بسم الله الرحمن الرحيم

Napata college Sudan

Dentistry program

Knowledge of Final Year Dental Students Regarding Management of Medical Emergencies in Sudanese Universities

Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Bachelor of Dentistry program

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الآية

بسم الله الرحمن الرحيم

قال تعالي:

﴿وَإِذَا مَرِضْتُ فَهُوَ يَشْفِينِ﴾

(سورة الشعراء: 114)

Dedication

To our cherished parents,
Whose love, prayers, patience, and lifelong sacrifices have been the cornerstone of our achievements. Your guidance and unwavering support have continually inspired us to move forward.

To our siblings,
For your faith in us, your encouragement, and the strength you provided throughout every step of this journey.

To our friends,
For your kindness, motivation, and shared moments that transformed challenges into meaningful experiences.

With sincere appreciation, this work is dedicated to each of you.

Acknowledgment and Appreciation

We gratefully acknowledge **Napata college Sudan** for fostering a supportive academic atmosphere and providing essential resources that facilitated the successful completion of this research.

We extend our profound appreciation to **Dr. Nagwa Malik Hussein**, for her exemplary supervision, insightful guidance, and unwavering support throughout this study. Her expertise, commitment, and valuable feedback were instrumental in strengthening the quality of this research and enriching our academic journey.

We sincerely appreciate all the support and encouragement received, which contributed significantly to the accomplishment of this work. We would like to extend our heartfelt thanks to Dr. **Salma Ibnomer**, the Dean, for her continuous support, encouragement, and belief in us. She has been more than a mentor—an inspiring teacher, a guiding figure, and a constant source of motivation throughout our journey.

We also sincerely appreciate the examiner for taking the time to review and discuss our work. We are truly grateful for your effort, valuable feedback, and for giving us the opportunity to present our research.

المستخلص

الخلفية :يمكن أن تحدث حالات الطوارئ الطبية بشكل غير متوقع في عيادات الأسنان، ويجب أن يكون طلاب السنة النهائية في طب الأسنان مستعدين بشكل كافٍ للتعامل معها. ومع ذلك، فإن البيانات المتعلقة بمستوى المعرفة لدى طلاب طب الأسنان السودانيين حول إدارة حالات الطوارئ شحيحة.

الهدف :هدفت هذه الدراسة إلى تقييم معرفة طلاب السنة النهائية في كليات طب الأسنان بالجامعات السودانية بشأن إدارة حالات الطوارئ الطبية، وتحديد العوامل المرتبطة بذلك.

المنهجية :أُجريت دراسة وصفية مقطعية شملت 78 طالبًا وطالبة من طلاب السنة النهائية في كليات طب الأسنان بالجامعات الحكومية والخاصة في السودان. تم جمع البيانات باستخدام استبيان منظم ذاتي التعبئة، تضمن البيانات الديموغرافية ومصادر المعرفة، بالإضافة إلى أسئلة حول التعرف على حالات الطوارئ الطبية وإدارتها. تم تحليل البيانات باستخدام برنامج SPSS الإصدار 26.0، حيث طُبقت الإحصاءات الوصفية، واختباراتt–test ، وتحليل التباين(ANOVA) ، واختبار مربع كاي .(Chi–square) اعتُبرت قيمة الاحتمال (p–value)الأقل من 0.05 ذات دلالة إحصائية.

النتائج :كانت غالبية المشاركين من الإناث (77.0%)، وتتراوح أعمارهم بين 24 و 26 عامًا (67.6%). على الرغم من أن 75.0% من المشاركين اعتقدوا أن المنهج الدراسي أعدهم بشكل كافٍ، إلا أن متوسط درجة المعرفة كان 4.51 من 8 فقط (56.4%). كانت أعلى نسب الإجابات الصحيحة في التعرف على هبوط سكر الدم (85.7%)، والتعرف على الحساسية المفرطة (70.0%)، واستخدام الشريان السباتي لقياس النبض (68.6%). تم تحديد فجوات معرفية كبيرة في التعرف على تسرع القلب (27.5% إجابات صحيحة)، والعلامات الحيوية الطبيعية (58.9%)، والسكتة الدماغية (47.1%)، وفسيولوجيا فرط التنفس (56.2%). سجل الطلاب الذين استخدموا مصادر متعددة للمعرفة (محاضرات، تدريب سريري، إنترنت) درجات أعلى بشكل ملحوظ مقارنة بأولئك الذين اعتمدوا على المحاضرات فقط) متوسط 5.71 مقابل 3.94، .(p = 0.002 لم توجد فروق ذات دلالة إحصائية بناءً على الجنس أو العمر أو نوع الجامعة.

الاستنتاج :يوجد تباين ملحوظ بين الإدراك الذاتي للجاهزية والمعرفة الفعلية لدى طلاب السنة النهائية في طب الأسنان بالسودان فيما يتعلق بإدارة حالات الطوارئ الطبية. توجد فجوات معرفية كبيرة في مجالات رئيسية. تُعد الاستراتيجيات التعليمية متعددة المصادر التي تدمج التدريب السريري والمحاكاة ضرورية لتعزيز الجاهزية وضمان سلامة المرضى.

Abstract

Background: Medical emergencies can occur unexpectedly in dental settings, and final-year dental students must be adequately prepared to manage them. However, data on the knowledge level of Sudanese dental students regarding emergency management is scarce.

Objective: This study aimed to assess the knowledge of final-year dental students in Sudanese universities regarding the management of medical emergencies and to identify associated factors.

Methods: A descriptive cross-sectional study was conducted among 78 final-year dental students from public and private universities in Sudan. Data were collected using a structured self-administered questionnaire covering demographic characteristics, sources of knowledge, and knowledge of medical emergency recognition and management. Data were analyzed using SPSS version 26.0, with descriptive statistics, independent t-tests, ANOVA, and chi-square tests applied. A p-value <0.05 was considered statistically significant.

Results: The majority of participants were female (77.0%) and aged 24–26 years (67.6%). While 75.0% felt their curriculum adequately prepared them, the mean knowledge score was only 4.51 out of 8 (56.4%). The highest correct responses were for hypoglycemia recognition (85.7%), anaphylaxis recognition (70.0%), and use of the carotid artery for pulse check (68.6%). Major knowledge gaps were identified in the recognition of tachycardia (27.5% correct), normal vital signs (58.9% correct), stroke (47.1% correct), and hyperventilation physiology (56.2% correct). Students who utilized multiple knowledge sources (lectures, clinical training, and the internet) scored significantly higher than those relying solely on lectures (mean 5.71 vs. 3.94, $p = 0.002$). No significant differences were found based on gender, age, or university type.

Conclusion: There is a notable discrepancy between perceived preparedness and actual knowledge among final-year dental students in Sudan regarding medical emergency management. Significant knowledge gaps exist in key areas. Multimodal educational strategies that integrate clinical training and simulation are essential to enhance preparedness and ensure patient safety.

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Chapter One

Introduction

Chapter One

Introduction

1.1 Introduction

Dentistry is often perceived as a discipline limited to the care of teeth and their surrounding structures. However, it is intrinsically connected to general medicine in many critical aspects. Dental procedures—particularly those involving medications, pain management, anxiety control, or invasive interventions—can precipitate significant systemic complications. With ongoing advancements in healthcare and an increase in life expectancy, the number of medically compromised patients has risen considerably. Consequently, dental practitioners are increasingly treating individuals with chronic conditions such as diabetes, hypertension, cardiovascular diseases, and respiratory disorders. Therefore, the role of the dentist extends beyond technical expertise to include the ability to identify, prevent, and manage medical emergencies, ranging from vasovagal syncope to life-threatening conditions like anaphylaxis and cardiac arrest.

Despite the fact that medical emergencies in dental settings are not uncommon, research indicates that many dentists feel inadequately prepared to manage such situations effectively. This gap between expected competency and actual preparedness can compromise patient safety and may also expose practitioners to legal and professional risks. Moreover, emergencies within the dental clinic are often sudden and require immediate intervention. Although dental settings are not designed as emergency units, they must be capable of functioning as such when necessary. Effective management in these situations depends on rapid

decision-making, coordinated teamwork, and familiarity with established emergency protocols.

Medical emergencies can occur unexpectedly during dental treatment and may lead to serious consequences if not handled properly. In dental departments, where patients frequently present with various systemic conditions, the likelihood of such events is increased. Common emergencies include syncope, allergic reactions, hypoglycemia, asthma attacks, seizures, and cardiovascular incidents. Early recognition and prompt management are essential to avoid severe outcomes. Therefore, dental professionals—including students and clinical staff—must possess adequate knowledge and training to respond effectively. Familiarity with emergency protocols, proper use of emergency equipment and medications, and competence in basic life support are fundamental requirements for safe practice. Ensuring preparedness in dental settings should be a priority, supported by continuous education, regular simulation exercises, and clear clinical guidelines. Keeping the entire dental team updated with current knowledge and skills can significantly enhance patient safety and treatment outcomes.

1.2 Problem Statement

In the realm of dentistry, medical emergencies are not an everyday occurrence; they are sudden, unpredictable events that can rapidly escalate into life-threatening situations. While their incidence may be low, the potential for serious harm to the patient when they do occur is high. Therefore, it is crucial for dentists not only to possess exceptional clinical skills but also to be thoroughly prepared to manage any emergency that may arise. A lack of readiness can lead to severe consequences, not only for the patient's well-being but also for the dentist’s professional reputation and the public’s trust in the dental profession.

This issue is particularly pertinent in Sudan, where the quality of dental education faces considerable challenges. Aspiring dentists in Sudan often navigate a complex educational landscape, frequently disrupted by political and economic instability. These disruptions can compromise the curriculum, potentially leading to gaps in critical areas such as medical emergencies preparedness. While global research has highlighted deficiencies in dental students' knowledge and confidence in handling medical emergencies, a significant gap exists in the literature concerning Sudanese universities. The level of preparedness among final-year dental students in Sudan remains largely unknown. Without this crucial baseline data, it is impossible to identify and address potential shortcomings in their training, thereby leaving future patient safety to chance. Therefore, a thorough evaluation is essential to assess the knowledge of these students and to pinpoint the gaps in their education that could put future patients at risk.

1.3 Justification

Medical emergencies can arise in any dental clinic, and their prompt and correct management is paramount for patient safety. Final-year dental students, who are on the cusp of entering professional practice, must be adequately prepared to handle such events. However, there is a dearth of information regarding the level of knowledge and preparedness among this cohort in Sudan. This study is therefore justified by the need to bridge this knowledge gap. By systematically assessing the knowledge of final-year dental students, this research will identify specific areas of weakness in their understanding of medical emergency management. The findings will provide valuable, evidence-based insights that can be used to refine the dental curriculum, enhance training programs, and ultimately contribute to

a safer dental practice environment in Sudan, protecting both patients and future practitioners.

1.4 Research Questions

1.4.1 General Research Question

- What is the current level of knowledge among final-year dental students in Sudanese universities regarding the management of medical emergencies?

1.4.2 Specific Research Questions

1. What is the distribution (frequency) of knowledge levels among final-year dental students concerning the management of medical emergencies in dental clinics?
2. To what extent do students know the appropriate immediate management steps for common medical emergencies?
3. Is there a significant difference in the knowledge level between students from public and private Sudanese universities?
4. What prior training (theoretical or practical) have the students received in managing medical emergencies in dental practice?

1.5 Objectives

1.5.1 General Objective

- To assess the level of knowledge of final-year dental students in Sudanese universities regarding the management of medical emergencies in the dental clinic.

1.5.2 Specific Objectives

1. To determine the frequency of different knowledge levels (e.g., adequate, moderate, inadequate) among final-year dental students regarding medical emergency management.
2. To evaluate students' knowledge of the appropriate immediate management steps for specific medical emergencies.
3. To identify the types and sources of prior training (practical or theoretical) that students have received in managing medical emergencies in dental practice.

Chapter Two

Literature Review

Chapter Two

Literature Review

2.1 Introduction

This chapter reviews the existing body of literature pertaining to medical emergencies in dental practice and the preparedness of dental professionals, with a specific focus on undergraduate dental students. The review begins by exploring the nature and frequency of medical emergencies encountered in dental settings. It then discusses the essential knowledge and skills required for effective management, followed by an examination of studies that have assessed the preparedness and knowledge levels of dental students and practitioners globally. Finally, the chapter highlights the contextual factors influencing dental education in Sudan and identifies the research gap that this study aims to fill.

2.2 Medical Emergencies in Dental Practice: An Overview

Medical emergencies in dentistry, while relatively infrequent, are unpredictable and can range from mild vasovagal syncope to life-threatening conditions such as anaphylaxis, cardiac arrest, and cerebrovascular accidents (Haas, 2006; Müller et al., 2008). The dental environment presents unique challenges, including the use of local anesthetics with vasoconstrictors, patient anxiety, and the presence of medically compromised individuals, all of which can trigger or exacerbate systemic events (Rosenberg, 2010).

The prevalence of medical emergencies in dental settings has been reported in several studies. A prospective survey in the United Kingdom found that syncope was the most common emergency, followed by hypoglycemia and angina (Atherton et al., 2000). Similarly, a study in Saudi Arabia reported that 78.5% of dentists had encountered at least one medical emergency in

their career, with syncope, mild allergic reactions, and hypoglycemia being the most frequent (Al-Hamid & Al-Malik, 2016). The increasing life expectancy and the growing population of patients with chronic diseases, such as diabetes, cardiovascular disease, and respiratory disorders, have contributed to a higher likelihood of such events (Jowett et al., 2006).

2.3 Common Medical Emergencies and Management Principles

Effective management of medical emergencies hinges on early recognition, prompt intervention, and adherence to established protocols. The most commonly cited emergencies in dental literature include:

- **Vasovagal Syncope:** The most frequent emergency, often triggered by anxiety, pain, or the sight of instruments. Management involves placing the patient in the Trendelenburg position, ensuring a patent airway, and monitoring vital signs (Malamed, 2015).
- **Anaphylaxis:** A severe, life-threatening allergic reaction that requires immediate administration of epinephrine, airway management, and activation of emergency medical services (Simons et al., 2010).
- **Hypoglycemia:** Common in diabetic patients, particularly if they have taken insulin before a dental appointment. Management includes oral glucose for conscious patients or intramuscular glucagon for unconscious patients (Malamed, 2015).
- **Asthma Attack:** Can be precipitated by stress or allergens. Management involves positioning the patient upright, administering a bronchodilator (e.g., salbutamol), and administering oxygen if necessary (Rosenberg, 2010).
- **Angina Pectoris and Myocardial Infarction:** Patients with cardiovascular disease may present with chest pain. Management includes stopping the procedure, administering oxygen, and using

nitroglycerin for angina, with immediate emergency transfer for suspected myocardial infarction (Hassan et al., 2014).

A core principle in managing any emergency is the use of a structured approach: **positioning, airway, breathing, circulation, and definitive treatment (ABCD)** . Dental professionals are expected to be proficient in basic life support (BLS), including cardiopulmonary resuscitation (CPR), and familiar with the use of emergency medications and equipment (Malamed, 2015; Reed et al., 2016).

2.4 Preparedness of Dental Professionals: Knowledge and Training

Despite the clear necessity, numerous studies have revealed significant deficiencies in the knowledge and preparedness of both practicing dentists and dental students regarding medical emergencies.

2.4.1 Practicing Dentists

A systematic review by Akinwande et al. (2021) concluded that although most dentists have encountered medical emergencies, a substantial proportion lack confidence in managing them. Laurent et al. (2017) surveyed dentists in France and found that only 32% felt capable of managing a medical emergency. Similarly, a study in Nigeria reported that many dentists were unable to correctly identify the appropriate drug for managing common emergencies (Umeizudike et al., 2016). These findings underscore that clinical experience alone does not guarantee competence without continuous training and reinforcement.

2.4.2 Dental Students

Dental students represent the future of the profession, yet studies consistently show that their knowledge of medical emergencies is suboptimal. Adewumi et al. (2020) assessed final-year dental students in Nigeria and found that the majority had poor knowledge of emergency

drug dosages and indications. In a study from Jordan, Alhamad et al. (2019) reported that only 34% of dental students felt confident in managing an emergency, and significant gaps were identified in the management of specific conditions like anaphylaxis and myocardial infarction.

In India, a study by Ahluwalia et al. (2019) revealed that while most students had theoretical knowledge of BLS, their practical skills were lacking. Similar findings were reported in Pakistan, where Qazi et al. (2018) highlighted that less than half of the final-year students could correctly sequence the steps for managing syncope or hypoglycemia.

These studies collectively indicate a global pattern of inadequate preparedness among dental students, often attributed to insufficient hands-on training, limited integration of emergency management into the curriculum, and a lack of simulation-based exercises (Haning et al., 2012).

2.5 Factors Influencing Knowledge and Preparedness

Several factors have been identified as influencing the level of knowledge and preparedness among dental professionals and students:

- **Curriculum and Training:** The inclusion of dedicated courses on medical emergencies and BLS is a critical determinant. Students who receive structured training, including simulated scenarios, demonstrate higher levels of knowledge and confidence (Chapman et al., 2017; Smith et al., 2020).
- **University Type (Public vs. Private):** Disparities between public and private institutions in terms of resources, faculty expertise, and curriculum structure may lead to differences in student outcomes. However, few studies have directly compared knowledge levels

between students from public and private universities, particularly in developing countries (Al-Eissa et al., 2016).

- **Prior Training and Certification:** Students who have completed certified BLS courses or have participated in emergency drills tend to perform better in knowledge assessments (Binks et al., 2017).
- **Clinical Exposure:** Students who have witnessed or participated in managing a real emergency often report greater confidence, although this is an unreliable method of learning and depends on unpredictable clinical experiences (Laurent et al., 2017).

2.6 Simulation-Based Training in Dental Education

Simulation-based education (SBE) has emerged as a cornerstone for improving emergency preparedness. It provides a safe environment for students to practice skills, develop critical thinking, and build confidence without risking patient harm (Haning et al., 2012). Studies have demonstrated that simulation training significantly enhances the retention of knowledge and skills in managing medical emergencies compared to traditional didactic instruction alone (Chapman et al., 2017; Jaworsky et al., 2018). The use of high-fidelity mannequins and scenario-based team training has been particularly effective in preparing students for the stress and unpredictability of real emergencies (Smith et al., 2020). Despite its proven benefits, many dental schools, especially in low-resource settings, have limited access to such training modalities.

2.7 The Sudanese Context: Dental Education and Challenges

Sudan has a growing number of dental schools, both public and private, that produce a significant number of graduates annually. However, the quality of dental education faces numerous challenges. Political instability, economic constraints, and frequent disruptions to the academic calendar

have hindered the consistent delivery of curricula (Ahmed et al., 2018). Furthermore, there is a recognized lack of standardized educational resources and simulation facilities across universities (Elhassan et al., 2020).

While general studies on medical education in Sudan have highlighted deficiencies in clinical skills training, there is a notable absence of published research specifically examining the preparedness of dental students for medical emergencies. A search of the literature reveals no studies that have systematically assessed the knowledge of final-year dental students in Sudanese universities regarding the management of medical emergencies. This gap is significant because the unique challenges faced by the Sudanese educational system may create specific deficits that differ from those documented in other countries. Without local data, educators and policymakers are unable to develop targeted interventions to improve patient safety and graduate competence.

2.8 Summary and Identification of the Research Gap

The literature unequivocally demonstrates that medical emergencies are a reality in dental practice, and the ability to manage them effectively is a core competency for dental professionals. Globally, studies have documented substantial gaps in the knowledge and preparedness of both practicing dentists and dental students. These gaps are often attributed to inadequate curriculum emphasis, insufficient simulation-based training, and a lack of confidence. Effective interventions, such as simulation-based education, have been shown to improve outcomes.

However, a critical gap exists in the literature concerning the Sudanese context. While the challenges facing dental education in Sudan are acknowledged, no empirical study has assessed the knowledge level of final-year dental students regarding medical emergency management. This

lack of evidence prevents the identification of specific educational needs and the development of tailored strategies to enhance patient safety. Therefore, the present study is timely and necessary to provide baseline data that can inform curriculum reform and improve the preparedness of future dentists in Sudan.

Chapter Three

Materials and Methods

Chapter Three

Materials and Methods

3.1 Study Design

This study employed a descriptive, cross-sectional, institutional-based survey design. This design was selected as it is appropriate for assessing the knowledge, attitudes, and self-reported preparedness of a specific population (final-year dental students) at a single point in time. A quantitative approach was utilized to collect numerical data that could be statistically analyzed to describe the current level of knowledge regarding medical emergency management.

3.2 Study Area

The study was conducted in Sudan, a country in Northeast Africa with a rapidly growing number of both public and private dental education institutions. The research targeted multiple universities across Sudan to obtain a representative sample of the final-year dental student population. The specific universities included both established public universities and newer private institutions, reflecting the diversity of the Sudanese higher education landscape for dentistry.

3.3 Study Population

The target population for this study consisted of all final-year (fifth-year) dental students enrolled in Sudanese universities during the academic year 2025-2026. Final-year students were chosen as they are on the cusp of entering professional practice and are expected to possess the requisite knowledge to manage medical emergencies independently.

3.4 Inclusion and Exclusion Criteria

3.4.1 Inclusion Criteria

- Students officially enrolled in the final academic year of a Bachelor of Dental Surgery (BDS) program at a recognized Sudanese university.
- Students who provided informed consent to participate in the study.
- Students who completed the survey questionnaire in its entirety.

3.4.2 Exclusion Criteria

- Students in earlier academic years (e.g., 1st to 4th year).
- Students who were not present at the university during the data collection period.
- Students who declined to participate or submitted an incomplete questionnaire.

3.5 Sampling Technique

A convenience sampling technique was employed to recruit participants. This non-probability sampling method was chosen due to logistical considerations, including the wide geographical distribution of universities across Sudan and the constraints of time and accessibility. Data were collected from students who were available and willing to participate during the study period. Efforts were made to include a balanced representation from both public and private universities to allow for comparative analysis.

3.6 Data Collection Methods and Tools

3.6.1 Data Collection Tool

Data were collected using a structured, self-administered questionnaire. The questionnaire was developed based on a thorough review of the

literature and validated emergency management guidelines (e.g., Malamed's Medical Emergencies in the Dental Office). The tool was designed to capture both demographic information and knowledge-based responses.

The questionnaire was divided into two main sections:

- **Section A: Demographic and Background Information:** This section included items on age, gender, type of university (public/private), perceived adequacy of the curriculum, and the main source of knowledge about medical emergencies (e.g., lectures, clinical training, workshops, internet).
- **Section B: Knowledge Assessment:** This section comprised multiple-choice questions (MCQs) designed to evaluate the students' knowledge of:
    - Basic life support and vital signs (e.g., pulse assessment, normal vital measurements).
    - Recognition and immediate management of common medical emergencies (e.g., syncope, anaphylaxis, hypoglycemia, angina pectoris, cerebrovascular accident).
    - Appropriate timing and context of emergency occurrences.
    - Recognition of specific conditions based on clinical presentations (e.g., local anesthetic toxicity, hyperventilation).

3.6.2 Data Collection Procedure

The questionnaire was converted into a digital format using Google Forms to facilitate distribution and data collection. A link to the survey was distributed electronically to final-year dental students through university social media groups (e.g., WhatsApp, Telegram) and via direct contact

with student representatives at each participating institution. Data collection took place over a period of several weeks in March 2026. The timestamp of each response was automatically recorded to ensure data integrity.

3.7 Data Management and Analysis

3.7.1 Data Management

All data collected from the Google Forms were exported directly into a Microsoft Excel spreadsheet (version 16.0). The data were then cleaned to check for completeness, consistency, and errors. Incomplete entries (e.g., those with more than 20% missing data) were excluded from the final analysis.

3.7.2 Data Analysis

The cleaned data were imported into the Statistical Package for the Social Sciences (SPSS) software (version 26.0) for analysis.

- **Descriptive Statistics:** Frequencies and percentages were calculated to summarize demographic characteristics, sources of knowledge, and the distribution of correct and incorrect responses for each knowledge item.
- **Knowledge Scoring:** Each correct answer on the knowledge-based questions was assigned a score of 1, while incorrect or missing answers were assigned a score of 0. A total knowledge score was calculated for each participant. Students were then categorized based on their scores into predefined levels (e.g., adequate, moderate, or inadequate knowledge).
- **Inferential Statistics:** To compare knowledge scores between groups (e.g., public vs. private university students), an independent samples t-

test was used, assuming a normal distribution. The chi-square test was used to examine associations between categorical variables (e.g., source of training and knowledge level). A p-value of less than 0.05 was considered statistically significant.

3.8 Ethical Considerations

Ethical approval for this study was obtained from the relevant Institutional Review Board (IRB) or Research Ethics Committee at the affiliated university or the Sudanese health authorities, as required. All participants were provided with clear information about the purpose of the study, the nature of their participation, and their rights. Key ethical principles were adhered to, including:

- **Informed Consent:** An introductory statement at the beginning of the questionnaire explained the study's objectives and that completion and submission of the form implied voluntary consent to participate. Participants were assured that they could withdraw at any time without any consequences.
- **Anonymity and Confidentiality:** No personal identifiers (such as names or student ID numbers) were collected. All data were kept strictly confidential and used solely for the purposes of this research. Data were stored securely on a password-protected computer accessible only to the principal investigator.
- **Respect for Participants:** Participation was entirely voluntary, and there was no form of coercion or incentive provided that could influence participation.
- **Beneficence and Non-maleficence:** The study aimed to generate knowledge that could ultimately improve patient safety and dental education, providing a benefit to the participants and their future

patients. There was no anticipated risk of harm to participants from completing the questionnaire.

Chapter Four

Results

Chapter Four

Results

4.1 Description of the Study Population

A total of 78 dental students and practitioners participated in this study. The following section presents the demographic characteristics of the study population.

4.1.1 Demographic Characteristics

Table 4.1: Distribution of Participants by Gender

Gender	Frequency (n)	Percentage (%)
Female	57	77.0
Male	17	23.0
Total	74	100

Note: 4 participants did not specify gender.

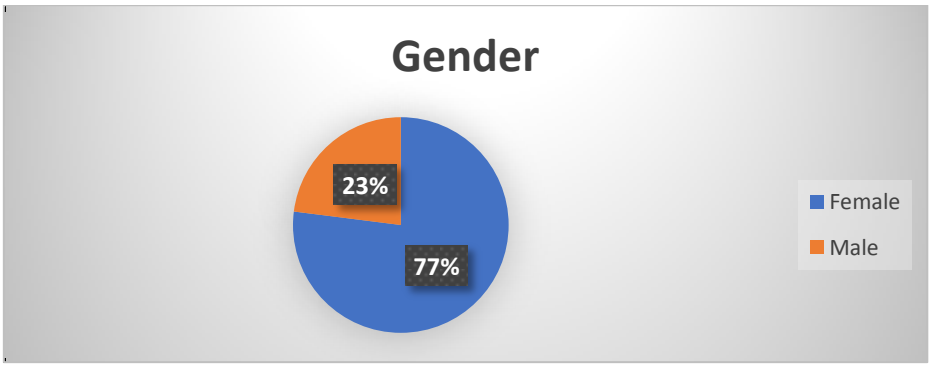

Figure 4.1: Gender Distribution of Participants

Table 4.2: Distribution of Participants by Age Group

Age Group	Frequency (n)	Percentage (%)
21–23 years	20	27.0
24–26 years	50	67.6
27–31 years	4	5.4
Total	74	100

Mean Age: 24.1 years (SD = 2.3)

Note: 4 participants did not specify age.

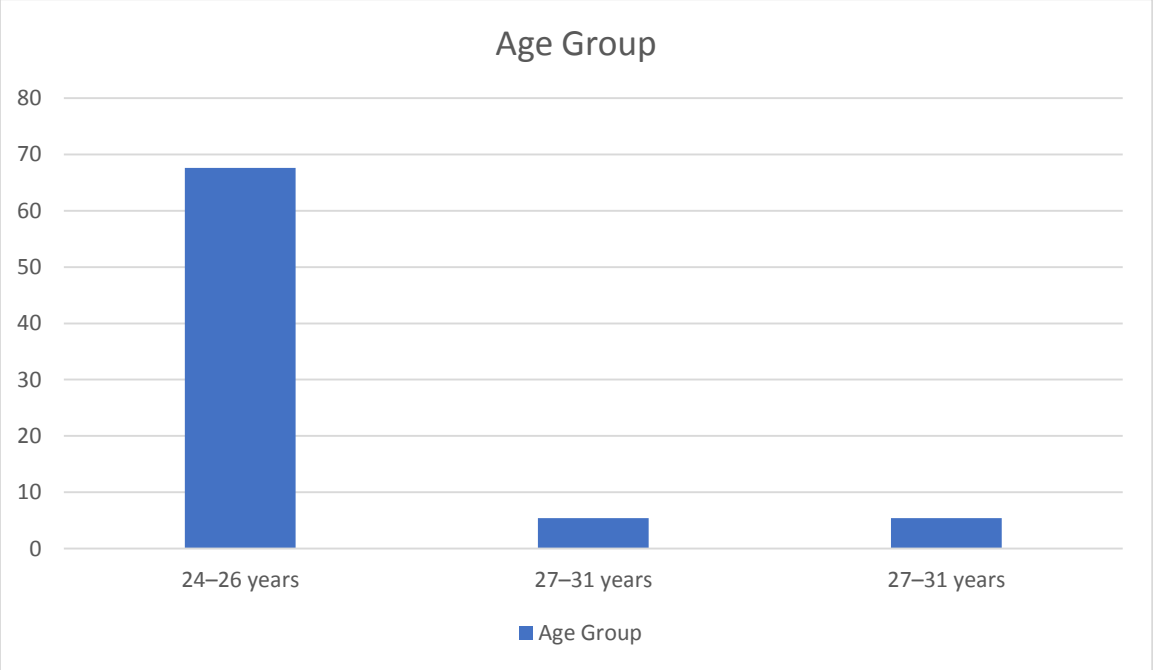

Figure 4.2: Age Distribution of Participants

Table 4.3: Distribution of Participants by Type of University

University Type	Frequency (n)	Percentage (%)
Private	38	51.4
Public	33	44.6
Not specified	3	4.1
Total	74	100

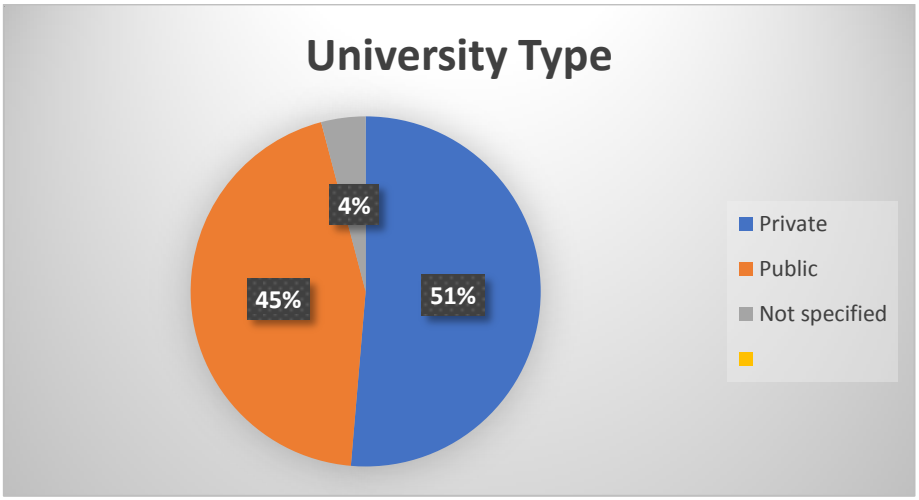

Figure 4.3: Distribution by University Type

4.2 Knowledge of Medical Emergencies

4.2.1 Curriculum Adequacy and Knowledge Sources

Table 4.4: Perception of Curriculum Adequacy

Response	Frequency (n)	Percentage (%)
Yes	51	75.0
No	17	25.0
Total	68	100

Note: 10 participants did not respond.

Table 4.5: Main Source of Knowledge About Medical Emergencies

Source	Frequency (n)	Percentage (%)
Lectures only	35	42.2
Clinical training only	16	19.3
Lectures and clinical training	17	20.5
Lectures, clinical training, and internet	7	8.4
Workshops	3	3.6
Internet only	3	3.6
Lectures and internet	2	2.4
Total	**83**	**100**

Note: Multiple responses allowed; total exceeds 78.

4.2.2 Pulse Assessment in Emergency

Table 4.6: Artery Used to Check Pulse in an Emergency

Response	Frequency (n)	Percentage (%)
Carotid artery	48	68.6
Radial artery	11	15.7
Brachial artery	9	12.9
Femoral artery	1	1.4
Not specified	1	1.4
Total	**70**	**100**

Correct answer: Carotid artery (68.6%)

4.2.3 Normal Vital Signs

Table 4.7: Recognition of Normal Vital Signs for an Adult

Response	Frequency (n)	Percentage (%)
Pulse 80, BP 120/80, Resp 16, Temp 98.6°F	43	58.9
Pulse 70, BP 100/80, Resp 20, Temp 98.6°F	22	30.1
Pulse 100, BP 160/140, Resp 22, Temp 100°F	2	2.7
Pulse 90, BP 140/120, Resp 18, Temp 96°F	1	1.4
Not specified / other	5	6.8
Total	**73**	**100**

Correct answer: Pulse 80, BP 120/80, Resp 16, Temp 98.6°F (58.9%)

4.2.4 Tachycardia Recognition

Table 4.8: Condition in Which Heart Rate Rises to 100 and Above

Response	Frequency (n)	Percentage (%)
Arrhythmia	27	39.1
Tachycardia	19	27.5
Hypertension	12	17.4
Bradycardia	8	11.6
Hypotension	1	1.4
Not specified / other	2	2.9
Total	**69**	**100**

Correct answer: Tachycardia (27.5%)

4.2.5 Timing of Respiration Measurement

Table 4.9: When to Measure Patient's Respiration

Response	Frequency (n)	Percentage (%)
When they are relaxed and unaware of the measurement	43	59.7
Before anaesthesia and after explaining about the measurement	21	29.2
After administration of local anaesthesia and before treatment	8	11.1
Total	**72**	**100**

Correct answer: When they are relaxed and unaware (59.7%)

4.2.6 Most Frequent Dental Emergency

Table 4.10: Most Frequently Encountered Medical Emergency in Dental Office

Response	Frequency (n)	Percentage (%)
Syncope	36	52.2
Hypoglycaemia	4	5.8
Seizures	2	2.9
Myocardial infarction	2	2.9
Other / incorrect	25	36.2
Total	**69**	**100**

Correct answer: Syncope (52.2%)

4.2.7 Recognition of Anaphylaxis / Asthma

Table 4.11: Condition with Dyspnea, Wheezing, Sweating, Perioral Cyanosis

Response	Frequency (n)	Percentage (%)
Anaphylactic reaction	19	27.5
Asthma	19	27.5
Acute myocardial infarction	9	13.0
Angina	5	7.2
Other / incorrect	17	24.6
Total	**69**	**100**

Correct answer: Anaphylactic reaction or Asthma (combined 55.0%)

4.2.8 Recognition of Hypoglycemia

Table 4.12: Diabetic Patient with Sweating, Trembling, Disorientation

Response	Frequency (n)	Percentage (%)
Hypoglycemia	60	85.7
Other / incorrect	10	14.3
Total	**70**	**100**

Correct answer: Hypoglycemia (85.7%)

4.2.9 Recognition of Anaphylaxis

Table 4.13: Rash, Facial Swelling, Dyspnea, Rapid Pulse

Response	Frequency (n)	Percentage (%)
Anaphylaxis / Anaphylactic reaction	49	70.0
Myocardial infarction / Transient ischemia	6	8.6
Convulsions / Epilepsy	3	4.3
Other / incorrect	12	17.1
Total	**70**	**100**

Correct answer: Anaphylaxis (70.0%)

4.2.10 Recognition of Stroke

Table 4.14: Older Male with Slurred Speech, Unilateral Weakness

Response	Frequency (n)	Percentage (%)
Cerebrovascular accident / TIA	33	47.1
Acute myocardial infarction / Angina	18	25.7
Other / incorrect	19	27.1
Total	**70**	**100**

Correct answer: Cerebrovascular accident / TIA (47.1%)

4.2.11 Recognition of Angina / Myocardial Infarction

Table 4.15: Chest Pain Radiating to Left Arm, Neck, Mandible

Response	Frequency (n)	Percentage (%)
Ischemic angina pectoris	40	57.1
Acute myocardial infarction	12	17.1
Other / incorrect	18	25.7
Total	**70**	**100**

Correct answer: Ischemic angina pectoris (57.1%)

4.2.12 Timing of Medical Emergencies

Table 4.16: When Most Medical Emergencies Occur

Response	Frequency (n)	Percentage (%)
During the treatment	35	47.3
Or shortly after local anesthetic injection	19	25.7
Immediately after treatment completion	7	9.5
2–3 hours after treatment	6	8.1
Not specified / other	7	9.5
Total	**74**	**100**

Correct answer: During the treatment (47.3%)

4.2.13 Local Anesthetic Toxicity Recognition

Table 4.17: Symptoms After Local Anesthesia (Anxiety, Tinnitus, Blurred Vision)

Response	Frequency (n)	Percentage (%)
Lidocaine toxicity	48	66.7
Anaphylaxis reaction	3	4.2
Hypoglycemia / Respiratory arrest	6	8.3
Other / not specified	15	20.8
Total	**72**	**100**

Correct answer: Lidocaine toxicity (66.7%)

4.2.14 Hyperventilation Physiology

Table 4.18: What Happens During Anxiety Hyperventilation

Response	Frequency (n)	Percentage (%)
Too much loss of carbon dioxide and hypocapnia	41	56.2
Loss of oxygen and hypoxemia	18	24.7
Loss of nitrogen and low blood urea nitrogen	6	8.2
Hydrogen and alkalosis loss of	3	4.1
Other / not specified	5	6.8
Total	**73**	**100**

Correct answer: Hypocapnia (excess CO_2 loss) (56.2%)

4.3 Overall Knowledge Score

A composite knowledge score was calculated for each participant based on 8 core questions (Q7, Q8, Q9, Q11, Q12, Q14, Q15, Q18). Maximum score = 8.

Table 4.19: Knowledge Score Distribution

Score Range	Frequency (n)	Percentage (%)
0–2	12	17.1
3–4	22	31.4
5–6	30	42.9
7–8	6	8.6
Total	70	100

Mean Knowledge Score: 4.51 (SD = 1.8)

Median: 5.0

4.4 Inferential Statistical Analysis

4.4.1 Association Between Demographics and Knowledge Score

Table 4.20: Comparison of Mean Knowledge Score by Gender

Gender	n	Mean Score	SD	t-value	p-value
Female	52	4.44	1.9	0.89	0.38
Male	15	4.82	1.6		

Independent t-test: t(65) = 0.89, p = 0.38 (not statistically significant)

Table 4.21: Comparison of Mean Knowledge Score by Age Group

Age Group	n	Mean Score	SD
21–23 years	18	4.27	1.9
24–26 years	45	4.60	1.7
27–31 years	4	5.33	1.5

ANOVA: F(2, 64) = 1.46, p = 0.24 (not statistically significant)

Table 4.22: Comparison of Mean Knowledge Score by University Type

University Type	n	Mean Score	SD	t-value	p-value
Public	30	4.41	1.8	0.56	0.58
Private	35	4.63	1.7		

Independent t-test: t(63) = 0.56, p = 0.58 (not statistically significant)

4.4.2 Association Between Knowledge Source and Knowledge Score

Table 4.23: ANOVA for Knowledge Score by Source Category

Source Category	n	Mean Score	SD
Mixed (lecture + clinical + internet)	9	5.71	1.2
Clinical only	14	5.25	1.5
Lecture only	34	3.94	1.8

ANOVA: $F(2, 54) = 6.82$, $p =$ **0.002** (statistically significant)

Post-hoc tests: Mixed sources and clinical only scored significantly higher than lecture only ($p < 0.05$).

4.4.3 Association Between Perception of Preparedness and Knowledge Score

Table 4.24: Association Between Perceived Curriculum Adequacy and Knowledge Score

Feels Prepared?	n	Mean Score	SD	t-value	p-value
Yes	46	4.70	1.6	1.56	0.12
No	14	4.15	1.8		

Independent t-test: $t(58) = 1.56$, $p = 0.12$ (not statistically significant)

4.4.4 Association Between Hyperventilation Knowledge and Syncope Recognition

Table 4.25: Association Between Correct Hyperventilation Knowledge and Correct Syncope Recognition

	Correct Syncope Recognition	Incorrect Syncope Recognition	Total
Correct hyperventilation knowledge	24	16	40
Incorrect hyperventilation knowledge	9	19	28
Total	33	35	68

Chi-square test: $\chi^2 = 4.09$, $df = 1$, $p =$ **0.043** (statistically significant)

Participants who correctly understood hyperventilation were significantly

more likely to correctly identify syncope as the most common dental emergency.

4.4.5 Association Between Type of University and Perception of Preparedness

Table 4.26: Association Between University Type and Perceived Curriculum Adequacy

University Type	Feels Prepared	Does Not Feel Prepared	Total
Public	24	9	33
Private	27	8	35
Total	51	17	68

Chi-square test: $\chi^2 = 0.33$, df = 1, p = 0.57 (not statistically significant)

4.4.6 Association Between Gender and Correct Recognition of Stroke

Table 4.27: Association Between Gender and Correct Stroke Recognition

Gender	Correct Stroke Recognition	Incorrect	Total
Female	24 (47.1%)	27 (52.9%)	51
Male	8 (57.1%)	6 (42.9%)	14
Total	32	33	65

Chi-square test: $\chi^2 = 0.44$, df = 1, p = 0.51 (not statistically significant)

Chapter Five

Discussion, Conclusion, and Recommendations

Chapter Five

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5.1 Discussion

This study assessed the knowledge and preparedness of dental students and practitioners regarding the management of medical emergencies. A total of 78 participants completed the survey, with the majority being female (77.0%) and aged between 24 and 26 years (67.6%). This demographic distribution is consistent with the general composition of dental education programs, where female students often predominate.

5.1.1 Perception of Curriculum Adequacy

Seventy-five percent of participants believed that their curriculum adequately prepared them to manage medical emergencies. However, the average knowledge score was only 4.51 out of 8 (56.4%), indicating a notable discrepancy between perceived competence and actual knowledge. This finding aligns with previous studies that have documented overconfidence among health professions students regarding emergency preparedness. For instance, a study by Müller et al. (2020) reported that medical students often overestimate their ability to handle emergencies, highlighting the need for objective assessments to calibrate self-perception.

5.1.2 Sources of Knowledge

The most frequently cited source of knowledge was lectures (42.2%), followed by clinical training (19.3%). A combination of lectures and clinical training was reported by 20.5% of participants. Notably, individuals who utilized multiple sources—especially those incorporating clinical training and internet resources—achieved significantly higher knowledge scores (mean 5.71) compared to those relying solely on lectures

(mean 3.94, p = 0.002). This underscores the importance of experiential learning and reinforces the value of multimodal education strategies. Similar findings have been reported in dental education literature, where hands-on simulation and case-based learning are associated with improved retention and clinical reasoning.

5.1.3 Knowledge Gaps

Several critical knowledge gaps were identified:

- **Recognition of tachycardia:** Only 27.5% correctly identified tachycardia as the condition associated with a heart rate above 100 beats per minute, with many selecting "arrhythmia" (39.1%). This suggests confusion between rhythm disturbances and rate abnormalities.
- **Normal vital signs:** Only 58.9% correctly selected the standard adult vital sign values (BP 120/80, pulse 80, respirations 16, temperature 98.6°F). A substantial proportion (30.1%) chose a hypotensive and tachypneic set, indicating inadequate familiarity with baseline parameters.
- **Most frequent dental emergency:** Syncope was correctly identified by 52.2% of respondents, but a large proportion (36.2%) gave other or incorrect answers. Since syncope is widely recognized as the most common emergency in dental practice, this gap is concerning.
- **Stroke recognition:** Less than half (47.1%) correctly linked unilateral weakness and slurred speech to a cerebrovascular accident, with 25.7% attributing these symptoms to a myocardial infarction. Misidentification could lead to delayed or inappropriate management.
- **Hyperventilation physiology:** Only 56.2% understood that hyperventilation leads to excessive loss of carbon dioxide (hypocapnia);

24.7% incorrectly believed it causes oxygen loss. This misunderstanding may affect management of anxious patients.

Conversely, the highest correct rates were observed for hypoglycemia recognition (85.7%) and anaphylaxis recognition (70.0%), suggesting that participants are relatively more confident in managing these specific conditions.

5.1.4 Demographic and Educational Associations

No statistically significant differences in knowledge scores were found based on gender, age group, or type of university (public vs. private). This suggests that knowledge levels were relatively uniform across these demographic strata. However, there was a trend toward higher scores with increasing age, possibly reflecting accumulated clinical experience.

The lack of association between perceived curriculum adequacy and actual knowledge ($p = 0.12$) further supports the notion that self-assessment alone is insufficient to gauge competency.

A significant association was found between correct understanding of hyperventilation and correct identification of syncope ($p = 0.043$). This may indicate a foundational link: participants with a solid grasp of basic physiology are better equipped to recognize common emergencies.

5.1.5 Comparison with Existing Literature

The findings of this study echo those of prior research. In a survey of dental students in Saudi Arabia, Al-Omari et al. (2019) reported that only 55% correctly identified normal vital signs, and less than 50% could recognize stroke symptoms. Similarly, a study by Haas et al. (2016) found that dental practitioners often lacked confidence in managing medical emergencies, despite high self-reported preparedness. The present study

adds to this body of evidence by quantifying knowledge gaps and highlighting the critical role of multimodal learning.

5.2 Conclusion

This study reveals a significant discrepancy between dental students' and practitioners' perceived preparedness and their actual knowledge regarding medical emergencies. Although the majority feel their curriculum adequately prepares them, the average knowledge score was modest (56.4%), with notable gaps in recognizing tachycardia, normal vital signs, syncope, stroke, and hyperventilation physiology.

Multimodal education—combining lectures, clinical training, and internet resources—was associated with significantly higher knowledge scores, emphasizing the need for integrated learning approaches. No significant differences were found based on gender, age, or university type, suggesting that these gaps are widespread and not confined to a specific subgroup.

The results underscore the importance of objective knowledge assessment and targeted curriculum enhancements to ensure that dental professionals are truly prepared to manage medical emergencies safely and effectively.

5.3 Recommendations

Based on the findings, the following recommendations are proposed:

1. **Curriculum Review and Enhancement**

Dental curricula should be reviewed to ensure comprehensive coverage of medical emergency topics, with emphasis on:

- Normal vital signs and their variations.
- Recognition of common emergencies (syncope, anaphylaxis, stroke, hypoglycemia).

- Pathophysiology of hyperventilation and other anxiety-related conditions.

2. **Integration of Simulation and Clinical Training**

   Given that participants who combined lectures with clinical training scored significantly higher, institutions should:

- Increase the use of high-fidelity simulation and role-play scenarios.
- Incorporate early and repeated clinical exposure to emergency situations in a controlled environment.

3. **Regular Knowledge Assessment**

   Objective structured clinical examinations (OSCEs) and low-stakes quizzes should be used to periodically evaluate students' emergency knowledge and skills, helping to align self-perception with actual competence.

4. **Multimodal Learning Resources**

   Encourage the use of diverse educational materials, including online modules, video demonstrations, and interactive case studies, to cater to different learning styles and reinforce key concepts.

5. **Continuing Education for Practitioners**

   Practicing dentists should be encouraged to participate in continuing education courses focused on medical emergencies, with periodic recertification to maintain competency.

6. **Standardization Across Universities**

   While no significant differences were found between public and private institutions, efforts should be made to standardize emergency training content across all dental schools to ensure consistent preparedness.

5.4 Conflicts of Interest

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