UNIVERSIDADE FERNANDO PESSOA

MEDICAL ERRORS IN DENTISTRY: AN INTEGRATIVE REVIEW

[Erros Médicos em Medicina Dentária: Uma Revisão Integrativa]

Dissertação de Mestrado

em Mestrado Integrado em Medicina Dentária

Hajar Hajjaj

Orientador: Mestre José Frias Bulhosa

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Dedication

This part is the last one I'm writing for this work because I want to write it with as much heart as possible. It marks the end of one of the most beautiful accomplishments of my life.

The adventure in dentistry started in 2017 for me and God knows how the road was filled with obstacles. From private lessons to legal appeals and even emails sent to members of parliament in Belgium, I tried everything to regain my place in dental school because I have this mentality of trying plans from A to Z before giving up.

In 2022, it wasn't in Brussels that the journey continued, but in Porto. And even though this option seemed unthinkable at first and wasn't what I had imagined for myself, leaving was a choice I will never regret. Because not only did I have the chance here to get the master's degree I wanted, but I also had the opportunity to learn a new language and discover an amazing country that will forever hold a special place in my heart. Because this is my new beginning, this is where I met incredible people, and this is where I learned to understand myself better.

But none of this would have been possible without the support of my parents. I will be forever grateful to them for giving me such a beautiful upbringing despite their past wounds, for believing in me until the end, and for supporting me both mentally and financially. I also thank my brothers and sisters, my cousins, and my friends for their love, their support and their encouraging words when things weren't going so well. Above all, I thank God for all the blessings. I hope that practicing dentistry will bring me even closer to Him.

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I would also like to thank all the professors of Universidade Fernando Pessoa for their understanding and support throughout these years. As international students, communication wasn't always easy but their openness and flexibility allowed us to move forward with confidence and peace of mind.

I am also very grateful to the clinical technicians for their kindness, availability, and constant support during our practical sessions. Their everyday help, small tips and good mood made a real difference in our learning experience.

To all my friends and colleagues, thank you for the encouragement, support, and shared moments. I want to give special thanks to Rita who has been an exceptional clinical partner, always calm, patient and supportive through the ups and downs of these last two years.

I also want to thank the people who made this journey lighter, those who shared a smile during stressful days or listened when things got difficult. Those who kindly offered advice, tips or help with exam preparation when it was most needed.

Lastly, I would like to thank my family, especially my parents, for their unconditional love and constant encouragement. Their presence, even when we were not physically together was a source of strength and balance. I am also grateful to my siblings for their motivating words and for reminding me to keep perspective during this intense chapter of life. I also wish to sincerely thank my brother Abdeljalil who generously lent me his computer after mine broke, making it possible for me to complete this work. I am also grateful for his help in formatting and organizing the final version of my thesis.

Abstract

Medical errors in dentistry represent a major issue for patient safety but they remain underexplored. This integrative review aims to identify the most frequent types of errors in dental practice, examine how often they occur and propose strategies for their prevention. This review also highlights the importance of anticipating errors to ensure safer and more effective dental care. Based on the analysis of 26 scientific articles published between 2005 and 2025 and obtained from databases such as PubMed or EBSCO, procedural and diagnostic errors emerged as the most common. For example, one study reported that 32% of periodontal cases were misclassified while omission errors in radiographic interpretation reached a frequency of 39.2%. Medication-related incidents and errors in patient management were also reported. These are often linked to insufficient training, lack of standardized protocols or communication failures. The findings highlight the multifactorial nature of dental errors and the need for a comprehensive approach to reduce risks. To improve patient safety, it is essential to strengthen continuing education, adopt appropriate technologies, implement standardized procedures and promote a culture of safety within clinical teams.

Keywords: medical errors, dentistry errors, dental negligence, dental malpractice, dental patient safety, error prevention in dentistry

Resumo

Os erros médicos na odontologia representam uma questão importante para a segurança do paciente, mas permanecem pouco explorados. Esta revisão integrativa tem como objetivo identificar os tipos mais frequentes de erros na prática odontológica, examinar com que frequência ocorrem e propor estratégias para sua prevenção. Esta revisão também destaca a importância de antecipar os erros para garantir um atendimento odontológico mais seguro e eficaz. Com base na análise de 26 artigos científicos publicados entre 2005 e 2025 e obtidos em bases de dados como PubMed ou EBSCO, os erros procedimentais e diagnósticos surgiram como os mais comuns. Por exemplo, um estudo relatou que 32% dos casos periodontais foram classificados incorretamente, enquanto erros de omissão na interpretação radiográfica atingiram uma frequência de 39,2%. Também foram relatados incidentes relacionados a medicamentos e erros no manejo do paciente. Estes estão frequentemente ligados à formação insuficiente, à falta de protocolos padronizados ou a falhas de comunicação. Os resultados destacam a natureza multifatorial dos erros odontológicos e a necessidade de uma abordagem abrangente para reduzir os riscos. Para melhorar a segurança do paciente, é essencial fortalecer a educação continuada, adotar tecnologias adequadas, implementar procedimentos padronizados e promover uma cultura de segurança dentro das equipes clínicas.

Palavras-chave: erros médicos, erros em odontologia, negligência odontológica, má prática odontológica, segurança do paciente em odontologia, prevenção de erros em odontologia.

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1. INTRODUCTION

Dentistry is a medical field just as important as any other, in which the patient's oral health is taken care of based on diagnoses and the assignment of appropriate treatments. However, as in all other medical fields, the risk-free factor does not exist and errors may sometimes occur. These errors are diverse and can, in some cases, have serious consequences for the patient, ranging from temporary discomfort to long-term complications. They may affect not only the quality of care but also the trust between the patient and the practitioner.

According to the WHO (2021), up to 40% of patients in primary care can suffer preventable safety incidents, which indicates a considerable general level of risk that can also be expected in dental care. Despite advancements in dental technology and protocols, the issue of safety in dental practice remains underexplored in comparison to other medical specialties. This lack of dedicated research and awareness increases the risk of repeated mistakes in daily practice.

The aim of this paper is to study what a medical error is, its prevalence in dentistry and the measures to reduce them. The first step to reducing those errors is to know in which cases they are most common. The second step is to know how to avoid them. Patient safety must be at the core of dental team practice. That is why it is important to detect these issues and implement strategies to reduce the associated risks.

The specific research question that guides this work is as follows: What are the most frequent types of medical errors in dentistry and how can they be prevented? In addition to examining their frequency, this review aims to underline the importance of ethical awareness and clinical responsibility in everyday dental practice. These aspects are essential to understanding how errors happen and how structured decision-making can help reduce their occurrence.

This work will therefore consist of a development part with three main parts: in the first, the methodology adopted to carry out this work will be explained. After presenting the methodology, the next section will show the main results of the review. These results include the types of studies analysed, the countries where they were conducted and the key issues they reported. The following discussion will begin by defining what a medical error is and explaining how often such errors occur in dental practice. It will then explore the most common types of dental errors found in the literature and examine possible

strategies for preventing them. The last part will be dedicated to the forensic consequences related to these errors. Finally, we will present the conclusion.

This integrative review will offer a global approach based on a rigorous selection of studies from scientific databases. By bringing together findings from different sources, this work aims to provide a clearer picture of the current situation and encourage future improvements in patient safety within dental care.

2. METHODOLOGY

To carry out this integrative review, we will synthesise the scientific literature found in articles published in databases such as PubMed, Google scholar or EBSCO with the aim of collecting, evaluating and interpreting research on this topic. This set of articles was the result of using an algorithm created with MeSH descriptors and keywords as shown in (Table 1) and a set of inclusion and exclusion criteria. The inclusion criteria will be date of publication (2005 to the present), language (English, French and Portuguese), type of work published (cohort studies, case-control studies, cross-sectional studies, clinical cases, serial cases, reviews, qualitative studies, mixed-methods studies and retrospective descriptive studies using databases or registries), full-text available on UFP's library information platforms, articles and studies conducted on humans. All articles that do not fulfil the objective of the study or the defined inclusion criteria will be excluded.

Table 1 – List of databases used, MeSH or keywords and number of articles found

Databases	**MeSH or keywords**	**Number of articles found**
Google Scholar	"medical errors" OR "dental errors" OR "dental negligence" OR "dental malpractice" OR "patient safety in dentistry" OR "error prevention in dentistry"	2190
EBSCO		1201
PubMed	("Medical Errors"[MeSH Terms] OR "medical errors" OR "Dentistry"[MeSH Terms] AND "errors" OR "Malpractice"[MeSH Terms] OR "dental malpractice" OR "Negligence"[MeSH Terms] OR "dental negligence" OR "Patient Safety"[MeSH Terms] AND "dental patient safety"OR "Risk Management"[MeSH Terms] OR "error prevention in dentistry" OR "risk management" OR "Adverse Events" OR "adverse events") AND ("Dentistry"[MeSH Terms] OR "dentistry" OR "dental care")	1630
		Total = 5021

On PubMed, filters were applied in accordance with the inclusion criteria: publication year (from 2005 to the present), language (English, French, or Portuguese), study type, studies involving humans, and full-text availability. The Advanced Search Builder was

also used to refine the results using relevant MeSH descriptors to improve precision. This strategy yielded a total of 1630 articles.

On EBSCO host, the search was limited to two databases relevant to the topic: MEDLINE and Dentistry & Oral Sciences Source. As EBSCO does not allow filtering by study type directly, the Advanced Search tool was used to incorporate all eligible study types through the Boolean operator "AND". Filters regarding language, full-text access, date range and studies involving humans were also applied. This resulted in 1201 articles retrieved.

Google Scholar was used as a complementary source, given its limited filtering capabilities. Boolean operators were employed to manually incorporate all inclusion criteria into the search, while ensuring the focus remained on dentistry. For the study type, the search was restricted to systematic reviews and case reports. This strategy resulted in the retrieval of 2190 articles. Only the first 20 pages of the database, corresponding to the 200 most relevant articles were analyzed.

The total number of articles retained is 3031.

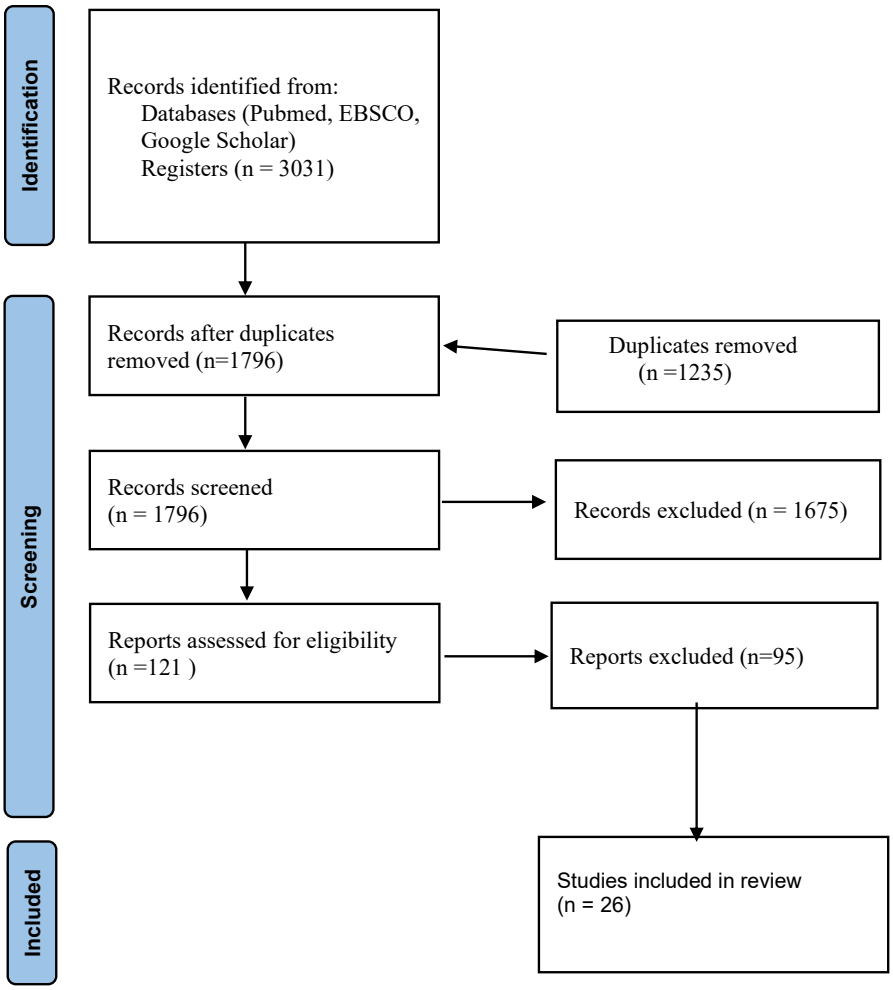
To better define the scope and structure of this integrative review, the research question was structured using the PICO model:

- P (Population): patients receiving dental care
- I (Intervention): clinical practices and dental procedures
- C (Comparison): absence of standardized protocols or preventive strategies
- O (Outcomes): types and frequency of medical errors, their consequences and strategies for prevention

This framework supported the development of inclusion and exclusion criteria and guided the systematic selection of studies across the selected databases (PubMed, Google Scholar and EBSCO).

As described above, total of 3031 articles was retained across the databases consulted. After removing 1235 duplicates, 1796 articles were reviewed based on their titles and abstracts. Of these, 1675 were excluded for not being relevant. The remaining 121 full-text articles were then checked. After this step, 95 articles were excluded. In the end, 26 studies were included in the review. The study selection process is illustrated in the (Figure 1) in the next page.

Figure 1: PRISMA diagram of the study selection



3. RESULTS AND DISCUSSION

A total of 26 articles were analysed, covering various study types such as narrative and systematic reviews, cross-sectional studies and retrospective descriptive studies. Based on the inclusion criteria outlined in the methodology, the 26 selected articles are classified below by study type in (Table 2):

Table 2: Classification of the 26 included articles by study type

Type of Study	Number of Articles	Articles Included
Narrative Review	10	Ramoni et al. (2012), Speers & McCulloh (2014), Nagelberg (2015), Barreto & Feitosa (2016), Nassani (2017), Sarasin et al. (2019), Sarasin et al. (2020), Teoh et al. (2022), Dzhafar & Veleva (2023), Vally et al. (2023).
Systematic Review	1	Hegde et al. (2023)
Cross-sectional Study (Survey/Observational)	7	Fabiani et al. (2006), Cristina et al. (2009), Woelber et al. (2012), Tokede et al. (2021), El-Wakeel & Ezzeldin (2022), Hegde et al. (2024), Stoeva et al. (2024).
Retrospective Descriptive / Observational Study	8	Choi et al. (2012), Thusu et al. (2012), Yousuf et al. (2015), Renton & Sabbah (2016), Yazdanian et al. (2021), Abomalik et al. (2022), Siriwatana & Pongpanich (2024), Tokede et al. (2024).

These studies covered key topics including diagnostic errors, medication errors, procedural mistakes, breaches of hygiene protocols, and legal aspects of dental malpractice. To provide a thematic overview of the analyzed literature, the 26 selected articles were categorized according to their main focus.

Narrative reviews made up a large part of the selected studies (10 out of 26). While they provide valuable overviews, they may lack methodological transparency and carry a risk of bias. However, this review also includes more methodologically robust studies that contribute to balancing the overall quality of the evidence. For example, the systematic review by Hegde et al. (2023) provides a structured analysis of radiographic interpretation errors, while cross-sectional studies such as those by El-Wakeel & Ezzeldin (2022) or

Tokede et al. (2021, 2024) offer quantifiable data based on real-world dental practice. These studies enhance the credibility of the analysis.

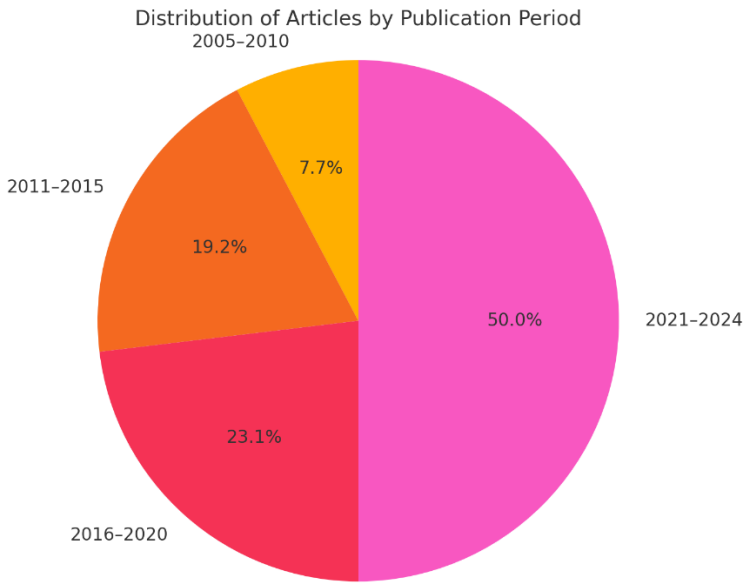
The integrative review approach allows diverse study types to explore a complex issue from multiple perspectives. This is particularly relevant when addressing medical errors. The objective is to offer a comprehensive and multifactorial understanding by combining varied forms of evidence.

Below in (Table 3), it summarizes the articles based on key topics such as diagnostic errors, medication errors, procedural errors, hygiene protocols, prevention strategies, and legal aspects. Some articles addressed multiple themes or provided a more general overview of medical errors in dentistry.

Table 3: Thematic classification of the included articles and number per theme

Main topic	Articles per theme	Articles
Diagnostic errors (Including radiographic interpretation)	6	Choi et al. (2012), Speers & McCulloh (2014), El-Wakeel & Ezzeldin (2022), Hegde et al. (2023), Hegde et al. (2024), Tokede et al. (2024).
Medication errors / Anesthesia	3	Sarasin et al. (2019), Sarasin et al. (2020), Teoh et al. (2022)
Procedural errors	7	Yousuf et al. (2015), Barreto & Feitosa (2016), Nassani (2017), Yazdanian et al. (2021), Abomalik et al. (2022), Hegde et al. (2024), Siriwatana & Pongpanich (2024).
Safety protocols	3	Fabiani et al. (2006), Cristina et al. (2009), Stoeva et al. (2024).
Communication/Prevention strategies	4	Ramoni et al. (2012), Woelber et al. (2012), Teoh et al. (2022), Vally et al. (2023).
Legal aspects	4	Thusu et al. (2012), Renton & Sabbah (2016), Yazdanian et al. (2021), Abomalik et al. (2022).
General reviews	3	Speers & McCulloh (2014), Nagelberg (2015), Dzhafar & Veleva (2023).

Figure 2: Distribution of articles by publication period



Above (Figure 2) it shows that half of the selected articles were published between 2021 and 2024. The dominance of recent publications reflects a growing awareness of patient safety in dentistry and highlights the importance of adapting to evolving clinical standards. It also illustrates the growing role of new technologies such as digital diagnostic tools and artificial intelligence, as well as updated protocols aimed at reducing medical errors. This recent context highlights why this integrative review is timely and relevant for tackling current issues in dental practice.

To support the results section and provide a detailed overview of the studies analysed in this review, including their classification and key methodological elements, please refer to (Appendix 1).

The following sections will present and discuss the main findings of the selected studies, organized by thematic categories.

3.1 Medical error and prevalence in dentistry

A medical error is an incident that occurs when a planned action is not performed correctly or when an inappropriate plan is implemented. It is mostly an unintentional fault on the part of the healthcare professional resulting from imperfections in his or her knowledge, diagnostic and therapeutic methods. In other situations, this may be due to the complexity of the case without negligence or imprudence being involved as explained by Dzhafer and Veleva (2023). There are few studies on treatment errors in dentistry and their consequences so there is a serious lack of data on this subject. According to Speers and McCulloh (2014), dentists are responsible for 18% of procedures carried out on the wrong area (incorrect selection of the tooth to be treated, for example), and 41% of errors are linked to the use of an inappropriate procedure or treatment. Thusu et al. (2012) reported in a British study based on the analysis of a national database of errors in dentistry that most reported incidents are not directly related to the treatments themselves but to administrative errors (such as lack of information about the patient's medical history) and organizational errors (such as inadequate communication with the patient) before and after the procedures.

3.2 Most common errors in dentistry

There are different types of medical errors in dentistry, depending on their nature and consequences. According to a study conducted at Chulalongkorn University in Bangkok, documentation errors represent 23.4% of the reported incidents, including errors in documentation, missing or incorrect information, and breaches of confidentiality, as noted by Siriwatana and Pongpanich (2024). However, it is well-established how important it is to collect information about patients in the medical field, because otherwise it can lead to serious complications, misdiagnoses, or incorrect prescriptions of medicines.

3.2.1. Incorrect diagnosis and errors in radiographic interpretation

As previously mentioned, one of the potential errors is misdiagnosis and one of its main causes is inadequate collection of information about the patient's medical and dental history, medications, and any relevant medical background, as highlighted by Vally et al. (2023). Before beginning an oral examination, the dentist must take a full history to obtain as much information as possible about the patient, in the case of new patients but it should

also be updated for established patients at every visit as their condition may change or alter.

According to El-Wakeel and Ezzeldin (2022), a study conducted with 151 dental teaching staff from public and private universities in Egypt showed that the most frequently misdiagnosed conditions were lesions of the oral mucosa (83.4%), followed by temporomandibular joint disorders and periodontal disease (58.9%), and the main causes identified are inadequate medical teaching methods, lack of training (which can lead to poor information gathering as mentioned above), and insufficient resources. Two practitioners discussing a clinical case may not always agree on the diagnosis, but when the disagreement is due to cognitive bias on the part of one practitioner, it becomes a potential problem.

According to Tokede et al. (2024), a study conducted in the United States in 2024 found that 32% of periodontal cases are misclassified, meaning about one in three, due to a lack of sufficient clinical and radiographic information. This highlights the crucial role of clinical examination but also points to the value of radiographic imaging as a complementary diagnostic tool in dentistry. Indeed, the visual inspection and the interpretation of a radiographic image provide valuable information for making an accurate diagnosis and when not done correctly, it can lead to errors. Although the occurrence of interpretive errors has not been widely studied in dentistry and further research is needed to understand this subject, a study conducted in Australia demonstrates that radiographic interpretive errors occur globally at an estimated frequency of 3% to 20% (Hegde et al.2024). Their prevalence varies based on factors such as level of expertise and the healthcare field. These errors of interpretation in radiology are classified into four types. In the next page, this classification and the prevalence of each type of error is illustrating in (Table 4).

Table 4: Types of radiographic interpretive errors and their reported frequency

Type of Error	Definition	Perceived Frequency
Omission Error	A finding or abnormality is missed on the radiograph	39.2%
Delayed Diagnosis	A correct diagnosis is made but not in a timely manner	36.7%
Misdiagnosis	An incorrect diagnosis is made (wrong condition identified)	27.9%
Near Miss	An error is made but detected and corrected before any harm occurs	26.6%

Note. Adapted from Hegde, S., Gao, J., Vasa, R., Nanayakkara, S., & Cox, S. (2024). Australian dentist's knowledge and perceptions of factors affecting radiographic interpretation. International Dental Journal, 74, 589–596. https://doi.org/10.1016/j.identj.2023.11.006

These errors can be caused by a variety of circumstances and actions, including factors related to image interpretation, image quality, clinician performance and the patient, according to the WHO report on the International Classification of Patient Safety, as cited by Hegde et al. (2023). About the quality of panoramic radiography, a Korean study carried out in 2012 revealed that the main factors affecting image quality were patient positioning, image density, sharpness and contrast, as demonstrated by Choi et al. (2012).

3.2.2. Medication administration errors

In their profession, dentists can prescribe medications to manage pain, treat infections, control inflammation, prevent complications, and address certain oral conditions. They administer anaesthesia to perform pain-free oro-dental procedures and improve patient comfort. This is why pharmacology is included in the dental curriculum: to help us understand the concepts of pharmacokinetics and pharmacodynamics to anticipate how drugs will affect the body and to avoid errors. The lack of adequate training in pharmacology is one of the significant risk factors for medication errors, as well as insufficient communication between healthcare professionals (insufficient collaboration between dentists and pharmacists for example) or the absence of standardized protocols in dental practices, as explained by Sarasin et al. (2019). Several errors can occur incorrect dosage, inappropriate choice of medicine, confusion between medicines with similar names or unanticipated drug interactions. Nagelberg (2015) revealed that dosage errors in dentistry particularly in pediatric patients often occur due to failure to consider age, weight, and other patient-specific characteristics. Poor communication with the patient

can also lead to the patient misunderstanding the prescription or failing to follow it properly, as noted by Sarasin et al. (2020).

Medical errors related to anaesthesia include incorrect administration of the dosage, accidental intravascular injections, incorrect needle placement or needle rupture (Nagelberg, 2015). In dentistry, it can also lead to venous or arterial injections or embolisms. Regarding antibiotics, Teoh et al. (2022) conducted an American study on the prescription of antibiotics before dental surgery and found that nearly 81% of prescriptions were unnecessary. It also revealed that 1.4% of patients who were prescribed antibiotics unnecessarily experienced serious adverse reactions. In Australia, 80% of prescriptions are considered unnecessary, whether for therapeutic or prophylactic indications. It may be the result of ignorance of good practice or the latest technical and scientific standards.

3.2.3. Inadequate treatment and errors in carrying out procedures

Errors due to inadequate treatment or incorrect application of procedures are responsible for a large proportion of medical errors in dentistry, with a direct impact on the quality of care and patient safety. Indeed, in Saudi Arabia, a study identified 168 cases of dental malpractice between 2009 and 2015, as reported by Abomalik et al. (2022). Most of this involved prosthodontics (32.4%), followed by orthodontics (20.2%), endodontics (15.8%), oral surgery (13.2%), and restorative dentistry (8.8%). A smaller number of cases were recorded in implantology (6.1%), pedodontics (2.6%), and infection control (0.9%).

In prosthodontics, the most frequent procedural errors relate to poor preparation of abutment teeth, inaccurate impressions, and fractures of porcelain, metal or tooth roots, as explained by Nassani (2017). Regarding orthodontics, Barreto and Feitosa (2016) showed in their analysis that more than half of the patients presented with issues of either manifest iatrogenicity, potential risk of iatrogenicity, or orthodontic relapse, and that treatments requiring dental extractions carried a high risk.

In terms of endodontics, a study carried out in Karachi, Pakistan, and published by Yousuf et al. (2015) found that 32.8% of the teeth analysed showed errors, including overextension beyond the working length, underfilling, or instrument fractures. Mandibular molars were the teeth most affected by these errors. We can therefore see that iatrogenic errors occur more often than we realize.

3.2.4. Inadequate communication with the patient

Communication errors in dentistry are also a significant risk factor and can affect both the quality of care and patient safety. According to Woelber et al. (2011), practitioners' lack of training in communication can lead to poorly explained consents, instructions that are misunderstood by the patient and, as a result, medical errors. Vally et al. (2023) also reported that poor communication quality can compromise the accuracy of the medical history. However, as we saw earlier, taking a good medical history plays a crucial role in establishing an accurate diagnosis. Poor communication between staff members regarding the patient can also lead to errors, which is why it is crucial for dentists to receive more training in communication skills, as noted by Renton and Sabbah (2016).

3.2.5. Safety of the facilities

Dentistry facilities, when properly maintained, allow good control and effective prevention of errors and infections. However, as we saw earlier, there is no such thing as zero risk. In fact, when facilities, whether autoclaves or burs used during treatment are not properly maintained and disinfected, the risk of errors increases. This is why maintaining strict hygiene protocols remains essential in daily practice. According to Stoeva et al. (2024), a Bulgarian study carried out in 2024 on 158 dental students showed that 51.3% of them did not follow hand disinfection protocols and 11.4% of them correctly followed the rules for disinfecting work surfaces. Which raises concerns about how safe the practices managed by these future dentists will be. An older study, which still fits our inclusion criteria, showed that 76% of dentists who use an autoclave have tested its effectiveness on a regular basis and that only 28% of them decontaminate the water circuits of dental units daily. It was also noted that 50% of the dentists surveyed had already suffered injuries from sharp instruments, as reported by Fabiani et al. (2006). Consequently, the inappropriate use of equipment, even when conforming, remains a major risk to the safety of care.

The working environment of dentists presents a real infectious risk; however, according to Cristina et al. (2009), a study conducted in Genoa, Italy, only 23.6% of dental clinics had an adequate ventilation system, and just 54.7% of practitioners considered all patients as potentially infectious.

3.2.6 The prevention of such errors

In the previous section, we looked at the various medical errors that exist in dentistry, and although there is no such thing as zero risk, there are measures that can be taken to limit these errors. The power of prevention in the medical sector must not be overlooked.

The prevention of these medical errors in dentistry is a multifactorial approach. In fact, several measures are proposed in Teoh et al.'s study (2022) : the first would be to improve the training of dentists, particularly in pharmacology and communication skills. The authors recommend improving initial and continuing training in pharmacology, as well as implementing electronic prescription tools with safety alerts to limit common errors. According to Woelber et al. (2012), 97% of dentists and patients consider communication to be essential to the quality of the therapeutic relationship. Making sure the patient has fully understood the information helps prevent treatment adherence errors, so don't hesitate to repeat key points when necessary. Moreover, providing written materials that explain care and follow-up improves patient understanding and reduces the risk of post-operative errors (Vally et al., 2023).

Then, it is necessary to use appropriate tools and not hesitate to embrace new technologies when they can strengthen diagnosis and improve treatment accuracy. We can use imaging software assisted by artificial intelligence to improve diagnostic accuracy, for example (Hegde et al. 2023).

Another important point is to reinforce a culture of safety (Teoh et al. 2022). Indeed, it is about the health of a human being who puts their body in our hands; it is essential that we live up to the trust the patient has in us. That is why Ramoni et al. (2012), affiliated with the Harvard School of Dental Medicine, propose in their study the implementation of an incident reporting system, in-depth root cause analyses, and the integration of checklists to ensure the safety of care delivery. They also encourage teamwork to make lasting improvements, avoid future mistakes and ensure better management of medical records.

Regarding protocols, Renton and Sabbah (2016) suggest that standardized protocols are essential in dentistry to prevent medical errors. They also show that checklists and procedures such as timeouts reduce serious risks (incorrect extraction, poor anaesthesia). Siriwatana and Pongpanich (2024) note that 23.4% of incidents are due to documentation errors or non-compliance with protocols. Their strict application improves safety, care and patient confidence. The same goes for adhering to hygiene protocols: sterilization, asepsis of the facilities, infection prevention, and personal hygiene. None of these aspects

should be overlooked. This is why it is essential to have clear and detailed protocols fully understood by the entire team (Müller & Schmid, 2020). It is essential to remember that dentists are bound by the code of ethics, which requires full transparency and honesty with their patients. According to Renton and Sabbah (2016), any medical error, no matter how serious, must be communicated to the patient as part of ethical and professional responsibility. This transparent approach not only respects the patient but also helps maintain trust and reduces the risk of legal consequences.

To summarize the key recommendations mentioned above, the table on the next page (Table 5) presents 10 essential practices to reduce medical errors in dentistry.

Table 5: 10 key recommendations to prevent medical errors in dentistry

1. Strengthen continuing education: Maintain and regularly update overall professional knowledge and skills including clinical techniques, patient safety, ethics, communication, pharmacology and risk management.

2.Enhance communication with the patient: Ensure they fully understand the explanations and provide written materials.

3.Ensure rigorous management of medical records: Maintain complete, detailed, and up-to-date patient records in real time to ensure care continuity and safety of dental treatments.

4.Remain vigilant about hygiene: Strictly follow sterilization protocols and regularly inspect autoclaves.

5.Check medical prescriptions carefully: Confirm dosages and potential drug interactions, especially for children and the elderly. Use digital tools with built-in safety alerts to minimize prescription errors.

6.Use diagnostic support technologies: Integrate radiographic analysis software and AI tools when available.

7. **Carefully analyze errors when they happen:** When a mistake or near-miss occurs, hold a meeting to understand what went wrong and decide on changes to prevent it from happening again.

8.Promote a safety culture: Encourage reporting of incidents and collectively analyse errors to learn from them.

9.Standardize clinical protocols: Implement detailed written procedures for each medical act (extractions, anaesthesia, prescriptions) to standardize practices and avoid oversights.

10.Promote teamwork: Hold regular meetings between practitioners and auxiliary staff to harmonize practices and improve coordination.

Sources: Yamalik & Perea-Pérez, (2012); Ramoni et al., (2015); Teoh et al., (2019); WHO, (2020); Woelber et al., (2020); Siriwatana & Pongpanich, (2024).

3.2.7 Legal proceedings related to such errors

Procedural dental errors are a significant cause of legal action, as demonstrated by two recent studies conducted in Iran and Saudi Arabia. Yazdanian et al. (2021) analysed 107 complaint files filed between 2014 and 2019 in Tehran. Their results showed that 82.2% of complaints concerned therapeutic errors, including root perforations in 12% of cases, while 17.7% involved diagnostic errors. The most frequently implicated disciplines were prosthodontics (31.9%), endodontics (24.2%), and surgery (17.6%). Similarly, Abomalik et al. (2022) studied 168 cases of dental malpractice in Riyadh between 2009 and 2015. They found that 32.4% of the cases involved prosthodontics, followed by orthodontics (20.2%) and endodontics (15.8%). In both studies, most complaints were filed against general dentists practicing mainly in the private sector. These cases often involved professionals with less than ten years of experience. Therefore, strengthening continuous training and improving communication with patients is essential to reduce legal risks.

4.CONCLUSION

According to the analysed literature, procedural errors appear to be the most frequently reported type of medical error, especially in legal claims. However, diagnostic errors also emerge as a significant concern due to their potential severity and impact on patient outcomes. Together, these two categories represent the most common and critical types of medical errors in dentistry.

Various prevention strategies have been identified, including improved professional training, better communication, strict hygiene and safety protocols, and the promotion of a safety-oriented culture within dental practices. In addition, the use of digital tools such as AI-based diagnostic systems and electronic prescriptions may contribute to reducing the risk of error. The development and implementation of dedicated incident reporting systems in dentistry would also be essential. These tools could improve data collection and transparency, help identify high-risk situations and guide preventive actions more effectively. Improving patient safety in dental care requires a proactive and structured approach that combines human vigilance with technological support.

It is also worth reaffirming the importance of prevention and continuous improvement in dental safety. Although current data on medical errors in dentistry are still developing compared to other medical fields, this situation highlights the need to invest in better reporting systems and structured data collection. Such improvements would support better identification of risks and help dental professionals enhance vigilance and adapt preventive strategies more effectively.

The legal implications of such errors, as highlighted in several studies, also reinforce the need for prevention and professional accountability in dental care.

5.APPENDIX

To ensure a rigorous assessment of the 26 studies selected for this integrative review, an analysis grid was drawn up. It summarises the following elements for each study: authors, type of research, main theme, key results and main methodological limitations. This tool was used to compare the robustness of the studies, their relevance to the problem and their contribution to the overall analysis.

Appendix 1: Analysis grid for articles included in the integrative review

Authors / Year	Type of Study	Topic	Main Findings	Limitations
Abomalik et al. (2022)	Retrospective Descriptive	Legal Aspects	Most common malpractice: prosthetics (32%), orthodontics (20%).	Legal case review; may not reflect actual prevalence.
Barreto & Feitosa (2016)	Narrative Review	Procedural Errors	Over 50% of orthodontic patients experience treatment-related complications.	Single-institution data; no control group.
Choi et al. (2012)	Retrospective Descriptive	Diagnostic Errors	Patient position and image quality affect radiographic interpretation.	Training setting limits external validity.
Cristina et al. (2009)	Cross-sectional Study	Safety / Hygiene	Less than 25% of dental clinics had adequate ventilation.	Observational only; no patient impact assessment.
Dzhafar & Veleva (2023)	Narrative Review	General reviews	Definitions and legal implications of medical errors.	Descriptive; lacks case studies or examples.
El-Wakeel & Ezzeldin (2022)	Cross-sectional Study	Diagnostic Errors	83% of instructors report diagnostic errors in oral lesions.	Single-university scope; small sample size.
Fabiani et al. (2006)	Cross-sectional Study	Safety / Hygiene	Only 76% of dentists regularly test their autoclaves.	Limited to one region; audit-only perspective.
Hegde et al. (2023)	Systematic Review	Diagnostic Errors	Types of radiology errors: omission (39.2%), delayed diagnosis (36.7%).	No clinical outcome correlation; based on image reading.
Hegde et al. (2024)	Cross-sectional Study	Procedural errors	Factors influencing radiograph interpretation include experience and training.	Survey-based interpretations; possible bias.
Nagelberg (2015)	Narrative Review	General reviews	Lack of pharmacology training is a risk factor for medication errors.	Opinion-based; no clinical data provided.
Nassani (2017)	Narrative Review	Procedural Errors	Prosthetic errors: poor preparations, material or root fractures.	Limited generalizability; descriptive analysis only.

Ramoni et al. (2012)	Narrative Review	Prevention / Communication	Proposes the implementation of incident reporting systems, root cause analyses, and checklists.	Conceptual proposal; lacks empirical validation.
Renton & Sabbah (2016)	Retrospective Descriptive	Legal aspects	Checklists reduce serious risks (wrong tooth extraction, etc.).	Descriptive only; no intervention tested.
Sarasin et al. (2019)	Narrative Review	Medication Errors	Lack of training and clear protocols increases anesthesia-related errors.	Derived from medical models; few dental-specific sources.
Sarasin et al. (2020)	Narrative Review	Medication Errors	Insufficient communication and misunderstanding of prescriptions.	Conceptual framework; lacks clinical trials.
Siriwatana & Pongpanich (2024)	Retrospective Descriptive	Procedural errors	23.4% of incidents due to documentation errors.	Document review only; lacks patient feedback.
Speers & McCulloh (2014)	Narrative Review	Diagnosis / General	Errors are often due to poor diagnosis or inadequate procedures.	Metaphorical comparison; lacks dental-specific data.
Stoeva et al. (2024)	Cross-sectional Study	Safety / Hygiene	51.3% of students do not comply with hand hygiene protocols.	Hygiene behavior self-reported; may be underestimated.
Teoh et al. (2022)	Narrative Review	Medication Errors	80% of antibiotic prescriptions prior to surgery deemed unnecessary.	Single-country data; may not reflect global practices.
Thusu et al. (2012)	Retrospective Descriptive	Legal Aspects	Errors are mostly administrative, not just therapeutic.	Relies on legal/administrative reports; not medical data.
Tokede et al. (2021)	Cross-sectional Study	General Errors	Methodology for quantifying adverse dental events.	Methodology theoretical; not tested on patients.
Tokede et al. (2024)	Retrospective Descriptive	Diagnostic Errors	32% of periodontal cases misclassified, linked to missing clinical/radio info.	Dependent on available records; underreporting possible.
Vally et al. (2023)	Narrative Review	Communication	Insufficient communication compromises the collection of medical history.	Survey-based; response bias possible.
Woelber et al. (2012)	Cross-sectional Study	Communication	97% of practitioners consider communication crucial.	Self-reported perceptions; not tested in practice.
Yazdanian et al. (2021)	Retrospective Descriptive	Legal Aspects	Frequent problems in prosthetics (31.9%), endodontics (24.2%), surgery (17.6%).	Focused on claims data; lacks clinical detail.
Yousuf et al. (2015)	Retrospective Descriptive	Procedural Errors	32.8% of teeth show endodontic errors.	Institutional focus; not generalizable.

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