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# Opportunities and challenges of social media for oral health literacy improvement: a qualitative investigation based on Iranian dentists' perspectives

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## Abstract

**Background** Despite the possible impacts of social media on oral health literacy, the specific challenges and opportunities in this particular setting remain underexplored. The current research objective was identify the opportunities and challenges of social media for oral health literacy based on Iranian dentists' perspectives.

**Methods** In the current qualitative investigation, a semi-structured interview was conducted with 24 dentists utilizing a purposive snowball sampling method. The analysis of the data was performed using thematic analysis in the MAXQDA 10 software.

**Results** The analysis of the interview data led to recognition of six main themes and a total of 16 sub-themes. The three main themes identified as opportunities for using social media for oral health literacy include facilitating accessibility, popularizing, and supporting usability. Three identified challenges for oral health literacy include quality issues, incomplete understandability, and create bias in usability for oral health information. Social media platforms present unique opportunities for enhancing information accessibility through increasing information encountering, interactive question-answering, and communication empowerment. Providing opportunities for simplifying information, promoting the prevention of oral health diseases, and clarifying information claims are social media facilitate roles that can effectively make information more understandable. Moreover, social media platforms facilitate the use of oral health information by supporting decision-making, dental counseling presentations, and experience sharing. Misinformation, the complexity of information quality evaluation and privacy, and ethical and security concerns are significant social media challenges for oral information accessibility. Insufficient published information and creating fear by reading health information (cyberchondria) are social media challenges that affect the understandability of information. Ignoring content disclaimers and misleading advertising are two challenges within social media that hinder the usability of oral health information.

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**Conclusion** Social media acts as a dual-faceted method for oral health literacy, providing both opportunities and challenges. Confronting the obstacles associated with social media demands the creation of solutions that strengthen their positive attributes.

**Keywords** Dentists, Storytelling, Social media, Oral health, Health literacy

## Introduction

Many dental conditions require expensive treatment, and individuals may not receive adequate care due to financial constraints [1]. Apart from economic obstacles, the absence of insurance coverage and limited access to dental care also contribute to the challenges of maintaining good oral health [2]. Prevention is a key element in addressing oral and dental diseases. In this respect, previous studies have indicated that promoting Oral Health Literacy (OHL) can be an effective approach [3, 4].

Health literacy is essential in influencing health behaviors. Research indicates that higher levels of health information literacy correlate positively with improved health behaviors and the pursuit of health information. The act of seeking health information serves as a mediator in the relationship between health information literacy and health behaviors, while social support plays a moderating role in this dynamic [5, 6]. Essentially, individuals who possess greater health information literacy are more inclined to actively seek out health-related information, which subsequently encourages more proactive health behaviors. Additionally, accessing health information through diverse sources enhances an individual's understanding and commitment to their health status. Enhancing health literacy has the potential to mitigate health disparities among marginalized populations, including those facing language and cultural obstacles, as well as individuals with conditions that hinder comprehension [5–8].

OHL is defined as the proficiency of individuals in acquiring, understanding, and applying general Oral Health Information (OHI), which empowers them to make better decisions concerning their oral health care [9]. The advancement of OHL competencies is vital for addressing inequalities and promoting better general oral health. Essential skills in dental hygiene involve a thorough understanding of dental terminology, the ability to apply proper brushing and flossing methods, the capacity to recognize common oral health concerns, and an awareness of the critical nature of regular dental check-ups [10, 11]. A range of elements plays a significant role in the prevalence of oral diseases, including economic barriers, inadequate access to healthcare services, specific personality traits, and the caregiving practices of individuals [12]. Evidence suggests that OHL is an essential internal variable that impacts the occurrence of oral diseases in the population [13, 14]. Enhanced oral health literacy facilitates individuals in taking an active role in

self-care initiatives and preventive actions related to their oral health. At the same time, on a community scale, oral health literacy is crucial for mitigating inequalities in oral health access and outcomes [13]. Acknowledging the critical role of OHL, the American Dental Association has highlighted that a lack of adequate OHL obstructs the successful prevention, identification, and treatment of oral health conditions [9, 15, 16].

In the contemporary period, integrating information technology with healthcare processes has enhanced the standard, productivity, and efficacy of delivering health services and served as a method to enhance health literacy [11, 17]. These technologies can heighten awareness within society by introducing novel opportunities and eliminating the limitations of time and space. Moreover, they establish the foundation for addressing diverse informational requirements [18]. Access to health information and the improvement of health literacy play critical roles in educating patients and mitigating health problems, particularly in managing, identifying influencing factors, and averting diseases [19]. Adequate health information literacy empowers people to change their health behavior and improve their lifestyle [20].

Social Media (SM) is among the technologies adopted to enhance health literacy across different societal strata [21, 22]. SM platforms empower and educate various health stakeholders, enabling the exchange of knowledge and experiences [23, 24]. The utilization of these Internet-based resources empowers individuals and communities to interact and share a diverse array of content, including information, ideas, personal messages, and image [25]. SM has emerged from social interactions, offering opportunities for sharing and disseminating diverse content [26].

The reported data reflect a growing reliance on digital resources to fulfill health information requirements through various tools and online platforms [18]. Despite obstacles like geographical dispersion, time constraints, and financial constraints hindering health literacy promotion, using information and communication technologies is imperative. This issue is of great importance for providers and recipients of oral and dental services [24]. However, ordinary health consumers face difficulties in assessing the accuracy of information shared on SM due to issues such as misleading advertisements, content evaluation challenges, source verification difficulties, privacy concerns, and breaches of professional ethics [27].

Despite the rise in SM usage among the general public and professionals, the potential for leveraging these platforms to enhance health literacy remains underused [28]. Although there is informal engagement with SM, there is a notable gap in exploring how these technologies can effectively support health storytelling. While SM presents various possibilities, there is a dearth of studies examining health professionals' advantages and challenges when using these tools [29–33].

In Iran, there has been a lack of established and enforced regulations regarding the utilization of SM in the health sector. Consequently, the application of SM in the realm of oral health faces various constraints and challenges. To date, there has been no original research conducted to investigate the role of SM in enhancing OHL within the Iranian context. This study aims to identify the opportunities and challenges dentists face in using SM to enhance OHL, with a focus on Iranian dentists' perspectives.

The findings of this research hold significance for three distinct groups: patients, health policy makers, and dental professionals. Enhancing OHL via social SM platforms can facilitate the early detection of dental issues, foster a deeper understanding of oral health, and promote beneficial changes in public behavior and dietary habits. SM serves as a valuable tool for disseminating information, providing access to relevant data and statistics, and enabling rapid circulation of knowledge, thereby influencing oral health practices through educational initiatives and promotional efforts. Moreover, SM has the potential to mitigate physical barriers that have historically posed significant challenges for health policy makers, particularly in terms of accessing health-care resources and support. SM can contribute to the realization of universal health coverage objectives in a financially sustainable manner. By recognizing the opportunities and challenges associated with leveraging SM for OHL, it is possible to enhance the continuity of care and services, augment dentists' understanding of public health behaviors, improve professional attitudes and practices, and effectively address the oral health needs of the community.

## Methodology

This research study applied a qualitative design to explore the viewpoints and personal narratives related to the advantages and obstacles of SM for facilitating OHL. The qualitative survey method is particularly effective for gaining insights into Individual perspectives and professional aspirations and incentives [34, 35]. The required data were collected using a semi-structured interview guide and the interview protocol was designed by the research team and approved by three medical librarians and two dentists specifically for this study (Appendix A).

We employed purposive and snowball sampling strategies, contacting Iranian dentists on SM via phone and electronic mail. After the preliminary selection of participants who reacted to our notifications, these individuals referred other candidates. The principle for participation included: (1) They possessed a degree in dentistry from a university; (2) They accumulated a minimum of three years of professional experience in the dental field; (3) They maintained a consistent presence on SM platforms and (4) Their content can be defined around enhancing oral health literacy. Exclusion criteria include: (1) the SM accounts were operated by individuals other than the dentist; (2) the SM engagement was exclusively focused on advertising and revenue generation; and (3) A significant portion of the content consists of re-sharing information originally created by others, rather than being generated by the dentists who manage the SM accounts. The research was managed from March to August 2024, with all interviews by one of the authors between 19 and 35 min (27 min in average) carried out through telephone in Persian language.

The personal details of the participants were revealed exclusively to one member of the research team responsible for conducting the interviews. Each participant received a unique numerical code that reflected the order of their participation in the interview process. Throughout every stage of this research, the confidentiality of the participants' personal information was upheld, and all recorded results were reported using the designated codes. Participants were thoroughly informed about the study's procedures and were given the opportunity to withdraw from the study at any time.

In this research, the trustworthiness of the data and results were recognized by implementing four criteria identified by Lincoln and Guba [36]. The criteria include credibility, dependability, conformability, and the transferability of the data and outcomes. Triangulation methods were employed to enhance the study's credibility by engaging two additional experts in the research process. One of these experts was a dentist, while the other possessed specialized knowledge in health literacy. These experts review and checked the transcript of the interview. Furthermore, sustained involvement with the subject matter was considered among the most effective approaches to ensure the research's credibility. As a result, the researchers deeply immersed themselves in the subject under investigation for an extended duration, leading to a comprehensive understanding of the environment and conditions surrounding the study. The assurance of the research's dependability was reviewed by an external auditor knowledgeable in current qualitative research. This issue led to a thorough description of all research stages, and the external auditor performed an evidence-based audit. Conformability was assured

by asking two researchers to independently conduct the research process and analysis, aiming to maintain the objectivity and neutrality of the data. Furthermore, the researchers took great care in presenting the entire research process clearly and transparently, providing a detailed report of each step. In addition, the researcher kept raw data, notes, documents, and recorded materials that provided in telephonic interviews for potential future reviews. The study aimed to establish transferability by comprehensively describing the dataset and research methodology. Detailed explanations were given regarding the contextual background of the research and the subject matter. These efforts contributed to the transferability of the findings and enabled a basis for evaluating the data's transferability. Moreover, the strategy of maximum diversity was employed in sampling to ensure transferability further.

Subsequently, the Persian transcripts from the interviews were subjected to thematic analysis in order to identify the opportunities and challenges inherent in the discussion on SM for OHL by MAXQDA 10 software. Open coding was used for analysing data. After the process of discarding duplicate codes and amalgamating similar entries, the codes were classified into wider themes grounded in their conceptual similarities. Therefore, The core units of investigation in the research were specific words, phrases and themes demonstrating the dentists' perspectives and experiences. During the initial content analysis phase, we engaged in repeated readings of interview content to gain familiarity with the data. Afterward, we established preliminary codes in alignment with the research question and the desired outcomes. The third phase involved an interpretive examination of the initial codes, leading to the categorization of subthemes and overarching themes. In the next step, we reviewed the themes and conducted a thorough assessment to

amalgamate, refine, segregate, or eliminate initial themes as needed. Finally, we defined and labeled the themes and their corresponding sub-themes based on the relevance of the content.

Codes were partly informed by our existing coders' knowledge around OHL and relevant literature. The initial set of codes was then refined through team discussion. Regular meetings were held between the coders to discuss any ambiguities or inconsistencies in the coding. Through these discussions, we clarified the definitions of the codes and ensured a shared understanding. Codes were then organized into broader themes through Narrative synthesis. We developed narratives that linked the codes together, and then used these narratives to generate themes. To ensure inter-coder reliability, a percentage 20% of the transcripts were double-coded by two independent coders. Inter-coder reliability was then calculated using Cohen's Kappa, resulting in a score of 92, indicating a strong level of agreement.

Within the framework of this qualitative research, a saturation approach was implemented to warrant the sufficiency of interviews. Data saturation in qualitative research is the point when enough data has been collected to draw necessary conclusions, such that additional data collection does not provide new insights [35, 37]. In current research data saturation being appeared by the 22th interview and two more interviews were conducted to ensure data saturation (totally 24 interviews).

## Results

The demographic information of the participants in this study is presented in Table 1. The major share (62.50%) of the interviewees were women. The most job experience of the participants was between three and 10 years (50.00%). The dentists participating in this study did not limit their SM presence to a single platform. They engaged with various SM platforms and simultaneously published different information formats to communicate their professional stories (Appendix B).

### Social media opportunities for oral health literacy

Table 2 presents 108 first codes identified from the analysis of the interviews conducted. These codes were organized into three primary themes, encompassing the opportunities over the SM, and nine sub-themes that illustrate its role in enhancing OHL.

### Social media facilitating oral health information accessibility

In this study, we determined "facilitating OHI accessibility" as a first opportunity on SM for OHL. SM technologies play a pivotal role in enhancing information accessibility by encouraging the production of new content. By transcending temporal and spatial limitations, SM provides users with real-time access to news and

**Table 1** Demographic information of the participants

		Frequency (n = 24)	Percentage (%)
Sex	Male	9	37.50
	Female	15	62.50
Age	25–35	11	45.83
	36–46	9	37.50
	47–57	4	16.67
Job experience	3–10	12	50.00
	11–20	10	41.66
	More than 21	2	8.34
Workplace	Hospital	3	12.50
	Personal office	18	75.00
	Clinic	3	12.50
Experience using SM	1–3	9	37.50
	4–7	12	50.00
	More than 7	3	12.50

**Table 2** Opportunities of social media for oral health literacy

Main-theme	Sub-theme	Coding references	Coding sources	Example quotes
Facilitating OHI accessibility	Information encountering	17	17	Patients report that they have encountered information that has helped solve their dental problems. (N16)
	Interactive question-answering	15	14	Exchanging questions and answers with colleagues has provided access to new experiences and information. (N23)
	Communication empowerment	12	12	Developing and improving communication between dentists and patients on social media facilitates the flow of information. (N12)
Popularizing OHI understandability	Information simplification	10	9	Our activity, as dentists, on social media involves explaining and interpreting some specialized information to patients. (N8)
	Promoting disease prevention	9	9	The flexible and user-friendly nature of social media makes it easy to use for disease prevention education (N2).
	Revealing information claims	8	6	Through these social media platforms, we become aware of many unscientific activities in dentistry. (N17)
Supporting OHI usability	Supporting decision making	10	10	Access to oral information on social media platforms provides patients with support for decision-making and satisfaction with the dentist's work. (N24)
	Facilitating counseling services	13	12	The spread of offline consultations on social media has strengthened the use of dental information correctly. (N9)
	Experiences sharing	14	14	The spread of offline consultations on social media has strengthened the use of dental information correctly. (N10)

current affairs. Such accessibility contributes to shifts in individual attitudes and enriches personal understanding. Additionally, SM platforms create avenues for users to exchange content, allowing for the partial exposure of tacit knowledge within a communal framework. The dentists who participated in the study reported that information encountering, interactive question-answering, and communication empowerment are opportunities for SM to facilitate OHI accessibility.

**Oral health information encountering** In the present study, increasing OHI encountering was the most repeated term facilitating OHI accessibility and supporting the OHL. Interviewees stated that by facilitating OHI encountering, SM can provide an implicit learning environment for oral health. Although participants referred content evaluation problem, they emphasised that SM provides opportunities to enhance OHI encountering. Interviewees stated that OHI sharing on SM can develop implicit educating in oral health. The participants stated that users' engagement on SM could improve their educating. In this study, some participants stated that dentists must only share theoretical learning information, not practical information, to support OHL. This statement was derived from an emphasis on the lack of information among non-specialist users, which affects their ability to assess the accuracy of the information presented to them.

*"My observations indicated that individuals who have viewed videos or picture about dental root diseases on social media are more inclined to pursue complex surgical treatments." (Interview 19)*

**Interactive question-answering** This qualitative research identified "interactive questions-answering" as another SM opportunity for OHI accessibility. Participants in the study viewed the interactive 'questions and answers' feature on SM as a valuable platform for offering consultations to patients and engaging in discussions with fellow professionals. They discussed that the public can become aware about common dentists' activities and OH issues through SM. According to the interviewees, the interactive nature of the 'questions and answers' process available through social media is applicable for fostering communication among dentists and enhancing the dentist-patient relationship. Due to the possibility of misinformation on SM, the patient-patient interaction was overlooked as a potential avenue for obtaining OHI. A number of interviewees acknowledged the potential opportunities of SM for improving dentist-patient interactions, especially in terms of disseminating, sharing, or providing OHI and monitoring patients' oral health. However, there were also concerns voiced regarding the limited time available to dentists, the safeguarding of patient confidentiality, and the inability to adequately address some patient inquiries. In addition, some interviewees noted that they limited their responses to the questions that were posed at times that they found convenient.

*"In numerous instances, individuals pose inquiries in the comments section of our published posts, to which we provide responses. Additionally, other users seek further information by reviewing these exchanges. Occasionally, users engage in discussions, asking and answering questions amongst themselves regarding prevalent oral health issues." (Interview 14)*

**Communication empowerment** According to this study, the participants believed that accessing OHI over SM enabled patients to find and enhance interpersonal connections with others with similar oral health conditions. As indicated by the participants, the opportunity to access user comments and profiles linked to the published information facilitates communication with others and allows for the gathering of further information. The participants reported that following the identification of comparable activities on social media, a range of facilities—including the monitoring of their pages, the establishment of private communication, the joining of mutual groups, and participation in interactive discussions—has facilitated greater access to OHI. This study's findings demonstrated that participants held diverse perspectives on accessing OHI contingent upon the type of interactions fostered among users through SM platforms. A subset of interviewees concentrated solely on the interactions between dentists and patients, indicating that communication via social media acts as a supplementary resource for delivering advice and support to those patients who have already had face-to-face consultations and are in the midst of their treatment. In light of this situation, some participants in the interviews expressed that their involvement on SM is largely limited to the distribution of information about chronic oral diseases.

*"Social media creates a straightforward way for dental clinics to connect with their patients. Clinics can utilize these platforms to answer questions, send appointment reminders, and inform patients about new services or special offers. This kind of interaction can significantly boost patient satisfaction and foster loyalty." (Interview 4)*

#### **Social media roles in popularizing oral health information understandability**

Social media roles in popularizing oral health information understandability In this research, we recognized "popularizing OHI understandability" as a crucial opportunity for SM to promote OHL. SM offers novel avenues for translating and transforming OHI into diverse formats. It enhances information development by facilitating internal and external communication channels. Moreover, SM plays a crucial role in the processes of sense-making and decision-making through the dissemination of ideas, collaborative efforts, crowdsourcing initiatives, and the harnessing of collective intelligence. The dentists who participated in the research reported that strategies such as simplifying information, promoting oral health disease prevention, and clarifying information claims serve as effective SM tools that make OHI more understandable.

**Oral health information simplification** Several participants identified SM as a potential solution to the existing challenges in obtaining reliable OHI for general population. According to the interviews, SM has the potential to convey OHI using straightforward language that is suitable for a diverse audience. The participants expressed that, in light of the insufficient availability of public medical information resources, leveraging social media could represent a suitable strategy for promoting public education on oral health issues. Participants in the study indicated that a significant portion of dental information disseminated on SM is difficult for the general public to understand. Furthermore, the involvement of dental professionals on these platforms enhances awareness regarding the informational needs of patients and fosters a deeper comprehension of their lifestyles.

*"Social media plays a significant role in influencing oral health behaviors, affecting how people view and make choices regarding dental care by providing public oral information. Dental professionals and clinics can harness social media to educate, connect with, and assist their patients, simplifying healthier oral hygiene practices." (Interview 16)*

**Promoting oral disease prevention** Current research findings show widespread access to OHI through SM has heightened public awareness of oral diseases. A number of participants expressed the view that awareness of the disease's early symptoms could serve as an essential condition for encouraging individuals to maintain vigilance regarding their oral health. In this scenario, some dental experts have indicated that the continuous reinforcement of basic oral hygiene practices, in conjunction with the associated risks of diverse health conditions stemming from oral health issues, might be a viable approach to incentivize individuals to attend dental appointments. Interviewees also suggested that the dissemination of OHI policies via SM might be an effective means of broadly communicating health messages related to prevention. Moreover, other participants pointed out that SM could facilitate the essential conditions for fair public access to OHI by tackling issues such as the lack of suitable information and the shortcomings in health communication infrastructures.

*"Social media has opened up access to information, allowing people to easily learn about oral health. Content shared by dental experts and health organizations can help individuals improve their dental hygiene. By keeping up with trustworthy sources, patients can stay updated on the newest developments in dental care and ways to prevent issues." (Interview 11)*



**Revealing information claims** The current investigation identified that the extensive engagement of non-dentists in SM for purely commercial motives has raised significant concerns. Interview participants expressed that the dissemination of misleading OHI poses a risk to public health, primarily due to insufficient OHL. According to the dentists interviewed, the professional presence in SM has facilitated awareness regarding questionable oral health practices. Numerous interviews highlighted the rise of SM as a platform for advertising, which is often accompanied by the widespread circulation of pseudo-dental claims. Nonetheless, the activities of dentists on SM may serve as a valuable opportunity to educate the public about the risks associated with unreliable OHI. Individuals utilizing SM can readily access both accurate and inaccurate information by contrasting it with the insights provided by dental professionals.

*“Social media has become a place for non-experts to make money by spreading their claims of knowledge. The behavior of these individuals does not follow the standard patterns of the dental profession and we cannot endorse them. It would be great if a method were made public to remove these individuals and their false knowledge from social media.” (Interview 2)*

#### **Social media supporting of oral health information usability**

The current investigation highlighted the importance of “supporting OHI usability” as a vital avenue for dentists to engage in narrative practices through SM, thereby advancing OHL. The research participants stated that republishing some oral health educational topics in different forms (e.g., movies and animations) can be usable through SM. Participating dentists noted that approaches like the support of decision-making, dental counseling presentation, and experience sharing are valuable SM opportunities that facilitate the usability of OHI.

**Support of decision making** According to the result of the present work, the formation of networks utilizing SM has resulted in dialogues about problems and has encouraged the support of others in addressing these challenges. Within these groups, members often deliberate on the most effective approaches and share their experiences and skills with one another. According to the interviewees, individuals facing multiple oral health challenges must engage with different healthcare professionals and select the most appropriate practices for their care. In these contexts, leveraging SM has become a prominent approach to facilitate more informed decision-making. The findings identified that participants believe that disseminating OHI through SM and interacting with fellow patients who have similar conditions can enhance the quality of their

decision-making processes. According to dentists, users often start their information-seeking process by focusing on the most commonly engaged activities in social media. Subsequently, they continue to navigate the relationships between the information available and the diverse user profiles that provide pathways to further insights. Some individuals noted that they limit their social media usage to instances where they have a clear understanding of factors like identity verification and the expertise of content creators.

*“Patients feel at ease on social media, where they discuss their pain and emotions with dentists, share their thoughts, and hear from others. Occasionally, a patient will detail their entire treatment journey, which can help others make informed decisions and find the motivation to pursue their own treatments.” (Interview 22)*

**Opportunities for dental counsellings** Dentists have indicated that they have leveraged SM to facilitate oral health counseling, addressing patients’ uncertainties related to medication administration and the preparatory steps required for treatment. The discussion highlights that the fear and stress linked to various clinical interventions, like surgery, can be lessened by patients’ participation in SM, seeking advice from dentists, and connecting with the experiences of fellow patients. The study demonstrated that streamlining the follow-up process after treatment, offering health recommendations, and raising awareness of health conditions via social media could significantly enhance oral healthcare practices. According to the participants, the deficiency in post-treatment follow-up approaches and the limited availability of patient education staff imply that SM might be utilized as a means to fulfill specific informational needs of patients after discharge. In this study, two approaches were identified for post-discharge follow-up. In the first approach, dentists use SM to establish interactive communication with some patients. In the second approach, dentists could identify the frequently asked questions of discharged patients and provide appropriate educational content to respond to them.

*“Engaging in conversations about diagnostic and treatment challenges is a frequent occurrence on social media. For instance, I’ve enhanced my understanding of common dental issues in children by exchanging ‘questions and answers’ with my peers online.” (Interview 9)*

**Experiences sharing** From the viewpoint of most interviewees, SM can be used to share experiences with dentist-dentists, dentist-patients, and patient-patient interactions. Within the SM, individuals with varying

**Table 3** Challenges of social media for oral health literacy

Main-theme	Sub-theme	Coding references	Coding sources	Example quotes
OHI quality issues	Misinformation and negative content	23	22	The big challenge is the existence of misinformation and negative content about the professional activities of some dentists. (N1)
	Complexity of information quality	16	13	It is very difficult for patients to discern the quality of dental information available on social media. (N5)
	Privacy, ethical and security concerns	19	19	Publishing images and videos of patients on social media without their consent can cause problems for them. (N17)
Incomplete OHI understandability	Superficial information	17	16	Some dentists publish superficial and basic treatment information but do not take steps to deepen and complete it. (N7)
	Cyberchondria	12	9	I learned that some patients have developed unnecessary fear of routine activities after seeing images of dental surgeries. (N8)
Create bias in OHI usability	Ignoring content disclaimers	10	10	Dentists, like other professionals, should clearly state the principle of disclosing the risks of using information independently and disclaiming their responsibilities on social media. (N19)
	Misleading advertising	20	19	Unfortunately, advertisements using misleading methods involving non-dentists are becoming increasingly common. (N21)

levels of experience come together to share information. Some participants have noted that SM tools might be advantageous for dental professionals, as they enable access to the diverse experiences of fellow practitioners. Furthermore, several interviews indicate that dentists utilize social media to gain insights into patients' experiences with prior therapeutic treatments. This methodology can serve as a valuable tool for future decision-making. Moreover, the interaction and sharing of experiences between patients with analogous conditions and difficulties have simplified this process through SM. Participants attended making decision based on the previous experiences of others on SM specially based on successful treatment experiences.

*"Patients often feel at ease on social media, sharing their pain and emotions with doctors, voicing their thoughts, and engaging with the perspectives of others. Occasionally, a patient will detail their entire treatment journey, inspiring and energizing others in the process." (Interview 8)*

### Social media challenges for oral health literacy

The data presented in Table 3 outlines the extraction of 117 primary codes obtained from the content analysis of interviews that explored the challenges of SM for OHL. These codes are structured into three main themes, referred to as quality issues, incomplete understandability, and bias in usability. The themes include seven sub-themes in total, shown in the table.

### Oral health information quality issues

This investigation emphasized the quality evaluation issues as a critical challenge to the accessibility of OHI through SM. While the interviewees recognized SM as a tool for improving OHI accessibility, they also pointed

out the inherent complexities of engaging with these platforms. They highlighted that users' access to information is often accompanied by various risks. Participating dentists expressed that misinformation and negative content, complexity of information quality evaluation and privacy, and ethical and security concerns are significant SM challenges that damage OHI accessibility.

**Misinformation and negative content** Some dentists believe SM is often used to spread misinformation about oral health. This phenomenon may harm persons who use this information to decide about their oral health problems. Interviews indicate that the dissemination of inaccurate or deceptive health information can result in misguided treatment choices, overlooked diagnoses, or the undertaking of superfluous tests and procedures, all of which may have significant repercussions for individuals. The challenge becomes particularly significant when information is conveyed as factual without adequate evidence or verification. Participants in this study emphasized that individuals must criticize the OHI they find over SM. According to these participants, before acting on the information presented, individuals are advised to seek validation from a qualified dental professional or a trustworthy source.

This precautionary measure is vital in order to avoid potential misinformation and to make informed decisions regarding dental health. A dentist who is active in SM can share his education background. The responsibility of a public user, as an engaged consumer of content, involves conducting a validation assessment. An additional obstacle SM presents for OHL is the difficulty in regulating the flow of information. This situation raises ongoing concerns about how negative comments can skew the original messages and discussions, along with the risk of misreading the comments made by others.



Participating dentists in our research believed that it is essential for oral healthcare providers to possess a thorough understanding of the reliability of online information. In this respect, hiring a content manager may guarantee their at least minimal knowledge of various oral healthcare processes rather than using anti-scientific information sources.

*“One major issue with social media is the proliferation of misinformation and myths surrounding oral health. Incorrect claims, unproven treatments, and deceptive information can cause people to engage in harmful practices that threaten their dental well-being. It’s essential for individuals to check facts with trustworthy sources or consult a reputable dental clinic before making choices regarding their oral health.” (interview 4)*

**Complexity of information quality** Participating dentists explained that the vast expanse of OHI on SM is marred by challenges in identifying trustworthy sources and users’ generally low awareness regarding the quality of the information they encounter. The absence of specialized knowledge complicates assessing the quality of online information sourced from SM. Based on the interviewer’s comments, the average OHI consumer often lacks the requisite knowledge or skills to accurately evaluate the credibility and quality of content on SM, tending instead to rely on subjective trust indicators and criteria. Participants emphasized that the general public can access SM and repost/reshare each other’s information without compromising its accuracy. In this research, some participants noted that they frequently experience a lack of time, which prevents them from crafting an adequate post for their SM channels. A profound eagerness is present to create succinct messages, especially those related to entertainment or promotional material. However, when sharing educational posts, it is advisable to avoid posting unconfirmed content. The impact of SM is huge, and dentists must provide scientific links to all information shared using oral health resources such as PubMed and other resources.

*“Dental topics are very specialized and complex. Publishing too specialized information may lead to confusion for users. I cannot expect ordinary media users to be able to easily make a correct judgment of the quality of the information. Evaluating this content is complex and requires subject matter expertise.” (Interview 7)*

**Privacy, ethical and security concerns** Some participants stated that on SM, gathering and dissemination of personal information can raise significant apprehensions among individuals who are reluctant to disclose sensitive

OHI. Personal health information can be disseminated on SM platforms through various means, such as status updates, images, and user comments. This sharing of sensitive data is not limited to a select audience; rather, it can be viewed by a diverse group of individuals, encompassing acquaintances, relatives, and even unknown users. Furthermore, it is essential for dentists to familiarize themselves with the terms of service associated with various social media platforms. Understanding these guidelines can help practitioners navigate the complexities of online interactions while safeguarding their professional reputation. By being informed, they can avoid potential pitfalls that may arise from unintentional breaches of privacy. Often, SM platforms articulate the protocols regarding the use and sharing of personal information. In addition, dentists, acting as representatives of oral health services, must adhere to the ethical standards established within their profession. Consequently, dental professionals are not permitted to disclose personal information about their patients, such as their age, sex, or diagnoses. When referencing a medical case in their communications, it is advisable to change the actual names and to refrain from displaying an individual’s face without securing permission.

*“It’s great to share personal dental experiences as they can be beneficial to others, but it’s important for patients to do this thoughtfully and protect their privacy. Be cautious about revealing sensitive information and consider talking to dental professionals before sharing treatment details online. Additionally, dental clinics should focus on maintaining patient confidentiality and ensure they have consent before sharing any patient stories.” (Interview 9)*

#### **Incomplete oral health information understandability**

We identified incomplete OHI understandability as another challenge for OHL through SM. Among various limitations dental professionals encounter, time constraints have prevented them from adequately conveying complex diagnostic and treatment issues to their patients. Participants expressed that superficial OHI and cyberchondria are challenges that affected the understandability of OHI on SM.

**Superficial oral health information** Based on the participant overviews, the deficiency of OHI and foundational knowledge regarding oral diseases serves as a critical stressor, correlating with the increasing prevalence of dental issues in society. Addressing this issue requires a large-scale media awareness campaign to facilitate the early detection of dental problems. Engaging the public through SM to raise awareness about oral health challenges could be an effective strategy. However,

dental professionals often concentrate on demonstrating their proficiency in their SM posts rather than on imparting vital information about oral health and diseases. The respondents noted that narratives are constructed when individuals are referred for their dental concerns. Accessing a patient's historical information is demanding, and it is often difficult to articulate the primary factors contributing to the disease. Despite the many limitations that dentists experience, they firmly believe in the value of publishing basic OHI to prevent oral health issues, particularly in children. Yet, they encounter difficulties in executing this effectively. Dentists have considered a lack of understanding of basic information for oral care among the most important problems of patients and stated that they have not yet been able to cover it on SM.

*"Many oral and dental problems can be treated with early diagnosis at the right time, at minimal cost. Many cases are easily preventable. Unfortunately, the information published on social media has paid very little attention to prevention issues. Providing partial and incomplete information can take away a person's peace of mind and prevent them from following up." (Interview 15)*

**Cyberchondria** The significant engagement with SM for transmitting OHI, in conjunction with the shifting patterns of information search behavior among users, may limit individuals' efforts to obtain a more holistic view of information. Participants in our study unanimously agreed that recommending only SM usage is not viable; individuals must apply multiple strategies to enhance their understanding of information. The dentists participating in the study expressed that SM could transform the nature of social interactions in the physical world. There is a tendency for some individuals to favor screen-based communication over direct, personal interactions. This tendency may lead to avoidance of healthcare consultations, the discovery of alarming health conditions, and exacerbating the individual's anxiety rather than alleviating it. Considering the multifaceted effects of SM, it is vital to approach this platform with care. Understanding the possible risks and benefits can support a more balanced use of SM in our everyday routines. People may assume they thoroughly understand various oral health issues by engaging with SM and reading only the preliminary posts. Therefore, it is crucial to foster a spirit of inquiry that motivates individuals to seek out more detailed information.

*"Some patients come into the office with a lot of anxiety. During the initial consultation, we try to calm them down while explaining the process. In many similar situations, we found that these people had previously been exposed to videos, photos, or sto-*

*ries on social media that highlighted the side effects of certain treatments. These patients were scared because they didn't want this to happen to them." (Interview 6)*

#### **Bias in oral health information usability**

Current research identifies that the creation of biases in OHI usability is a notable obstacle to OHL over SM. The informational bias presented in many content disseminated through SM encompasses a variety of advertising and economic factors. Participants in this research indicated that numerous narratives shared by dentists tend to highlight the favorable aspects of their practices while providing limited explanations regarding the challenges patients face. Participants mentioned non-disclosure of information risks and misleading advertising as two challenges within SM that hinder the usability of OHI.

**Ignoring content disclaimers** Our findings shown, the OHI shared on SM should not be regarded as a substitute for independent professional guidance. Additionally, this information is not intended to cover all potential situations that may arise. Patients should be cognizant that laws, regulations, and treatment standards evolve. Therefore, confirming and updating any information or references sourced from SM is imperative. The results of our study demonstrate that online communications can lead to significant misunderstandings regarding context and nuance, particularly when individuals are in distress. Therefore, dental professionals must incorporate disclaimers that relate to the content they share and their professional limitations on their SM accounts. These disclaimers act as an essential mechanism for the public, allowing for the preemptive management of boundary and ethical concerns that may arise in an online context. Participants should know that posting messages or images on SM does not create a dentist-patient relationship. Therefore, dental practitioners are not required to provide advice to individuals who are not their patients. Moreover, responding to a non-patient with a professional assessment could potentially lead to malpractice liability.

*"This principle applies to all medical professionals; if they provide a non-patient with a professional evaluation and subsequent harm occurs that is reasonably foreseeable, the non-patient may file a malpractice claim for the resulting damages. To avoid such liability, dental professionals should decline to offer professional advice via SM when contacted by non-patients. Responding could expose them to legal repercussions even if the inquiry appears straightforward." (Interview 13)*

**Misleading advertising** Participants explained that advertisements for dental services in SM must adhere to principles of truthfulness and non-deception. For an advertisement to be deemed entirely truthful, every factual claim must be supported by appropriate evidence. An advertisement is classified as non-deceptive if it does not have the potential to mislead a reasonable consumer and does not omit critical information that would enable the consumer to make an informed decision about using services from a designated dental practice. All pertinent information must be disclosed in a manner that is easily understandable to a reasonable consumer. If the disclosures are presented in written form, they should be in a sufficiently large font to ensure clarity; non-compliance with this requirement may lead to the disclosure being considered inadequate. The advertisement must also avoid implying meanings that are not aligned with its intended communication. The individuals interviewed for this study reported that some dentists are not well-versed in the core principles of job advertising. Their SM activity may risk the professional standing of all dental community members.

*“Social media is filled with ads for dental products that often make over-the-top or misleading claims. Many items that promise quick fixes or miraculous solutions for dental problems usually don’t have solid scientific support and can sometimes be ineffective or even harmful. It’s important for patients to be careful and do their homework before buying these products.” (Interview 17)*

## Discussion

The study identified that information encountering, interactive question-answering, and communication empowerment are opportunities for SM that facilitate OHI accessibility. The process of encountering information refers to the ability of users to access necessary information with minimal or no interaction with information media [38, 39]. This occurrence is termed serendipitous information discovery, contrasting with intentional information seeking. In this context, individuals may not actively seek information; however, they can inadvertently come across relevant information without conscious effort [40–42].

Our research demonstrated that dentists greatly accept interactive question-answer methodologies in their relationships. Engaging in question-and-answer activities allows individuals to encounter novel information, which can catalyze enhancing personal motivations. This engagement also facilitates the assessment of others’ knowledge and provides insights into unrecorded information [43–45]. Using SM platforms enhances awareness of emerging scientific topics, empowers addressing

inquiries, and enables gathering feedback from others [46, 47].

Consistent with previous studies, this research highlighted that engagement with SM platforms contributes to improved communication [48]. Additionally, SM is recognized as a valuable resource for fostering peer-to-peer collaboration [49]. The ability to learn from fellow practitioners, deliberate on clinical issues, provide patient-specific advice, and coordinate team interactions are notable benefits of SM for physicians [50, 51]. Furthermore, using SM to relay patients’ insights and experiences can significantly influence clinical decision-making [52].

The findings of the study reported that strategies such as simplifying information, promoting oral health disease prevention, and clarifying information claims are effective SM tools that make OHI more understandable. The role of SM in advancing clinical education is well-documented. This tool provides a beneficial platform for delivering various counseling services that can enhance public health [53, 54]. Additionally, engagement with SM has proven to facilitate the dissemination of health knowledge, support evidence-based medical practices, and improve access to reliable health information [55].

The current study’s findings indicate that SM serves multiple functions, including education, information dissemination, networking, research, and support for patients, and its capacity to deliver health advice significantly enhances the likelihood of patients engaging with health services [56, 57]. Furthermore, the ongoing sharing of fundamental OHI on SM, particularly regarding the risks associated with various diseases, may motivate individuals to seek OHI attention and undergo primary screenings [58, 59]. The straightforward nature of content sharing on these platforms is recognized as a cost-effective strategy for enhancing patient awareness and promoting oral health by improving access to preventive information, fostering interactions with dentists, and facilitating communication [57, 60].

The present study indicated that the SM presents an opportunity to gain insights into clarifying information claims. Pseudo-content is primarily structured for promotional and financial motives. Since their scientific credibility remains unverified, these materials may pose potential user risks. For OHI, as another health context, two approaches have been proposed to remove this obstacles in light of the overwhelming prevalence of misleading health information on SM. The first strategy is the introduction of credible activities aimed at guiding users through monitoring and assessing professionals’ engagement on SM. The second is the development of health information systems that can effectively filter out false information to enhance the quality of health-related content [61].

Participating dentists in current research noted that decision-making, providing dental counseling, and experience sharing are valuable SM opportunities that facilitate OHI usability.

This research identified that patients facing similar dental issues employed SM alongside direct communication to form groups and collaborative teams for discussing challenges and sharing best practices. According to other studies, SM's primary application is to aid decision-making processes [60, 62]. Additionally, prior research indicated that the engagement of physicians with SM significantly enhances communication among medical professionals [63, 64].

The study results identified that some dentists employ SM as a tool for oral health counseling, specifically targeting patient uncertainties related to medication instructions, examination readiness, and stress reduction in clinical interventions. A detailed analysis of patient empowerment via SM identifies five primary functions: educational, informational, networking, research, and support [60, 65]. Moreover, the capacity of particular SM platforms to provide health counseling is an essential role in enhancing the likelihood of patients accessing health services [62, 66, 67].

We identified the sharing of experiences as a crucial supportive factor in the effective usability of OHI. Participants expressed that online engagement with other patients who share similar circumstances and shared personal narratives served as valuable strategies for learning to manage their condition. Patients are sharing experiences with the online community permanently, instantly, and in real-time via SM. In general, sharing experiences on SM can have three general benefits. Initially, the act of sharing personal experiences with others fosters the growth of social capital, as it facilitates connections among individuals and strengthens social ties. Furthermore, these digital interactions allow consumers to assess available market options, thereby enhancing their ability to make well-informed choices. In addition, companies benefit from observing, analyzing, and integrating consumers' sharing activities via SM in multiple ways to identify service or quality problems, detect potential brand crises, engage with individuals online, and derive immediate actions from the observations [68–70].

Findings of present research shown misinformation and negative content, complexity of information quality evaluation and privacy, and ethical and security concerns are significant SM challenges that damage the accessibility of OHI. Experts and healthcare professionals are in the front position to counter misinformation and direct individuals to reliable evidence-based information sources [71, 72]. Counteracting misinformation involves enhancing patients' and healthcare providers'

awareness, developing platforms presenting evidence-based data, integrating scientific evidence into health-related mass media, and enhancing media and health literacy [73–75]. Moreover, while SM can be leveraged to address misinformation, further research is essential to evaluate the most effective outreach formats. These efforts are also necessary to determine which channels are most suitable for various populations, geographic contexts, and cultural settings [76, 77].

The challenges of quality assurance and information reliability are prominent issues in SM [60, 78]. Content creators are frequently unidentifiable, complicating the distinction between the audience and the producer. While SM allows individuals to engage in storytelling, this can also lead to risks associated with the rapid dissemination of information and universal access [79, 80]. The participatory and open nature of SM contributes to a higher incidence of inaccurate comments being shared than other media forms. Moreover, security and privacy issues present additional challenges adversely affecting the knowledge management process [81, 82]. Organizations must prioritize secure practices when using SM, ensuring that content complies with legal, regulatory, and competitive requirements [83, 84].

Findings of the study showed that superficial OHI and cyberchondria SM challenges that affected the understandability of OHI on SM. The general public can access this information freely, often engaging in rewriting/resharing articles without focusing on maintaining quality or credibility [62, 85]. The extensive dissemination of information through SM platforms is a notable characteristic of these tools. While this aspect can be viewed positively, it is essential to consider additional factors when the information is intended to inform or update information [86, 87]. One significant factor is the restricted space available for communication, which inherently constrains the depth of the topics discussed [57, 60, 88]. The presence of superficial information, coupled with a lack of references, incompleteness, misleading content, unreliability, bias, and the absence of disclosed conflicts of interest, raises significant concerns regarding the role of SM in the education, updating, and guidance of healthcare professionals across various domains [87].

Cyberchondria represents a significant challenge in contemporary health behavior. This phenomenon is characterized by an individual's compulsive search for online health information [89, 90]. The resulting distress can be profound, potentially resulting in absenteeism from work or social engagements. The phenomenon is marked by an excessive and repetitive engagement with online health resources, driven by underlying health anxieties. While medical consultations and diagnostic evaluations do not necessarily

ensure a sense of well-being, the term “cyberchondria” encapsulates the compulsive nature of these online searches, often fueled by fears regarding one’s health [91, 92]. Although there is some debate on its precise definition, cyberchondria is generally recognized as a manifestation of health-related concerns. It is not classified as a distinct psychopathological condition; instead, it is understood as a maladaptive form of reassurance-seeking behavior, reflecting broader issues of health anxiety and hypochondriasis [42, 93, 94].

Based on the results of the current study, it is highlighted that ignoring content disclaimers and misleading advertising are two challenges within SM that hinder the usability of OHI. A disclaimer serves as a brief notification that informs individuals about the limitations of liability. It is a formal declaration intended to restrict legal responsibilities, ensuring the audience comprehends the risks they undertake when engaging in specific activities (e.g., purchasing advertised products or adhering to health recommendations) [95–97]. Content disclaimers offer significant insights into shared content’s precision, trustworthiness, and objectives. These disclaimers act as a protective mechanism for both the producers and users of content, fostering transparency and helping to avert possible legal challenges [98, 99].

Misleading or false advertising refers to disseminating promotional material that includes intentionally or recklessly misleading claims or statements to enhance the sale of products, services, or property. Such advertisements are deemed deceptive when the advertiser knowingly misleads consumers instead of making an inadvertent error. Various governmental bodies implement regulations to curtail the prevalence of false advertising [100–102].

The integration of social media literacy training and the establishment of ethical guidelines are essential for policy maker and dental professionals operating within the digital realm [42, 103]. A variety of resources are available to address this requirement. Additionally, there are specialized courses that concentrate on social media marketing for dentists, instructing them on how to utilize platforms like Facebook effectively to attract new patients. These educational programs encompass strategies for brand development, audience engagement, and the optimization of online visibility [103, 104]. Collectively, these initiatives are designed to empower dentists to utilize social media for professional advancement while maintaining ethical integrity.

## Conclusion

SM can support OHL by facilitating OHI accessibility, popularizing OHI understandability, and supporting OHI usability. In this regard, OHI quality issues, incomplete OHI understandability, and bias in OHI usability

are three challenges over the SM for OHL. Dentists, oral health education policymakers, and patients can gain the necessary capabilities in using social media based on these opportunities and challenges.

This study faced several limitations: (1) insufficient cooperation from certain qualified dentists and specialists who were approached for participation; (2) Some dentists applied SM primarily for advertising purposes; (3) Despite numerous follow-up efforts, the research team was unable to secure interviews with five qualified dentists, primarily due to scheduling delays and the high demands of their professional commitments.; (4) Several interviews suffered from poor phone call quality, requiring the research team to replay recordings multiple times for accurate transcription; (5) Two interviews were cut short at the participants’ request and ultimately excluded from the study; (6) This qualitative study was conducted in the Iranian context and its results cannot be generalized to other countries, languages, and cultures and (7) Snowball sampling may over represent certain perspectives of tech-savvy dentists.

The findings of this research indicate several areas for future investigation: firstly, exploring the benefits and drawbacks of utilizing social media for oral health literacy from the perspectives of various healthcare and clinical provider groups; secondly, examining the individual and organizational determinants that influence dentists’ willingness to engage with social media in the promotion of oral health literacy; and thirdly, developing a tailored model aimed at enhancing oral health literacy through social media platforms.

## Abbreviations

SM	Social Media
OHL	Oral Health Literacy
OHI	Oral Health Information

## Supplementary Information

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Supplementary Material 1.

Supplementary Material 2.

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## Authors’ contributions

Hossein Ghalavand and Sirous Panahi developed the theoretical formalism, performed the analytic calculations and performed the numerical simulations. Mohsen Nouri participated in data analysis and rewriting the manuscript. All authors contributed to the final version of the manuscript.

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### Data availability

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

### Declarations

#### Ethics approval and consent to participate

This study was conducted in accordance with the ethical principles set forth in the Declaration of Helsinki. The research protocol was reviewed and approved by the Ethics Committee in Biomedical Research at Abadan University of Medical Sciences (Ethical code: IR.ABADAUMS.REC.1403.030). During the preliminary meeting, consent for participation in the study was acquired verbally from the individuals before the interviews began. The consent that was obtained from all of the participants was informed by ethics committee. Should participants have inquiries or issues regarding their rights, they are encouraged to reach out to the Abadan University of Medical Sciences Institutional Review Board via email at [research@abadanums.ac.ir](mailto:research@abadanums.ac.ir).

#### Consent for publication

Not applicable.

#### Competing interests

The authors declare no competing interests.

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