

ORIGINAL ARTICLE

The Treatment of Toothache in Abû Bakr al-Rāzī, *Kitāb al-Hāwī fī al-Tibb* and the Usability of his Legacy of Phytotherapy in Modern Dentistry

Abstract

This study examines dental pain narratives and treatments in Abû Bakr al-Rāzī's *Kitāb al-Hāwī fī al-Tibb*. It compares his approaches to dental pain with current scientific evidence, especially in phytotherapy, and shows that *Kitāb al-Hāwī* continues to inspire future research on medicinal plants used in dental care. A multidisciplinary team translated and analyzed all chapters on oral and dental health from the original Arabic text. The section on toothache and its treatments was analyzed separately. The plants Razi suggested for treating dental pain were reviewed in recent pharmacy and dentistry journals from an ethnopharmacological perspective, and the data were presented in tables. His treatment methods primarily focused on pain relief through herbal remedies and cauterization, with tooth extraction recommended only as a last resort. *Kitāb al-Hāwī fī al-tibb* makes significant contributions to the history of dentistry, providing definitions of dental diseases, treatment methodologies, and the surgical instruments employed. Razi's holistic approach to medicine offers valuable insights into the evolution of modern dentistry. Over 90% of the herbal remedies Razi suggested for alleviating dental pain remain relevant today, highlighting the accuracy of his evaluations in the context of phytotherapeutics. Further investigation into the efficacy and safety of these herbal products could provide valuable insights for contemporary dental practices and treatments.

Key words: Al-Hāwī, Humoral Pathology, Islamic Medicine, Persian Medicine, Toothache, Phytotherapy

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Introduction to al-Rāzī and his works

Abu Bakr Muhammad ibn Zakariyya Razi, also known as Rhazes, was a crucial physician, alchemist, and philosopher active between 865 and 925 CE. Born in the city of Rey, located on the borders of today's Iran, Razi started his career in music and completed it by advancing in the fields of medicine and alchemy. Razi served as chief physician in the hospitals of Rey and Baghdad, where he gained extensive clinical experience. His masterpiece, *Kitāb al-Hāwī fī al-Tibb*, is a monumental medical work that collects Greek, Syriac, Indian, Persian, and early Islamic medical knowledge, enriched with observations. Its influence transcended geographical boundaries, and Latin translations of his works were among the essential sources in European universities for centuries (Changizi Ashtiyani, et al., 2013, pp. 633-38; Edriss, et al., 2017, pp. 223-29; Álvarez-Millán, 2000, pp. 293-306; Kahya, 1997). In his work *al-Hawī*, Razi devoted much space to dentistry and thoroughly examined dental anatomy, diseases, treatment methods, surgical instruments, and oral lesions (al-Rāzī, 2000, Vol. 1, pp. 444-491; al-Rāzī, 2000, Vol. 2, pp. 509-521). Herbal medicines, which are significant in Razi's treatment recommendations, can substantially contribute to modern research, particularly in phytotherapy. This comprehensive information in the work constitutes an inspiring source for today's dentistry with its pharmacological properties and indications in treatment. Razi's medical approaches were shaped within the framework of the humoral pathology theory, which dominated medical thought in the Islamic world during his time.

The theory of humoral medicine and its role

The theory of humoral pathology originated in Ancient Greece and influenced the understanding of health and disease for centuries. According to this theory, the human body comprises four essential fluids: blood, warm and moist; phlegm, cold and wet; yellow bile, warm and dry; and black bile, cold and dry. According to this theory, health depends on the balance of these four fluids; an imbalance of these fluids leads to dyscrasia, which in turn leads to disease. Hot illnesses are associated with an increase in warm fluids and cold illnesses with an increase in cold fluids. Toothache is also categorized as hot or cold (Jouanna, 2012). This understanding, which originates in Hippocrates, sees the human body as a microcosm of the universe and considers medicine in harmony with nature. However, these hot and cold disease concepts in humoral pathology do not coincide with the modern medical understanding of infection and fever (Diamandopoulos, et al., 2001, pp. 94-101). It should also be noted that in the text we are studying, Razi explains dental and gingival diseases according to the humoral pathology theory, which was the medical paradigm of his time. This study, on the one hand, sheds light on the significance of Razi's treatment methods, rooted in the humoral pathology theory of his era, in shaping the historical trajectory of dental practice. On the other hand, it explores the therapeutic potential of the medicinal plants he recommended, emphasizing their relevance for modern phytotherapy and contemporary dentistry. By contextualizing Razi's approaches within both historical and modern frameworks, this study aims to provide a foundation for future research on the clinical applicability of these plants in present-day dental and phytotherapeutic practices.



The Study's Objectives

The objective of this study is to examine Abū Bakr al-Rāzī's treatments for toothache as described in his major work *Kitāb al-Hāwī fī al-Ṭibb*. The analysis situates these treatments within the framework of humoral pathology theory, the dominant medical paradigm of his time, while also comparing them with current knowledge in modern dentistry. Rāzī recommended a wide range of medicinal plants for toothache, summarized in Table 1 (Figure 1) and further detailed in Supplementary Table 1. By presenting both the historical context and the pharmacological relevance of these remedies, this study aims to highlight Rāzī's contributions to the history of dental practice and to stimulate further research into the clinical potential of traditional medicinal plants in contemporary dentistry.

Materials and Methods

The study examined the first and second volumes of the Arabic edition of *Kitāb al-Hāwī fī al-Ṭibb* published by Dar al-Kotub al-Ilmiyah (2000). Relevant sections on dental and oral diseases (Vol. 1, pp. 444–491; Vol. 2, pp. 509–521) were translated into Turkish. Since the text lacked systematic structure, information on oral conditions was reclassified and organized. Toothache types, treatments, and medicinal plants were analyzed and compared with modern pharmacological literature. References from national and international journals were reviewed, and findings were summarized in a comprehensive table. No ethical approval was required, as the study involved the analysis of historical texts only. This is a qualitative, descriptive, and document-based original research study. It involves the translation, thematic reclassification, and content analysis of selected sections from the historical medical text *Kitāb al-Hāwī fī al-Ṭibb* by Abū Bakr al-Rāzī. The study also includes a comparative literature review focusing on the modern ethnopharmacological relevance of the herbal treatments described in the text.

Result

Types, Causes, and Treatments of Toothache

Referring to Galen, Razi stated that the tooth is a bone that can absorb “lousy moisture”. Gum diseases are caused by “waste fluids flowing from the body towards the gums”, and toothache is caused by the penetration of these fluids into the tooth. If the pain originates from the gum, it is classified as “hot pain.” If it originates from the tooth itself, it is classified as “cold pain.” Treatment was carried out with substances contrary to the disease's nature: herbal mixtures, “honey, vinegar, arsenic, vitriol,” and “tar,” were used. Non-pharmaceutical methods included “massage,” “filling,” “compressing,” “cupping,” “dripping liquid into the nose” and “ear,” “cauterizing the tooth,” and “tooth extraction” (al-Rāzī, 2000, Vol. 1, pp.444-491).

Hot pains and treatments

According to Razi, a hot toothache is caused by waste fluids flowing from other parts of the body into the gums, softening the blood vessels. It is accompanied by the formation of a hot swelling in the gums, sometimes in the palate as well. Therefore, if swelling of the gums is detected during the examination, he considers it appropriate to intervene on the gum, not the tooth, and avoids tooth extraction. Razi recommends “vinegar” and



“honey,” which can both cool the heat and warm the cold, to treat hot diseases of the gums (al-Rāzī, 2000, Vol. 1, pp. 444-491; al-Rāzī, 2000, Vol. 2, pp. 509-521). Drugs called “astringents” were used to strengthen the veins, which were believed to have softened. These include “chicory, strawberry goosefoot, and ground pine bark” used as a mouthwash, “warm mastic, lentils, camphor, and a mixture of old grapevine wine and pure rose oil” used only in the mouth, and “german chamomile, marshmallow, fenugreek, flaxseed, and dill” used as compresses. Camphor used as a filling has been reported to prevent the carious area from expanding. Razi considers filing “cooling treatment” necessary if the teeth are elongated. Stating that hot diseases can dry and crack the teeth, he recommended applying “butter” and “duck fat” to the teeth and gums. He presented gargling and holding it in the mouth in hot diseases as separate treatment methods (al-Rāzī, 2000, Vol. 1, pp. 444-491).

Cold Pains and Treatments

Razi stated that the causes of “cold pain” are “bad humidity,” “coarse wind blowing,” and “stretching of the nerves under the tooth.” Tooth decay is caused by “lousy humidity” and is noticed when the tooth turns “eggplant colour” or “black.” This moisture comes from the “stomach,” “lungs,” “head fluids,” and “food.” Therefore, the drugs used were called “desiccant-solvent” and “desiccant-heater.” Drugs are used as a mouthwash or just in the mouth, as a filling, massaged onto the root, heated and instilled into the cavity, applied as a dressing, instilled into the ear and nostril, and smoked inside the mouth (al-Rāzī, 2000, Vol. 1, pp. 444-491; al-Rāzī, 2000, Vol. 2, pp. 509-521). Razi, recommended “mulberry gum, curly dock, asparagus seed, pine bark, caper root bark and fruit, garlic, frankincense, oily pine wood, leek, cypress cone tree bark, hing or devil’s dung, mulberry leaves, wild rue, black cumin (seed), arar, pepper, ginger, mustard, fig latex, arum, black viburnum, myrtle leaves, burnt vetch, cinquefoil, lice-bane, bay laurel seeds, alum, birthwort, buttercup, fumitory, pennyroyal, mustard oil, vinegar” and “honey mixture, pellitory or bitter apple” to be chewed in single, double or triple mixtures, cooked, and kept in the mouth or gargled (al-Rāzī, 2000, Vol. 1). However, caution should be exercised, as swallowing the “bitter apple” and getting it into the stomach can have dire consequences (al-Rāzī, 2000, Vol. 1, pp. 444-491; al-Rāzī, 2000, Vol. 2, pp. 509-521). If the “lousy moisture” comes from the stomach’s mouth, the patient is given appropriate medicines such as “bindweed and myrrh.” If a headache accompanies the pain, the cause of the toothache is attributed to the waste fluids flowing from the head to the teeth. In this case, Razi tried diarrhea to drain the harmful fluids from the head. Razi wrote that “mandrake roots, henbane, and opium may be mixed with grape juice or honey and taken in the evening for severe, sleepless pain.” However, he ultimately preferred applying these substances directly to the tooth and emphasized that drinking anesthetic mixtures was not safe. In his text, Razi uses these herbs singly, in pairs, and sometimes in threes. In addition to these treatments, he recommended “bandaging the jaw externally with flaxseed, fenugreek, dill, marshmallow flower, and chamomile or massaging” (al-Rāzī, 2000, Vol. 1, pp. 444-491). As a filling, he advises using a mixture prepared by kneading peach pith with half its amount of either “pepper and tar” or “black cumin seed and oil.” Razi, quoting Dioscorides, recommends that the “scarlet pimpernel be dripped as a liquid into the nostril opposite the aching side” and “some preparations are dripped into the



ear" (al-Rāzī, 2000, Vol. 1, pp. 444-491). For example, "*crushed pennyroyal, pistachio gum, sulfur, wolfberry, vitriol, or almond oil*" is put into the decayed tooth, and "almond oil" is dripped into the ear on the side of the decayed tooth. Cauterization, used in cases where medication is ineffective, is done either by pressing a heated iron against the tooth or by "*dripping hot oil and egg yolk*" onto the tooth (al-Rāzī, 2000, Vol. 1, pp. 444-491). One of the causes of "*cold toothache is the stretching of the nerves under the tooth*". For these pains, Razi recommends fillings, fumigation of the inside of the mouth. Only when these intermediate measures fail does he advocate for tooth extraction as a final recourse. Razi states that teeth have sensation because they receive soft nerves from the brain. In this type of pain, which is felt deep in the skin and the jawbone, the gums have no swelling while the tooth is decayed. In cases where the decay is not deep, and the pain is not severe, the first drugs to be used are "*astringent-dissolving vinegar, thuja, thorn trees, gale of the wind, mint, nut grass, etc.*" as they are believed to strengthen the nerves. If the pain was severe, "*vinegar, pellitory, and pennyroyal*" were recommended, as melting and dissolving would be done. Also, "*seeds of storax-opium, yellow sulfur-wolfberry, or hennbane*" were used for incense (al-Rāzī, 2000, Vol. 1, pp. 444-491). As a last resort before extraction, Razi recommends mixtures intended to weaken the connection between the tooth and the nerves and thus loosen the tooth. These include:

- pellitory or wild cucumber roots soaked in wine vinegar for three days;
- mixtures containing nettle seeds, yarrow, African balsam, hing (devil's dung), bitter apple, turmeric, aloe, mulberry peels, yellow arsenic and honey;
- combinations of flour, spurge milk, strawberry milk, and frankincense;
- and mixtures made from hawthorn or coconut with vinegar, as well as ervil, lupine, sulfur, tar, and maize-olive gum (al-Rāzī, 2000, Vol. 1, pp. 444-491). Some plants are expressed in proportions since the text is not written systematically. For example, in a different part of the text, "*3 dirhams of nettle seed and yarrow*" are mentioned in a mixture of "*2 dirhams of African balsam*" (al-Rāzī, 2000, Vol. 1, pp. 444-491). The gr. equivalent of 1 dirham, the Islamic measure of weight, varies from region to region (Halil). Before applying these, the area around the tooth should be covered with wax to protect the healthy tissues. In case of "*severe wind pain*," "*keeping sesame oil or heated cow butter in the mouth*" is recommended in addition to all the cold pain drugs from the above plants (al-Rāzī, 2000, Vol. 1, pp. 444-491). As a result of Razi's integrative and observational medical methodology, his approach to dental pain reflects a sophisticated understanding of pathology, diagnosis, and therapeutic decision-making. Rather than attributing toothache solely to humoral imbalance, a dominant explanatory model in medieval Islamic medicine, Razi considers various contributing factors. These include dietary habits, environmental influences such as wind and cold exposure, and individual physiological characteristics like age, temperament, and general bodily constitution. This multifactorial outlook anticipates modern holistic approaches to disease and care. Examining *Kitāb al-Hāwī Fi'l-Tibb* reveals that Razi systematically favored non-invasive treatment options in managing dental pain. He recommended various herbal preparations including analgesic plant extracts, aromatic substances, and sedative poultices for topical application. These remedies were designed to alleviate pain and correct the underlying physiological disturbances causing the ailment. This indicates Razi's commitment to restoring internal balance before advancing to more invasive methods. When such conservative treatments



failed, Razi advised cauterization to block nerve function and relieve persistent pain. While this technique involved a degree of invasiveness, he presented it as an intermediary step that should only be taken before considering tooth extraction. Extraction itself was depicted as a last resort justified only when all other therapeutic avenues had proven ineffective. This stepwise therapeutic framework begins with herbal remedies, progresses to cauterization, and ends with extraction. It reflects a cautious clinical approach that prioritizes patient welfare and minimal intervention. Moreover, *Kitāb al-Hāwī* describes dental conditions and their symptoms, including gum inflammation, abscesses, and caries. These discussions provide insight into how dental pathologies were recognized, categorized, and managed within the medical framework of Razi's time. Taken together, these findings demonstrate that Razi's approach to dental pain was both methodical and nuanced. His emphasis on personalized treatment strategies, gradual therapeutic escalation, and theoretical clarity positions him as a foundational figure in the historical evolution of dental medicine. His writings continue to offer valuable perspectives on the enduring legacy of pre-modern Islamic medical thought (al-Rāzī, 2000, Vol. 1, pp. 444-491; al-Rāzī, 2000, Vol. 2, 509-521).

Discussion

Razi developed his approaches to dental and gum diseases within the framework of humoral pathology theory. He categorized toothache as “hot” or “cold” and suggested treatments designed to rebalance bodily fluids. He also described that “waste fluids” from the head, lungs, or stomach could dry out and trigger dental pain. Although this explanation reflects the humoral paradigm, which differs fundamentally from modern biomedical models, some of his observations remain strikingly relevant today. His idea that “harmful moisture” from the stomach damages teeth parallels today's understanding of reflux-induced dental erosion (Ranjitkar, et al., 2012, pp. 479850).

Despite operating within an outdated framework, his holistic view of oral-systemic health shaped his extensive use of medicinal plants in periodontal therapy. For instance, he recommended camphor, chicory, and strawberry goosefoot—plants now known to exert anti-inflammatory and antimicrobial effects (Duke, 2002, pp. 142, 184; Bezerra, et al., 2022, p. 3; El-Sayed, et al., 2024). Similarly, ginger and chamomile, which he associated with oral conditions, have been widely studied and shown to reduce cariogenic bacteria and inflammatory markers in gingivitis (Hasan, et al., 2015, p. 1; Mostafa, et al., 2018; Tadbir, et al., 2015; Gomes, et al., 2018; Srivastava, 2010). Contemporary scientific data thus confirm the pharmacological activity of many plants listed in Table 1, reinforcing the alignment between Razi's therapeutic choices and modern dental findings. This concordance both highlights the scientific value of traditional remedies and underscores Razi's remarkable clinical insight.

Beyond periodontal therapy, Razi also addressed severe dental pain with stronger substances. He used henbane, mandrake, and opium, sometimes mixed with grape juice or honey as oral painkillers. However, he was cautious about their side effects, often preferring topical application as fillings. This practice can be regarded as a historical precursor of local anesthesia (al-Rāzī, 2000, Vol. 1, pp. 444–491). Modern studies further validate his intuition, as honey's antimicrobial, antibiofilm, and wound-healing activities have been repeatedly confirmed in contemporary research, including its effects against



Streptococcus mutans and its role in oral tissue repair (Mandal and Mandal, 2011; Tashkandi, 2021; Deglovic, et al., 2022, p. 3; Grabek-Lejko and Hyrchel, 2023; Alasqah, et al., 2022). In this way, his approach shows both a reliance on empirical knowledge and an effort to minimize harm principles, which are still central to dental therapeutics today.

Table 1: Medicinal Plants and Evidence for Dental/General Biomedical Uses

No	Plant (Latin Name)	Status	Description	Reference
1	<i>Cichorium intybus</i> (Chicory)	✓	Antimicrobial effect against oral patho-gens.	Al-Haliem, et al., 2025; Bezerra, et al., 2022; El-Sayed, et al., 2024
2	<i>Zingiber officinale</i> (Ginger)	✓	Antibacterial activity against <i>Streptococcus mutans</i> and other oral bacteria.	Ahmed, et al., 2022; Hasan, et al., 2015; Mostafa, et al., 2018
3	<i>Matricaria chamomilla</i> (Chamomile)	✓	Effective in oral ulcers and gingivitis treatment.	Srivastava, et al., 2010; Tadbir, et al., 2015; Gomes, et al., 2018
4	Aloe vera	✓	Clinically effective in recurrent aphthous stomatitis.	Babae, et al., 2012; Mansour, et al., 2014; Zagórska-Dziok, et al., 2017
5	<i>Anacyclus pyrethrum</i> (Pellitory)	✓	In vitro antibacterial activity against oral pathogens; traditional use for toothache.	Jalayer Naderi, et al., 2012; Usmani, et al., 2016; Subbiah, et al., 2023
6	<i>Citrullus colocynthis</i> (Bitter Apple)	✓	Antimicrobial effect against microbes common in oral infections.	Tahmasebi, et al., 2022; Ghahramani, et al., 2024; Tahmasebi, et al., 2025
7	<i>Olea europaea</i> (Olive)	–	Antioxidant properties demonstrated.	Omar, 2010; Carrol, et al., 2020, pp. 15-16; Kinkela Devčić, et al., 2024; Clusa, et al., 2025
8	<i>Fumaria officinalis</i> (Fumitory)	–	Reported antioxidant, antimicrobial and anti-inflammatory effects.	Staneva, et al., 2019; Prokopenko, et al., 2025; Ahmoda, et al., 2025
9	<i>Daniellia spp.</i> (African balsam)	–	Reported antimicrobial and antifungal properties.	Ahmadu, et al., 2004; Tittikpina, et al., 2022; Magnibou, et al., 2024
10	<i>Vachellia/Acacia spp.</i> (Thorn trees)	–	Antimicrobial and antioxidant activity; traditional oral hygiene use.	Ali, et al., 2012; Almas, 2001; Rangaraju, James, and Babu., 2023

In addition to herbal remedies, Razi demonstrated pharmacological insight in his discussion of toxic substances. He warned against swallowing bitter apple, anticipating modern toxicological data. While *Citrullus colocynthis* shows antimicrobial effects, toxicity limits its use (Rao and Poonia, 2023). Substances like arsenic have been abandoned due to safety concerns (Smith and Steinmaus, 2009), showing Razi's balance of innovation and caution.

His surgical recommendations further demonstrate this pragmatic balance. Tooth extraction was considered a last resort, and Razi advised covering surrounding tissues with wax before applying preparations to minimize collateral damage. He also described the use of plants such as pellitory and wild cucumber to loosen teeth, which modern pharmacological studies confirm as possessing analgesic and antimicrobial effects (Sahin, et al., 2021, pp. 1326–1331). When other options failed, he used cauterization or extraction. This approach reveals that even with limited tools, he aimed to minimize harm, mirroring today's principles of minimally invasive dental care. In addition, Razi employed a remarkable variety of medicinal plants to treat dental pain. Although he explained their effects within the framework of humoral pathology, many of these plants retain therapeutic relevance



today. Supplementary Table 1 provides a detailed overview of a broader range of herbs, each supported by modern pharmacological studies confirming their anti-inflammatory, antimicrobial, or analgesic effects (see Jishtu, et al., 2023, pp. 257–286; Antoniadou, et al., 2023, pp. 1123–1135; Idris, et al., 2019; Annaz, et al., 2022, pp. 100550; da Silva, et al., 2019, p. 1; Shennan, 1896, pp. 34–48; Mincheva, et al., 2019, pp. 100237; Erbay, et al., 2018, pp. 49–54; Özdemir and Bayraktar Döner, 2017, pp. 57–60; Razavi, et al., 2021, pp. 18–21; Magi, et al., 2018, pp. 208–215; Wigraiboon, et al., 2024, pp. 14–24; Haghgoo, et al., 2017, pp. 242–246; Golestannejad, et al., 2020, pp. 179–185; Hafez, et al., 2024, pp. 104632; Balogun, et al., 2023, pp. 1–10; Inchingolo, et al., 2024, pp. 1–18; Xia, et al., 2023, pp. 2514–2531; Van Damme, et al., 2000, pp. 433–446). This integration of traditional remedies with modern validation highlights not only the potential of phytotherapy in dentistry but also Razi's skill in transforming observation and experience into systematic medical knowledge.

Conclusion

Razi's writings illustrate both the limits of humoral pathology and his remarkable foresight. His recognition of systemic factors such as reflux, his use of medicinal plants later validated in periodontal therapy, and his caution toward toxic substances show a clear continuity between his medical reasoning and modern dentistry. His holistic view of oral health, supported by strong pharmacological insight, adds historical depth and continues to motivate contemporary research. This study shows that traditional remedies can align with modern evidence; hence, Razi's work encourages further exploration of the therapeutic potential of medicinal plants. At the same time, it highlights his exceptional skill in medicine: transforming careful observation and experience into treatments; an approach that still carries scientific relevance today.

Authors' Contribution

Merve Erdem interpreted the Turkish translation of the original text, investigated the contemporary scientific evidence concerning the medicinal plants, and drafted the manuscript. Ahmet Beyatlı and Ismail Uzar translated the relevant Arabic text into Turkish. Isa Bodur and Burak Karip, together with Merve Erdem, investigated the current scientific evidence concerning the medicinal plants discussed in the study. Burak Karip also prepared the table and reviewed the manuscript. Ibrahim Topcu contributed to the conception of the study and critically reviewed and revised the manuscript. All authors read and approved the final version of the work.

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Conflict of Interest

The authors declare no conflict of interest.

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