

SYSTEMATIC REVIEW

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Aesthetic dentistry and ethics: a systematic review of marketing practices and overtreatment in cosmetic dental procedures

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Abstract

Background The increasing societal emphasis on physical appearance, particularly influenced by social media, has led to a significant rise in demand for aesthetic dentistry procedures. This study aims to explore the ethical dimensions of marketing practices and the phenomenon of overtreatment in cosmetic dental procedures, highlighting the implications for patient care and professional integrity.

Methods A systematic literature review was conducted across four databases, yielding an initial 76 articles. After applying inclusion and exclusion criteria, 12 articles were selected for analysis. The review focused on ethical considerations, marketing practices, and overtreatment in aesthetic dentistry, employing narrative synthesis to extract relevant data.

Results The findings indicate that social media is a primary driver of patient expectations, often prioritizing aesthetic outcomes over health considerations. This trend raises ethical concerns about informed consent and autonomy. The commodification of dental care, fueled by aggressive marketing strategies, has resulted in a notable increase in overtreatment, where unnecessary procedures are performed to satisfy commercial pressures and idealized beauty standards. The review highlights a lack of robust ethical guidelines governing marketing practices in aesthetic dentistry, exacerbating these issues.

Conclusions The study underscores the urgent need for clear ethical frameworks to guide dental practitioners in balancing patient welfare with business interests. Recommendations include the implementation of ethics education in dental curricula, the development of comprehensive ethical guidelines, and fostering open communication between practitioners and patients. These measures are essential for enhancing informed decision-making and ensure that patient care remains the priority in aesthetic dentistry.

Keywords Aesthetic dentistry, Dental ethics, Marketing practices, Overtreatment, Social media influence, Cosmetic procedures, Patient autonomy, Informed consent

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Introduction

The pursuit of beauty has become a ubiquitous aspect of modern life, with aesthetic dentistry emerging as a significant field within dental practice. This trend is driven by the increasing societal emphasis on physical appearance and the pervasive influence of social media [1]. The



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advent of platforms such as Instagram, Facebook, and TikTok has transformed the landscape of cosmetic dentistry, allowing practitioners to showcase their work and engage with potential patients in unprecedented ways [2]. This digital revolution has not only heightened public awareness of aesthetic procedures but has also led to a surge in demand for treatments such as teeth whitening, veneers, and orthodontics [2].

The intersection of aesthetic dentistry and marketing practices raises important ethical considerations, as social media can raise awareness about oral health and promote preventive care while also creating opportunities for misleading advertising and the exploitation of patients' desires for aesthetic treatments [3]. As dental professionals navigate the fine line between promoting their services and ensuring patient welfare, the risk of overtreatment becomes a pressing concern. Overtreatment—defined as unnecessary dental procedures—can arise from various factors, including commercial pressures and patient expectations shaped by idealized beauty portrayals on social media [2].

Moreover, the ethical implications of marketing practices in aesthetic dentistry warrant scrutiny. The promotion of cosmetic procedures often emphasizes aesthetic outcomes over health considerations, potentially leading to a commodification of dental care [2, 4]. This trend raises questions about the responsibilities of dental practitioners to prioritize patient autonomy and informed consent while also addressing the societal pressures that drive individuals to seek cosmetic enhancements [4].

The ethical implications of marketing practices in aesthetic dentistry are complex. The promotion of cosmetic procedures often emphasizes aesthetic outcomes over health considerations, potentially leading to a commodification of dental care [2, 4]. This trend raises critical questions about the responsibilities of dental practitioners to prioritize patient autonomy and informed consent while also addressing the societal pressures that drive individuals to seek cosmetic enhancements [4].

Furthermore, the influence of social media on aesthetic dentistry is particularly noteworthy. These platforms provide a powerful conduit for dental professionals to promote their services and showcase their work [5]. However, this digital marketing landscape also presents challenges in terms of maintaining professional integrity and ensuring that patient interests are not compromised in the pursuit of commercial success. The balance between leveraging social media for legitimate practice promotion and avoiding the pitfalls of misleading or exaggerated claims is a delicate one that requires careful consideration and ethical guidance.

The potential for overtreatment in aesthetic dentistry is a significant ethical concern that merits close scrutiny. As

the demand for cosmetic dental procedures grows, there is an increased risk of unnecessary interventions that may not serve the best interests of patients. This issue is compounded by the fact that aesthetic treatments often fall outside the realm of medical necessity, blurring the lines between health care and elective enhancements. Dental professionals must navigate these complex waters, balancing their role as healthcare providers with the business aspects of their practice [6].

Patient autonomy and informed consent are central to ethical practice in aesthetic dentistry and must be prioritized. The challenge lies in ensuring that patients are fully aware of the risks, benefits, and alternatives to proposed treatments, particularly when these treatments are primarily cosmetic in nature. Dental professionals must strive to provide unbiased information, allowing patients to make decisions free from undue influence or pressure [4].

This systematic review aims to explore the ethical dimensions of marketing practices in aesthetic dentistry, particularly focusing on the phenomenon of overtreatment in cosmetic dental procedures. By examining existing literature published from 2011 to December 2024, this review will highlight the challenges faced by dental professionals in balancing the demands of a competitive market with their ethical obligations to patients. This period marks a notable evolution in aesthetic dentistry practices and ethical considerations, particularly influenced by the rapid growth of social media and changing patient expectations. Recent studies indicate a significant increase in demand for cosmetic dental procedures, raising concerns about the potential biological and psychosocial harms associated with these practices [7]. Ultimately, this analysis seeks to contribute to the ongoing discourse on the role of ethics in aesthetic dentistry, providing insights that may guide practitioners in navigating the complexities of this evolving field [4].

As aesthetic dentistry continues to grow in popularity, it is imperative to critically assess the ethical implications of marketing practices and the potential for overtreatment. This review aims to provide a foundation for understanding these dynamics and promoting a more ethically responsible approach to cosmetic dental care.

Materials and methods

We conducted a systematic literature review by searching four databases: PubMed, Web of Science, Scopus, and Google Scholar. The following search terms were employed: "aesthetics", "beauty", "cosmetic dentistry", "ethics", "bioethics", "professional ethics", "marketing", "advertising", "overtreatment", "unnecessary procedures", "dentistry", and "dental care". No restriction

was placed on the type of methodology used in the papers (qualitative, quantitative, mixed methods, or theoretical).

To ensure a comprehensive selection of studies, we refined our search strategy by adjusting search terms and combining them with Boolean operators (AND, OR) to capture a broader range of relevant literature. For example, we explored variations of key terms and included synonyms to enhance the search results. We included all articles published from 2011 up to December 2024, as this timeframe reflects significant shifts in aesthetic dentistry practices and ethical concerns, particularly with the rise of social media and its influence on patient expectations and treatment decisions. The selected studies encompassed various methodologies, including cross-sectional surveys, qualitative interviews, and theoretical analyses. The search was performed on 28 December 2024.

The specific search strings used for each database are provided as a supplemental file to enhance transparency and facilitate reproducibility.

While we focused on peer-reviewed articles to ensure the methodological rigor of our systematic review, we acknowledge that the exclusion of grey literature, books, and conference proceedings may limit the comprehensiveness of our findings. Grey literature often contains practical insights, case studies, and emerging trends that may not yet be published in peer-reviewed journals [8]. Additionally, conference proceedings can provide timely information on the latest research and developments in the field of aesthetic dentistry. However, it is important to note that 'conference papers rarely provide enough detail of the methods used due to space limitations in journal volumes and conference proceedings. There is therefore a danger that what is being assessed is the quality of reporting rather than the quality of research.' This highlights the inherent challenges in relying solely on peer-reviewed articles, as the richness of information found in grey literature and conference proceedings may be overlooked [9]. This highlights the inherent challenges in relying solely on peer-reviewed articles, as the richness of information found in grey literature and conference proceedings may be overlooked. However, we did include one dissertation in our analysis, which provided valuable insights into the impact of social media on beauty standards in dentistry. Despite this, our review may not fully capture the breadth of ethical considerations and practical implications that exist outside of traditional academic literature. Future research could benefit from including these sources to provide a more holistic understanding of the ethical dimensions of marketing practices and overtreatment in aesthetic dentistry. Only English-language articles were included. From an initial yield of 76

articles, 13 studies met the inclusion criteria after rigorous screening.

Search strategy and Boolean operators

The search strategy was developed using Medical Subject Headings (MeSH) terms and free-text terms, combined using Boolean operators (AND, OR). The primary search terms were grouped into four main categories:

- Aesthetic/cosmetic terms: "aesthetics," "beauty," "cosmetic dentistry"
- Ethical terms: "ethics," "bioethics," "professional ethics"
- Marketing/procedure terms: "marketing," "advertising," "overtreatment," "unnecessary procedures," "social media"
- Dental practice terms: "dentistry," "dental care"

Database-specific search strings

- PubMed: The search combined MeSH terms and Title/Abstract searches, yielding 28 results.
- Web of Science: Topic search (TS) yielded 5 results.
- Scopus: Title-Abstract-Keyword search returned 26 results.
- Google Scholar: Supplementary search identified 17 additional relevant articles.

Inclusion criteria included studies addressing ethical considerations in aesthetic dentistry, marketing practices, and overtreatment, as well as peer-reviewed publications in English. Exclusion criteria included non-English language publications, opinion pieces without substantive analysis, and articles not focusing on ethical aspects.

We followed the protocol from the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method [10], which resulted in 76 papers. We scanned the results for duplicates [11] and 57 papers remained. In this phase, we included all articles that focused on ethical considerations in aesthetic dentistry, marketing practices, and overtreatment in the field of dentistry. Papers that did not address ethical issues, were not focused on dentistry, or did not relate to marketing practices or overtreatment were excluded. Additional papers were excluded based on our predefined criteria, resulting in a total of 41 excluded articles.

We subsequently attempted to access the full texts of the remaining 16 articles. However, 2 articles were found to be inaccessible despite our efforts to access them through our institutional login, contacting the respective journals, and reaching out to the authors directly. As a result, these articles were excluded from our review,

which may impact the completeness of our findings, leaving us with 14 papers for full-text review and data extraction. During the next phase, the first author conducted a thorough evaluation of the full texts, resulting in the exclusion of two more articles (see Fig. 1 for PRISMA flow diagram).

Data analysis description

The subsequent phase of the study involved the analysis of the 12 articles. Data analysis involved conducting a narrative synthesis of the included publications [12]. Therefore, We extracted relevant information from the papers, including: year and country of publication; methodology; specific focus within aesthetic dentistry (e.g., marketing practices, overtreatment); ethical issues that emerge from marketing practices or potential overtreatment; factors that might exacerbate the ethical issues

discussed; suggested potential solutions to the issue(s); and any positive ethical considerations related to aesthetic dentistry marketing practices (Table 1).

Reviewer contributions

In addition to the authors listed, two additional reviewers, Yousef Moradi and Mohammad Aziz Rasouli, contributed to the systematic review process. They were involved in the screening of studies, data extraction, and quality assessment. Their expertise in epidemiology, biostatistics, and health development provided valuable insights that enhanced the rigor and reliability of the review.

Quality assessment statement

To ensure the rigor of our review, we conducted a quality assessment of the included studies using the Joanna

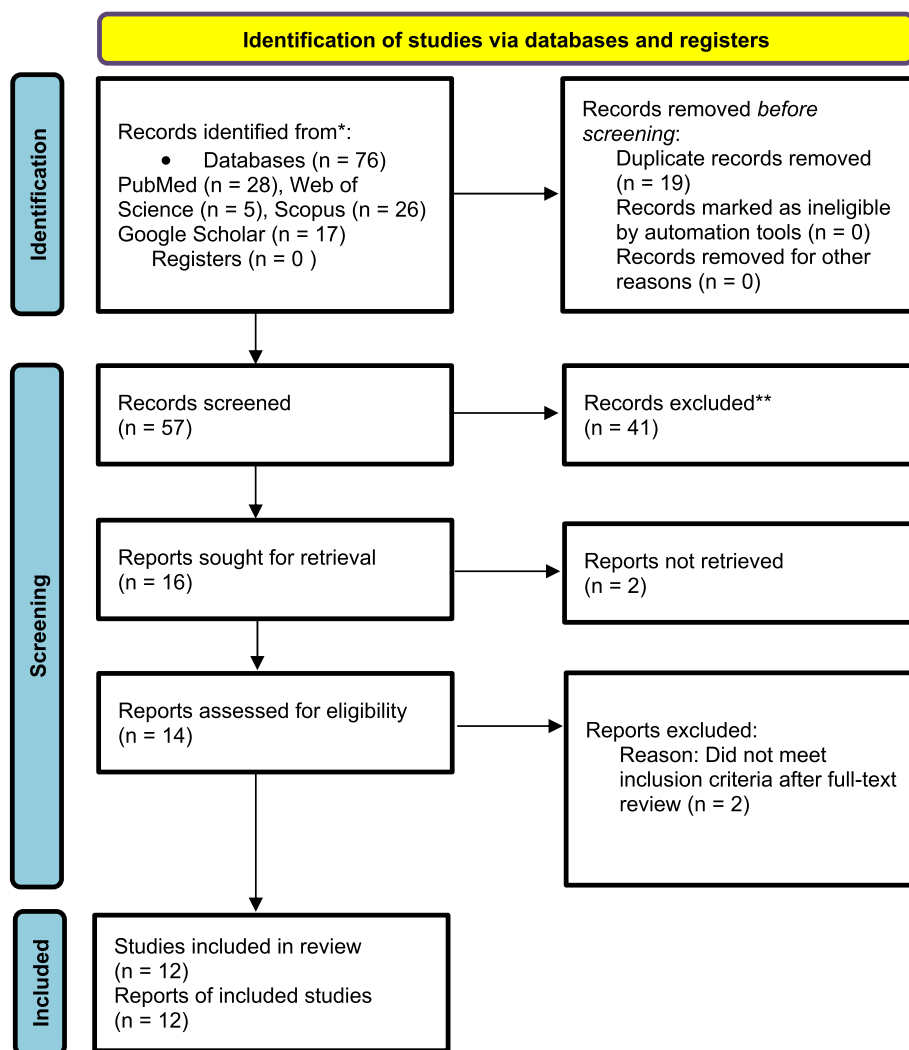


Fig. 1 Preferred Reporting Item for Systematic Reviews and Meta-Analyses (PRISMA) flowchart

Table 1 Data extraction from retrieved papers

Study/Source	Authors	Year	Study Type	Participants	Objective	Key Findings	Ethical Considerations	Marketing Practices	Overtreatment Concerns
Impact of Social Media on Aesthetic Dentistry	Abbasi et al	2022	Cross-sectional survey	461 dental practitioners	Investigate the impact of social media on aesthetic dental procedures	90.7% of practitioners noted increased demand for aesthetic procedures due to social media; popular procedures include teeth whitening (54.7%) and veneers (11.9%)	Social media can mislead patients about aesthetic procedures, leading to unrealistic expectations	Use of before-and-after photos for advertising; social media as a platform for education and communication	Risk of unnecessary procedures driven by trends and social media influence [2]
Suggestion for Determining Treatment Strategies in Dental Ethics	Kovács	2023	Theoretical article	N/A	Explore ethical treatment strategies in dentistry	Emphasizes the importance of patient autonomy and informed consent in aesthetic procedures	Ethical dilemmas arise from prioritizing aesthetic outcomes over health	Marketing strategies often focus on aesthetic results, potentially overshadowing health considerations	Overtreatment linked to commercial pressures and patient expectations shaped by social media [4]
Influence of Social Media Towards Aesthetic Dentistry	Ahmad et al	2023	Cross-sectional survey	500 patients	Assess the influence of social media on patients' decisions regarding aesthetic treatments	58.3% of respondents trust dental information from social media; teeth whitening is the most desired treatment	Patients may be influenced by unrealistic beauty standards propagated through social media	Social media as a primary source for dental information; influence of dental clinic accounts on patient choices	Increased demand for cosmetic procedures may lead to unnecessary treatments [14]
Overtreatment as an Ethical Dilemma in Australian Private Dentistry	Holden et al	2020	Qualitative study	20 dental practitioners	Explore overtreatment in private dental practice	Dentists report pressure to provide high-cost treatments, leading to potential overtreatment	The balance between commercialism and professionalism is crucial to prevent overtreatment	Financial incentives may drive unnecessary treatments; marketing strategies often focus on high-value procedures	Overtreatment is a widespread issue, often unmeasured in practice [6]
Knowledge and Attitude Toward Esthetic Dentistry and Smile Perception	Mannaa	2023	Cross-sectional survey	200 dental students	Investigate knowledge and attitudes towards esthetic dentistry among dental students	Positive correlation between academic progression and exposure to esthetic dentistry topics	Awareness of aesthetic standards can influence treatment decisions and patient expectations	Educational institutions play a role in shaping marketing strategies for dental practices	Students may feel pressured to conform to aesthetic standards, leading to overtreatment [15]
Social Media Impact on Students' Decision-Making Regarding Aesthetic Dental Treatments	Freire et al	2024	Cross-sectional survey	504 university students	Assess the influence of social media on students' regarding aesthetic dental treatments	37% of respondents indicated that social media influenced their decision to have aesthetic treatment	The role of social media in shaping perceptions of beauty can lead to ethical dilemmas in treatment recommendations	Posts from dental clinics or dentists were the most influential content	Patients may pursue unnecessary treatments based on social media trends [16]

Table 1 (continued)

Study/Source	Authors	Year	Study Type	Participants	Objective	Key Findings	Ethical Considerations	Marketing Practices	Overtreatment Concerns
Straight, White Teeth: How Social Media Has Impacted The Beauty Standard In Dentistry	Nayaz & Pieper	2024	Qualitative interviews	Two general dentists and two orthodontists	To explore how social media has influenced beauty standards in dentistry	Social media has created a homogenized beauty standard; dentists feel pressured to conform	Ethical implications of promoting unrealistic beauty standards and patient engagement	Use of social media for marketing and patient engagement	Concerns about the impact of beauty standards on treatment decisions [17]
How much dentists are ethically concerned about overtreatment; a vignette-based survey in Switzerland	Kazemian et al	2015	Vignette-based survey	732 dentists	Investigate dentists' ethical concerns regarding overtreatment in Switzerland	Most dentists perceive overtreatment as ethically unacceptable; concern about the prevalence of unethical behaviors among peers	Highlights the need for ethical guidelines in dental practice to address overtreatment	Not specifically addressed; focuses on ethical behavior rather than marketing	Overtreatment is recognized as a significant issue, with dentists concerned about the ethical implications of unnecessary treatments [18]
Ethics in dentistry	B. Sabarinath, B. Sivapathasundaram	2011	Survey	1128 dental clinics	Assess ethical practices in dental clinics	Identified issues related to advertising, qualifications, and ethical standards in dental practice	Emphasizes the importance of ethical standards and informed consent in practice	Advertising practices may mislead patients regarding qualifications and services	Potential for overtreatment due to misleading advertising and lack of informed consent [19]
Implementation of a medical ethics course in undergraduate dental education and assessment of knowledge and attitudes	Annabelle Tenenbaum et al	2020	Interventional study	299 dental students	Assess the impact of a medical ethics course on students' knowledge and attitudes	Significant improvement in knowledge of ethical principles and legal frameworks post-course	Highlights the importance of ethics education in shaping future dental professionals	Not specifically addressed; however, the course aims to improve ethical decision-making	Overtreatment concerns may arise from lack of knowledge and ethical training [20]
The Top 10 ethical challenges in dental practice in Indian scenario: Dentist perspective	Vanishree M. Kemparaj et al	2018	Qualitative study	20 dental professionals	Identify and rank ethical challenges in dental practice in India	Top challenges include inadequate sterilization, poor knowledge of ethics, and overtreatment	Emphasizes the need for ethical training and awareness among dental practitioners	Advertising practices may contribute to ethical dilemmas in treatment decisions	Overtreatment is identified as a significant issue, often driven by commercial pressures and patient expectations [21]
Qualitative assessment of ethical issues in dental practice: An expert opinion	Vanishree M. Kemparaj et al	2016	Qualitative study	15 bioethicists	Assess ethical issues in dental practice using expert opinions	Identified 18 categories of ethical challenges, including overtreatment and conflict of interest	Highlights the need for ethical standards and training in dental practice	Commercialization of dental practice may lead to ethical dilemmas	Overtreatment is a significant concern, influenced by marketing strategies and patient expectations [11]

Briggs Institute (JBI) Critical Appraisal Tools [13]. Each publication was evaluated against specific criteria tailored to its study design, including methodological soundness, relevance to the research question, and robustness of findings. To enhance inter-rater reliability, multiple reviewers were involved in the quality assessment process. Each reviewer independently assessed the studies, and any discrepancies in ratings were discussed and resolved through consensus. This approach helped to minimize subjective judgments and ensured consistency in the evaluation of the studies. This comprehensive assessment enabled us to identify the strengths and weaknesses of each study, considering factors such as sample size, potential biases, and ethical considerations (Table 2). By interpreting the results within the context of their quality, we enhanced the reliability of our synthesis and conclusions, providing a nuanced understanding of the impact of social media on aesthetic dentistry.

Trial registration

This systematic review was registered in the Research Registry under the unique identifying number reviewregistry1935. The registration can be accessed at [Research Registry](#).

Results

Methodological overview

This systematic literature review aimed to explore the ethical dimensions of marketing practices and overtreatment in aesthetic dentistry. A comprehensive search across four databases initially identified 76 articles, which was reduced to 57 after removing duplicates. Ultimately, 12 articles met the inclusion criteria for review. These studies employed various methodologies, including Cross-sectional surveys, Qualitative interviews, Theoretical analyses and Interventional studies.

The studies reviewed were published between 2011 and 2024, with a focus on various countries, including Pakistan, Hungary, Australia, Spain, Switzerland, and India. The sample sizes ranged from 200 to 1128 participants, encompassing dental practitioners, students, and patients.

Key findings

The review synthesized findings focusing on ethical considerations, marketing practices, and overtreatment in cosmetic dental procedures. The following key trends and patterns emerged from the analysis of the included studies:

Impact of social media on aesthetic dentistry

A significant majority of dental practitioners (90.7%) reported an increase in demand for aesthetic procedures attributed to social media influence. Popular treatments included teeth whitening (54.7%), Hollywood smiles (17.1%), and dental veneers (11.9%) [2]. Social media was identified as a primary source of information for patients seeking aesthetic treatments, contributing to heightened patient expectations and desires for cosmetic enhancements [14, 17].

Ethical considerations in aesthetic dentistry

Ethical dilemmas often arise when aesthetic outcomes are prioritized over health considerations. Kovács (2023) emphasized the importance of patient autonomy and informed consent in this context [4]. The commodification of dental care, driven by marketing practices that emphasize aesthetic results, raises critical questions about the responsibilities of dental practitioners to ensure patient welfare [4, 6]. Additionally, Sabarinath and Sivapathasundharam (2011) identified issues related to advertising and ethical standards, emphasizing the need for informed consent in dental practice [19].

Overtreatment concerns

Financial pressures and the desire to meet patient expectations often lead to unnecessary procedures. Holden et al. (2020) highlighted that many dentists felt compelled to provide high-cost treatments, which could result in overtreatment [6]. Kazemian et al. (2015) indicated that while dentists perceive overtreatment as ethically unacceptable, there is concern about the prevalence of unethical behaviors among peers [18]. Kemparaj et al. (2018) ranked overtreatment as one of the top ethical challenges in dental practice, driven by commercial pressures [21].

Influence of social media on patient decision-making

Social media significantly influences patient decision-making regarding aesthetic treatments. A study by Freire et al. [16] found that 37% of university students indicated that social media influenced their decision to undergo aesthetic treatment [16]. Additionally, Ahmad et al. (2023) reported that 58.3% of respondents trusted dental information from social media, with many patients expressing a desire for trending treatments [14]. This influence is particularly pronounced among younger demographics, who are more likely to seek aesthetic treatments based on social media exposure [14].

Patient perspectives on aesthetic treatments

Patients' perspectives are increasingly shaped by social media portrayals of beauty, leading to heightened

Table 2 Quality assessment of included studies

Study/Source	Authors	Year	Study Type	Quality Assessment Summary
Impact of Social Media on Aesthetic Dentistry	Abbasi et al	2022	Cross-sectional survey	Strengths: Large sample size (461 practitioners); clear objective; relevant findings on social media impact. Weaknesses: Potential for self-report bias; no control group to compare outcomes
Suggestion for Determining Treatment Strategies in Dental Ethics	Kovács	2023	Theoretical article	Strengths: Addresses ethical considerations; provides a theoretical framework. Weaknesses: Lacks empirical data; not based on primary research
Influence of Social Media Towards Aesthetic Dentistry	Ahmad et al	2023	Cross-sectional survey	Strengths: Large sample size (500 patients); relevant findings on patient trust in social media. Weaknesses: Self-reported data may introduce bias; lacks longitudinal perspective
Overtreatment as an Ethical Dilemma in Australian Private Dentistry	Holden et al	2020	Qualitative study	Strengths: In-depth qualitative insights from practitioners (20 participants); highlights ethical dilemmas. Weaknesses: Small sample size; findings may not be generalizable
Knowledge and Attitude Toward Esthetic Dentistry and Smile Perception	Mannaa	2023	Cross-sectional survey	Strengths: Relevant to dental education; provides insights into student attitudes. Weaknesses: Limited to one educational institution; potential self-selection bias
Social Media Impact on Students' Decision-Making Regarding Aesthetic Dental Treatments	Freire et al	2024	Cross-sectional survey	Strengths: Large sample size (504 students); relevant findings on social media influence. Weaknesses: Cross-sectional design limits causal inferences; potential self-report bias
Straight, White Teeth: How Social Media Has Impacted The Beauty Standard In Dentistry	Nayaz & Pieper	2024	Qualitative interviews	Strengths: Explores societal implications; qualitative insights from interviews. Weaknesses: Sample size not specified; findings may be subjective
How much dentists are ethically concerned about overtreatment: a vignette-based survey in Switzerland	Kazemian et al	2015	Vignette-based survey	Strengths: Addresses ethical concerns; large sample size (732 dentists). Weaknesses: Vignette method may not capture real-world complexities; potential for response bias
Ethics in dentistry	B. Sabarinath, B. Sivapathasundharam	2011	Survey	The study assesses the adherence to ethical codes in clinical practice among dental practitioners in Chennai. It employs a cross-sectional design and provides quantitative data on ethical practices, revealing significant gaps in adherence to ethical standards
Implementation of a medical ethics course in undergraduate dental education and assessment of knowledge and attitudes	Annabelle Tenenbaum et al	2020	Interventional study	This interventional study evaluates the impact of a medical ethics course on dental students' knowledge and attitudes. It uses a robust methodology with pre- and post-course assessments, demonstrating significant improvements in ethical understanding among students
The Top 10 ethical challenges in dental practice in Indian scenario: Dentist perspective	Vanishree M. Kemparaj et al	2018	Qualitative study	The study employs qualitative methods to identify and rank ethical challenges faced by dental practitioners in India. It provides in-depth insights into the ethical landscape of dental practice, highlighting critical issues such as sterilization and informed consent
Qualitative assessment of ethical issues in dental practice: An expert opinion	Vanishree M. Kemparaj et al	2016	Qualitative study	This study gathers expert opinions on ethical challenges in dental practice. It utilizes qualitative interviews and thematic analysis to identify 18 categories of ethical issues, providing a comprehensive overview of the ethical landscape in dentistry

expectations for aesthetic treatments [17]. Nayaz and Pieper (2024) indicated that patients often request specific procedures based on social media portrayals rather than health benefits [17].

Socioethical evaluation of cosmetic dentistry

Dentists face the challenge of balancing commercial interests with their professional obligations to provide care that is in the best interest of the patient [6, 17]. The commercialization of dentistry has led to a transactional relationship between patients and providers, where financial incentives may overshadow ethical considerations [6].

Marketing practices and ethical implications

Marketing practices often emphasize aesthetic outcomes over health considerations, raising ethical concerns. The use of before-and-after photos is prevalent among practitioners, with 48.6% utilizing this approach to attract patients [2]. Concerns about misleading advertising and manipulative content persist [4, 19].

Definition and measurement of overtreatment

Overtreatment is defined as the provision of unnecessary dental procedures that do not align with the best interests of the patient. The studies included in this review employed various methodologies to assess overtreatment, including:

- *Surveys and Questionnaires:* Many studies utilized surveys to gauge dentists' perceptions of overtreatment within their practices. For instance, Kazemian et al. (2015) found that a significant number of dentists acknowledged overtreatment as an ethical concern, with many expressing worries about the prevalence of unnecessary procedures among their peers [18].
- *Qualitative Interviews:* Some studies conducted qualitative interviews with dental practitioners to explore their experiences and perspectives on overtreatment. These interviews revealed that financial incentives often influenced treatment decisions, leading to overtreatment [6, 21].
- *Case Studies:* A few studies presented case studies illustrating instances of overtreatment, highlighting specific procedures that were deemed unnecessary based on clinical guidelines and patient needs [21].

The review identified a consistent theme across studies indicating that commercial pressures significantly contribute to the phenomenon of overtreatment. Key findings include:

- *Financial Incentives:* Holden et al. (2020) highlighted that many dentists felt compelled to provide high-cost treatments driven by commercial incentives rather than clinical necessity [6]. This pressure can lead to a misalignment between patient welfare and business interests.
- *Marketing Strategies:* Kemparaj et al. (2018) ranked overtreatment as one of the top ethical challenges in dental practice, emphasizing that marketing strategies often prioritize profit over patient care, which can exacerbate the issue of overtreatment [21].
- *Patient Expectations:* The desire to meet heightened patient expectations, often shaped by social media portrayals of idealized beauty, further complicates the issue. Dentists may feel pressured to offer unnecessary treatments to satisfy these expectations, leading to overtreatment [18].

Ethical concerns regarding overtreatment

Many dentists reported feeling pressured to provide unnecessary treatments due to financial incentives and the commercialization of dental care [6]. Kazemian et al. (2015) found that although dentists acknowledged overtreatment as unethical, they expressed concern about its prevalence among their colleagues [18]. Furthermore, Kemparaj et al. (2016) identified overtreatment as a significant issue influenced by marketing strategies and patient expectations, highlighting the necessity for ethical training among practitioners [11, 18].

Positive impact of social media on patient education

In addition to the negative aspects, the review also identified positive influences of social media on patient education and awareness regarding aesthetic dental procedures:

- *Increased Awareness of Oral Health:* Several studies noted that social media platforms serve as effective tools for raising awareness about oral health and preventive care. For instance, practitioners reported using social media to share educational content about the importance of regular dental check-ups and preventive measures [5].
- *Engagement and Interaction:* Social media allows for direct engagement between dental professionals and patients, facilitating discussions about treatment options and oral health practices. This interaction can empower patients to make informed decisions about their care [5].
- *Access to Information:* Patients reported that social media provides them with easy access to information about various aesthetic procedures, helping them understand their options and the potential benefits and risks associated with treatments [14].

Impact of ethics education

The implementation of ethics education in dental curricula has shown promise in addressing some of these concerns. Tenenbaum et al. [20] reported a significant improvement in dental students' knowledge of ethical principles and legal frameworks following a medical ethics course [20]. This underscores the importance of ethics education in shaping future dental professionals and potentially mitigating issues related to overtreatment arising from a lack of knowledge and ethical training.

Impact of social media on patient expectations

The review identified a consistent theme regarding the influence of social media on patient expectations for aesthetic dental procedures. Key findings from the studies include:

- *Increased Demand:* A significant majority of dental practitioners (90.7%) reported an increase in demand for aesthetic procedures attributed to social media influence. Popular treatments included teeth whitening (54.7%) and veneers (11.9%) [2].
- *Trust in Information:* Ahmad et al. (2023) reported that 58.3% of respondents trusted dental information from social media, indicating a reliance on these platforms for treatment decisions [14].
- *Direct Influence on Decisions:* Freire et al. [16] found that 37% of university students indicated that social media influenced their decision to undergo aesthetic treatment [16].
- *Unrealistic Expectations:* Nayaz and Pieper (2024) noted that patients often request specific procedures based on social media portrayals rather than health benefits, leading to heightened expectations [17].

Summary of key themes

The findings from this systematic review reveal several critical themes:

- *Social Media Influence:* Social media significantly drives demand for aesthetic dental procedures, shaping patient expectations.
- *Ethical Dilemmas:* The focus on aesthetic outcomes over health raises ethical concerns for practitioners.
- *Overtreatment:* Financial pressures and commercialization contribute to the risk of overtreatment, recognized as an ethical dilemma.
- *Patient Perspectives:* Patients are increasingly influenced by social media portrayals of beauty, leading to heightened treatment expectations.

- *Marketing Practices:* Marketing often emphasizes cosmetic results, potentially compromising patient welfare and informed consent.
- *Global Trends:* The studies indicate that ethical concerns in aesthetic dentistry are global issues, with a growing emphasis on social media's role in marketing over recent years.

Discussion

This systematic review aimed to explore the ethical dimensions of marketing practices and overtreatment in aesthetic dentistry, revealing significant insights into the interplay between social media, patient expectations, and ethical responsibilities of dental practitioners. The findings from the included studies highlight critical themes that warrant further discussion, particularly the influence of social media, the ethical implications of marketing practices, the phenomenon of overtreatment, and the need for robust ethical guidelines in aesthetic dentistry.

This review analyzes the ethical implications through the lens of principlism, focusing on the four fundamental principles of medical ethics: autonomy, beneficence, non-maleficence, and justice. These principles provide a structured framework for evaluating the ethical challenges in aesthetic dentistry, particularly when considering the complex interplay between patient desires, professional obligations, and commercial pressures [22].

Influence of social media on aesthetic dentistry

The review underscores the profound impact of social media on aesthetic dentistry, as evidenced by several studies [2, 14]. These studies indicate that a substantial majority of dental practitioners and patients perceive social media as a significant driver of demand for aesthetic procedures. The influence of social media platforms such as Instagram and Facebook is particularly noteworthy, providing a conduit for dental professionals to promote their services and showcase their work [5]. While these platforms serve as valuable tools for patient education and engagement, they also pose risks of misinformation and the promotion of unrealistic beauty standards.

The dual role of social media as both an educational resource and a potential source of misleading information create a complex landscape for dental practitioners to navigate. As Dwivedi et al. (2021) [5] note, while social media can be beneficial in raising awareness about oral health and promoting preventive care, it also creates opportunities for misleading advertising and the exploitation of patients' desires for aesthetic treatments. This trend raises ethical concerns about the responsibilities of dental practitioners to ensure that patients are

fully informed about the risks and benefits of proposed treatments.

The influence of social media directly relates to the principle of autonomy, as patients may feel pressured to conform to unrealistic beauty standards, potentially compromising their ability to make informed choices. For instance, studies indicate that patients often seek treatments based on social media portrayals rather than their health needs [17]. This highlights the need for practitioners to provide unbiased information that empowers patients to exercise their autonomy effectively.

The pressure to conform to social media trends can lead to a commodification of dental care, where aesthetic outcomes are prioritized over health considerations. As Kovács (2023) [4] emphasizes, patient autonomy and informed consent are paramount in aesthetic procedures, and practitioners must strive to provide unbiased information that empowers patients to make informed decisions. The challenge lies in balancing the desire to meet patient expectations with the ethical obligation to provide care that is in the best interest of the patient.

Ethical implications of marketing practices

The review highlights the significant ethical implications of marketing practices in aesthetic dentistry, particularly the tendency to emphasize aesthetic outcomes over health considerations. As noted by Nayaz and Pieper (2024) [17], the pressure on dental professionals to meet societal beauty standards can lead to marketing strategies that prioritize profit over patient welfare. This commodification of dental care raises critical questions about the ethical responsibilities of practitioners in promoting their services [23].

Atiyeh et al. (2020) [3] point out that many dental practices use deceptive tactics to persuade patients to undergo aesthetic treatments, without fully disclosing the risks and benefits. This practice not only undermines patient autonomy but also compromises the integrity of the dental profession. The findings from Holden et al. (2020) [6] further illustrate the ethical dilemmas faced by dental practitioners, who often feel pressured to provide high-cost treatments driven by commercial incentives rather than clinical necessity.

Sabarinath and Sivapathasundharam (2011) [19] identified issues related to advertising and ethical standards in dental practice, emphasizing the need for informed consent and transparency in marketing practices. The study highlights the importance of ethical guidelines in regulating advertising practices and ensuring that patients are not misled by false or exaggerated claims.

These marketing practices raise concerns related to beneficence and non-maleficence. By prioritizing profit over patient welfare, practitioners may inadvertently

cause harm, either by promoting unnecessary treatments or by failing to provide adequate information about the risks involved. The ethical implications of such practices are profound, as they challenge the fundamental principles of healthcare and the Hippocratic oath to "first, do no harm" [24]. The rise of aesthetic dentistry has led to a growing emphasis on promoting treatments that promise to enhance patients' smiles and overall appearance, often at the expense of comprehensive patient care [3].

The vulnerability of patients in aesthetic dentistry deserves particular attention [25]. Social media and marketing practices often exploit psychological vulnerabilities related to self-image and social acceptance [26]. Patients may seek aesthetic treatments not purely for personal satisfaction but due to societal pressures and idealized beauty standards perpetuated through digital media. This psychological vulnerability raises additional ethical concerns about the exploitation of patients' insecurities for commercial gain [4, 26]. This exploitation can be viewed through the lens of justice, as it raises questions about equitable access to care and the ethical obligation of practitioners to treat all patients fairly, regardless of their socio-economic status or susceptibility to marketing influences.

Overtreatment as an ethical concern

Overtreatment emerged as a significant concern across the studies reviewed, with Kazemian et al. (2015) [18] highlighting that most dentists perceive overtreatment as ethically unacceptable. The prevalence of overtreatment in aesthetic dentistry raises important ethical questions about the motivations behind treatment decisions [27]. Holden et al. (2021) [6] define overtreatment as a phenomenon that occurs when dental professionals perform unnecessary procedures or treatments that are not in the best interests of the patient, with significant financial and health consequences.

Overtreatment is measured through various methodologies, including surveys that assess dentists' perceptions and qualitative interviews that explore their experiences. These studies consistently indicate that financial incentives and commercial pressures significantly contribute to overtreatment. For example, many practitioners report feeling compelled to provide high-cost treatments driven by commercial interests rather than clinical necessity [6, 21]. This misalignment raises ethical concerns about the responsibilities of dental practitioners to prioritize patient welfare over profit.

Kemparaj et al. (2018) [21] identified overtreatment as one of the top ethical challenges in dental practice, driven by commercial pressures and patient expectations. The study emphasizes the need for ethical training and awareness among dental practitioners to address this issue.

Additionally, Kemparaj et al. (2016) [11] highlighted the importance of qualitative assessment of ethical issues in dental practice, including overtreatment and conflict of interest.

Tenenbaum et al. 2020 [20] reported a significant improvement in dental students' knowledge of ethical principles and legal frameworks following a medical ethics course. The study underscores the importance of ethics education in shaping future dental professionals and potentially mitigating issues related to overtreatment arising from a lack of knowledge and ethical training.

The phenomenon of overtreatment is particularly concerning in the context of aesthetic dentistry, where many procedures are elective and not medically necessary. This situation raises significant ethical dilemmas related to beneficence and non-maleficence. Practitioners must ensure that their treatment recommendations genuinely benefit the patient and do not cause harm through unnecessary procedures. As noted by Al-Worafi (2023) [28], the expansion of cosmetic dentistry into aesthetic treatments raises ethical questions about the responsibilities of dental practitioners to prioritize patient welfare. The challenge lies in balancing the desire to meet patient expectations with the ethical obligation to provide care that is in the best interest of the patient.

The findings suggest that commercial pressures and the desire to meet patient expectations can compromise the ethical standards of dental practice. This trend is particularly alarming given the potential for long-term health consequences and financial burden on patients resulting from unnecessary treatments [6].

Influence of social media on patient expectations

The findings from this systematic review reveal a clear pattern regarding the influence of social media on patient expectations in aesthetic dentistry. Several studies consistently highlight the following themes:

- *Increased Demand for Aesthetic Procedures:* Social media platforms serve as significant drivers of demand, with practitioners noting a marked increase in requests for popular treatments such as teeth whitening and veneers [2, 14].
- *Trust in Social Media Information:* A substantial portion of patients expresses trust in dental information sourced from social media, which shapes their treatment decisions [14, 16]. This reliance underscores the need for dental professionals to engage with patients on these platforms responsibly.
- *Pressure to Conform to Beauty Standards:* The portrayal of idealized beauty standards on social media can lead to unrealistic expectations among patients.

This phenomenon raises ethical concerns about the commodification of dental care and the potential for overtreatment [17].

- *Positive Role in Patient Education:* Conversely, social media also plays a crucial role in promoting patient education and awareness of preventive care. Practitioners can use these platforms to disseminate valuable information about oral health, preventive measures, and the importance of regular dental visits [5]. This educational aspect can empower patients to make informed decisions and improve their overall oral health.
- *Impact on Informed Consent:* The influence of social media complicates the informed consent process, as patients may enter consultations with preconceived notions based on curated online content rather than a comprehensive understanding of their health needs [4].

Need for ethical guidelines

The review collectively highlights the necessity for clear ethical guidelines in aesthetic dentistry. The studies emphasize the importance of establishing frameworks that address issues of informed consent, patient autonomy, and the responsibilities of dental practitioners in marketing their services [22, 29, 30]. As Kovács (2023) [4] suggests, ethical guidelines should be developed to navigate the complexities of aesthetic dentistry, ensuring that patient welfare is prioritized.

To address these ethical concerns, it is essential to promote ethical marketing practices in aesthetic dentistry [31]. This can be achieved through education and training programs that emphasize the importance of informed consent, patient autonomy, and evidence-based practice [18]. The absence of robust ethical guidelines can lead to a lack of accountability among dental practitioners, resulting in practices that may not align with the best interests of patients.

Establishing ethical guidelines is crucial for upholding the principles of justice and autonomy in aesthetic dentistry. These guidelines should ensure that all patients receive equitable treatment and that their rights to make informed decisions are respected. The findings from this review suggest that professional organizations and regulatory bodies must take proactive steps to develop and implement ethical standards that guide practitioners in their marketing practices and treatment decisions. These guidelines should address the unique challenges posed by social media and the increasing demand for aesthetic treatments, ensuring that patient welfare remains at the forefront of dental practice.

True informed consent in aesthetic dentistry extends beyond merely listing risks and benefits [32]. It requires a comprehensive discussion of realistic outcomes, alternative treatments, and the potential psychological impacts of aesthetic procedures [33]. Practitioners must ensure that patients understand that social media representations often show idealized or edited results that may not be achievable in reality. This enhanced informed consent process should include detailed documentation of patient expectations and thorough discussion of the limitations of aesthetic procedures [6].

Concrete steps for regulatory bodies and professional organizations

To effectively develop and implement ethical guidelines, regulatory bodies and professional organizations can take several concrete steps:

- *Develop Comprehensive Ethical Frameworks:* Organizations should create detailed ethical frameworks that address the unique challenges of aesthetic dentistry. These frameworks should include guidelines on informed consent, advertising practices, and the ethical implications of social media marketing.
- *Implement Training and Continuing Education Programs:* Regulatory bodies can mandate ethics training as part of dental education curricula and continuing education requirements for practicing dentists. This training should focus on the ethical challenges specific to aesthetic dentistry, including the risks of overtreatment and the importance of patient-centered care [20].
- *Create Resources and Toolkits:* Professional organizations can develop resources, such as toolkits or guidelines, that provide practical advice on navigating ethical dilemmas in aesthetic dentistry. These resources could include case studies, best practices, and decision-making frameworks to help practitioners make informed choices.
- *Establish Reporting Mechanisms:* Regulatory bodies should implement mechanisms for reporting unethical practices or concerns related to overtreatment and misleading marketing. This could involve creating a confidential reporting system that encourages practitioners and patients to report unethical behavior without fear of retribution.
- *Foster Collaboration and Dialogue:* Organizations can facilitate forums, workshops, or conferences that bring together dental professionals, ethicists, and regulatory bodies to discuss ethical challenges and share experiences. This collaborative approach can help create a community of practice focused on ethical standards in aesthetic dentistry.

- *Monitor and Evaluate Compliance:* Regulatory bodies should establish processes for monitoring compliance with ethical guidelines and evaluating their effectiveness. This could involve periodic reviews of practices and outcomes in aesthetic dentistry to ensure that ethical standards are upheld.

By taking these steps, regulatory bodies and professional organizations can provide essential support to practitioners, helping them navigate the ethical challenges inherent in aesthetic dentistry. This proactive approach will not only enhance patient welfare but also promote the integrity of the dental profession as a whole.

Implications for practice

The implications of the findings from this systematic review are significant for dental practitioners. First, there is a critical need for dental professionals to engage with patients through social media responsibly. This includes providing accurate information about aesthetic procedures, addressing potential risks, and managing patient expectations. By fostering open communication and transparency, dental practitioners can empower patients to make informed decisions about their care.

Second, dental practitioners must be vigilant in recognizing the potential for overtreatment and the ethical dilemmas that arise from commercial pressures. Practitioners should strive to maintain a balance between professionalism and commercialism, ensuring that treatment decisions are guided by clinical necessity rather than financial incentives. This may involve developing a practice culture that prioritizes patient welfare and ethical considerations over profit.

Moeller and Quiñonez (2020) [34] highlight that the economic interests of dentists may be influencing their practice, leading to a focus on profit over patient care. This can result in the neglect of underserved populations and the prioritization of cosmetic dentistry over essential care. To address this, dental professionals must prioritize patient autonomy and informed consent, ensuring that all treatment decisions are made in the best interest of the patient's overall health and well-being [35].

Limitations and future research directions

This review has several limitations. The relatively small number of studies meeting the inclusion criteria suggests that more research is needed in this area. Additionally, the rapid evolution of social media platforms and marketing techniques means that some findings may become outdated quickly. Future studies should aim to provide more longitudinal data on the long-term impacts of social media marketing on patient outcomes and professional ethics in aesthetic dentistry.

Future research should investigate the effectiveness of educational interventions aimed at enhancing patient understanding of aesthetic procedures and the associated risks. Empowering patients with accurate information can help mitigate the influence of social media and promote informed decision-making. Additionally, studies should examine the role of professional organizations and regulatory bodies in establishing and enforcing ethical guidelines in aesthetic dentistry. Understanding how these entities can support practitioners in navigating the ethical complexities of marketing practices and over-treatment will be essential for fostering a more ethically responsible approach to cosmetic dental care.

Conclusions

This systematic review underscores the significant ethical challenges in aesthetic dentistry, particularly regarding marketing practices and the risk of overtreatment. The findings reveal the strong influence of social media on patient expectations, often prioritizing aesthetic outcomes over health considerations, which raises concerns about informed consent and patient autonomy.

The study emphasizes the urgent need for clear ethical guidelines to navigate these complexities. It advocates for integrating ethics education into dental curricula and establishing robust marketing standards to ensure patient welfare remains a priority.

Ultimately, this review serves as a call to action for dental professionals, regulatory bodies, and educational institutions to collaborate in addressing these ethical dilemmas. By promoting a responsible and patient-centered approach to cosmetic dental care, the dental community can safeguard the integrity of the profession while fulfilling patients' legitimate desires for aesthetic improvements.

Acknowledgements

The authors would like to express their sincere gratitude to Kurdistan University of Medical Sciences for providing the necessary support to conduct this systematic review. Additionally, we extend our heartfelt thanks to the reviewers, Yousef Moradi and Mohammad Aziz Rasouli, for their invaluable contributions to the systematic review process.

Authors' contributions

M.R. served as the supervising author, making substantial contributions to the conception and design of the study, overseeing the acquisition and analysis of data, and drafting and revising the manuscript. M.R. also approved the final submitted version and is accountable for the integrity of the work. F.R. contributed significantly to the acquisition and analysis of data and assisted in drafting and revising the manuscript. F.R. approved the final submitted version and is accountable for his contributions to the work. Both authors have agreed to be personally accountable for their respective contributions and to ensure that questions regarding the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Funding

No funding was received for this study.

Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

Not applicable.

Competing interests

The authors declare no competing interests.

Received: 25 November 2024 Accepted: 13 January 2025

Published online: 27 January 2025

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