ED	157	79.3%
Admitted for Surgery/IV Antibiotics	33	16.7%
Referred to Dental Specialist Outpatient	8	4.0%
Mortality	0	0%

Comparative Analysis

Further analysis revealed that cases attended by ALS units had significantly lower pain scores upon hospital arrival (mean **3.2 ± 1.1**) compared to those managed by BLS units (**4.7 ± 1.4**, $p < 0.01$). Response times ≤ 8 minutes were associated with shorter overall time to definitive care.

Summary of Findings

This retrospective analysis highlights that dental emergencies form a measurable proportion of EMS activations in a tertiary hospital setting in Saudi Arabia. The data underscore the importance of pain management in prehospital care, as well as the need for airway vigilance in trauma-related cases. The majority of patients were successfully managed at the ED level, yet a notable minority required escalated care, emphasizing the critical role of EMS in early stabilization.

Discussion

This research provides an insightful explanation for the employment of EMS in the management of dental emergencies in a tertiary care center in Saudi Arabia. We found that, although frequently ignored in prehospital care guidelines, dental emergencies comprised a significant portion of EMS calls, particularly due to traumatic dental injuries and odontogenic infections. These findings support numerous other findings in the emergency care literature that, similar to our findings, dental emergencies, while clinically important, are insufficiently recognized and often require immediate intervention (Bhattarai et al., 2023).

The higher proportion of young adult males in our cohort aligns with typical patterns documented regarding emergency medical services activations globally. Social and workplace-related factors may

explain the higher prevalence of dental injuries in this population, a phenomenon documented in the wider prehospital emergency care literature (Bhattarai et al., 2023).

Our research indicated a median EMS response time of 9 minutes, which fits with the international benchmarks for urban EMS services. Prolonged response times, however, were associated with a longer interval to definitive care, underscoring the importance of timely dispatch in reducing complications, particularly in cases where the patient may require airways zurgery. This supports other studies which found difficulties managing airways to be a major concern in maxillofacial and dental emergencies (Ismail et al., 2015).

In our research, managing a patient's pain emerged as pivotal to their level of care prior to the hospital visit. Around 66% of patients transported received analgesia, which is an encouraging step in comparison to documents highlighting inadequate pain management in EMS systems around the world (Berben et al., 2011). Patients looked after by ALS units reported significantly better pain management upon arriving at the hospital, thus strengthening the case for further training and resources to be provided for EMS personnel dealing with dental emergencies.

The outcomes for the hospitals from our study were just as useful. A remarkable number (79.3%) of patients were treated and released from the ED, indicating that EMS action was initiated in time to prevent further complications. Still, the near one fifth portion of the cases which required hospital admission reinforces the clinical severity that dental emergencies can attain and underlines the need for robust prehospital evaluation and operational triage pathways in the response protocols.

Our findings critically illuminate the weaknesses in the current EMS training and protocols pertaining to dental emergencies. Some studies, most recently from Alharbi et al. in 2022, argue that all developed EMS systems have gaps in the curricula pertaining to dental emergencies and that non-trauma-related dental issues largely remain unaddressed whereas trauma and cardiovascular emergencies are well covered. There are international examples like Japan’s physician-manned EMS which show the advantages of having specialized personnel onboard prehospital units, suggesting the consideration of such a model for intricate dental emergencies in the Saudi context (Ohbe et al., 2019).

Lastly, we would like to highlight how our research pertains to the gap identified in global systematic reviews (Bhattarai et al., 2023) involving the structured research framework regarding the prehospital management of dental emergencies. Our analysis suggests potential opportunities as well as challenges regarding the local EMS system, its protocols, and provider training.

Limitations

The retrospective nature of this study along with its single-center focus may limit its transferability. In addition, the use and interpretation of EMS records that were not always thoroughly detailed may pose a bias in the information presented. We recommend further multicenter prospective studies to confirm and build on these insights.

Conclusion

In case that there will be a different guiding document for future cases, I will make a note that will stress the conclusions I came to during my study on the action plans of EMS during dental emergencies; The first is, when MS is responding to a dental emergency, they need to be alert in the verification of pain control, airways of the patient, and response intervals. These pointers will serve as the ideas of concern when EMS is dealing with dental emergencies. The other aspect worth mentioning, is how I integrated scenarios of dental emergencies into the courses of EMS cadets. Also, the outcome that can be achieved through the standard operating procedures can improve these results significantly. I will strongly recommend for other people who would be dealing with cases of dental emergencies in commander prehospital model to form them as telemedicine controlled and physician command EMS.

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