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Research article

Dentistry website analysis: An overview of the content of formulated questions and answers

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ABSTRACT

Aim: This study aimed to analyze the content of questions and answers posted on dentistry websites.
Subject and methods: A mixed-method study was conducted in 2020. A total of 1354 related questions were included, of which 1182 were answered by dentists. The data was analyzed quantitatively according to the classification of the questions, main complaints of the subjects and length of the questions and answers using $Excel_{2013}$. A qualitative content analysis was carried out also for data robustness and triangulation.
Results: Of the 1354 questions, 866 of them were categorized into 11 categories according to the main sub-classes of the International Classification of Diseases to Dentistry and Stomatology. Furthermore, the inquiries were allocated to 3 communication styles to present the users' main complaints that included contextual (52.33%), emotional (6.79%) and focal (40.89%) strategies. Results of the qualitative content analysis have led to 6 main themes: seeking the related recommendations of any actions, treatment seeking, information seeking, seeking for causes and reasons, seeking for oral and dental health recommendations and seeking for the dentists' diagnosis or comments.
Conclusions: The present study can be used for designing specific customized websites of dentistry and help the website managers for better optimization of the websites. All these interventions can pave the way for developing teleconsulting in dentistry for middle-income countries.

1. Introduction

Oral and dental health is considered a necessary determinant of the community's public health (Engelmann et al., 2020). However, there are inequalities in the provision of oral health services and challenges in access to such facilities (Chiu, 2016; Umefjord, 2006)Some of these challenges are related to global concerns, particularly in middle and low-income countries in which the rural and remote areas face difficulties in access to oral and dental services (Oh, 2010; Sittig, 2003). The aforementioned concerns include a variety of factors such as lack of access to oral and dental health, high costs and unaffordable dentistry services population increase, aging workforce migration, insufficient number of dentists and geographical challenges in access to traditional dentistry services (da Costa et al., 2020; Engelmann et al., 2020).

In such a condition, information and communication technology and the Internet can play a significant role in the delivery of oral and dental health's service (da Costa et al., 2020). This is in contrast with the recent status where the only way to communicate for answering the oral and dental health-related questions was face to face contact with the dentists (Chiu, 2016). It is clear that, right after increasing access to the world wide web and consequently developing the use of online documented information, Internet-oriented chat groups, weblogs, websites, etc., the Internet was likely the first choice of information acquisition, and patients are greatly commonly using the Internet to seek response for their health questions (Engelmann et al., 2020).

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Telemedicine allows medical services to be delivered by providers at a distance and has the potential to overcome barriers to classical care such as high costs, large geographical distances or limited access to medical services due to gaps in primary care (Reinhardt et al., 2021). In this regard, teledentistry have become an alternative technology that can allow the patients consult specialists to obtain their opinions are commendations (Paixão et al., 2018; Petruzzi and De Benedittis, 2016). In fact, Teledentistry, is a combination of telecommunications and dentistry, sharing clinical information and images remotely for dental consultation and treatment planning (Flores et al., 2020). These technologies can facilitate communication among clinicians and patients about oral health problems (Kumar, 2014). Patients use various communication tools such as email, websites, social networks and specialized systems to ask questions (Fonseca et al., 2021; Georgakopoulou, 2020; Jampani et al., 2011; Torres-Pereira et al., 2013). In addition, the most common form of teledentistry is teleconsultation, where patients or local healthcare providers consult dental specialists through telecommunications (Ghai, 2020). Also, Evidence indicates that people could receive real information after online and offline consultations with specialists about their health conditions, sicknesses and even probable treatments (Oh, 2010). A study regarding online consultation in oral and maxillofacial surgery has shown that most of the users have asked online questions about treatment interventions, pharmaceuticals, complications or a particular side effect (Brockes et al., 2012). The results of another study also showed that questions related to the oral and dental health problems are in the list of 10 common categories of health questions, which are asked by people in a specialized site of questions and answers (Nobles et al., 2020). Also, a study of online consultation in oral and maxillofacial surgery showed that most users asked online questions on side effects. Overall, dental clinics, to achieve their clients' satisfaction from Internet-based services, need to provide useful information to the patients. This can lead to producing an increasing volume of questions and answers via the Internet (Kim and Yang, 2013). Thus, analyzing the patients' questions and the specialists or dentist's responses can be considered as a valuable tool for better comprehending mutual contractions between the patients and the caregivers in an online environment (Britt et al., 2020). At the same time, the content analysis of the questions and answers posted via dentistry websites can play an effective and helpful role in designing online user-friendly dentistry consulting services and shed light for policymakers to define new ways of technology-based contracts for the improvement of the community's health. This study aimed to analyze the content of questions and answers posted on dentistry websites in 2020.

2. Materials and methods

This study aimed to analyze the questions and answers posted in the Persian language in the scope of oral and dental health and dentistry in 2020. Firstly, a comprehensive search was conducted via Google search engine to reach the questions and answers posted on dentistry websites. Google is the most popular search engine globally, used by 80–90% of online users (Rank Checker Tool; StatCounter, 2019), applying the following Persian keywords: "dentistry questions", "question from dentists", "dentistry consultation", "dentistry question and answer", "current dentistry question", "chat with dentist", "oral and dental health question and answer", "current oral and dental health questions", "oral and dental health question and answer", "current oral and dental health questions", "oral and dental health ask and response" and "questions about oral and dental health".

For each keyword, the first 10 pages that were retrieved from the search were included. Each page included 10 results that totalled 100 cases for each keyword, because most users won't browse beyond the first 10 pages of results (Rajendran and Swamynathan, 2015). The aforementioned cases were considered if they had a webpage on questions and answers in dentistry, and the page was not duplicated. Finally, 283 related links to the pre-stated keywords were retrieved and entered into the study. The retrieved links were then tabulated using Microsoft Excel according to the keywords. After opening each link and entering the considered webpage, the inclusion and exclusion criteria were applied. Persian web pages which contain people's questions and the dentists' answers were included. Exclusion criteria included the following: webpages with contents different from question and answer, web pages without any questions in their asking and answering pages, webpages with audio questions and answers, web pages with broken links, questions answered by non-dentists and finally the webpages with frequently asked questions page. Thus, 283 web pages were retrieved, and 213 of those were excluded, and 71 (dentistry webpages: 63, public health websites: 3, dentistry legal issues webpage: 1, school of dentistry website:4) were included in the study.

2.1. Data collection

To collect data regarding the proposed questions and answers in the included websites, a customized data collection sheet was designed according to the aims of the study. This form contains some demographic information of the seekers/users, the same as their age and gender, the content of their questions and the content of the answers presented by the dentists. The data selection process is illustrated in Figure 1.

2.2. Data analysis

To triangulate the present data and increase the robustness of the results, the combination of qualitative content analysis was carried out together with the quantitative analysis. The process of data analysis is described in further detail as follows:

2.3. Quantitative analysis

Microsoft Excel $_{2013}$ was used to describe the data.
The data collection form included 7 items, as follows:

1 The identity of the user if available in another word, if the questions were asked by users for themselves or on behalf of someone else.
2 The classification of the questions according to the International Classification of Diseases to Dentistry and Stomatology (ICD-DA).

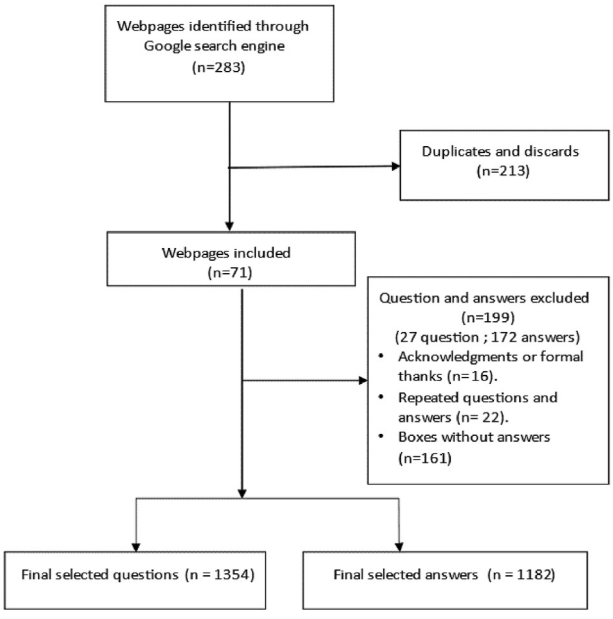

Figure 1. The selection process for the dentistry questions and answers.

The Application of the International Classification of Diseases to Dentistry and Stomatology (ICD-DA) categories at the level of three characters is intended to provide a convenient and practical basis for the classification of data by all those working in the field of oral and dental disorders. It is derived directly from the Tenth Revision of the International Classification of Diseases (ICD-10), and includes all diseases and conditions associated with the oral cavity and adjacent structures. ICD-DA consists of a tabular section and a comprehensive alphabetical index. The tabular section includes 21 main sections or chapters. Sections has been classified into main categories and sub-main categories, each category class has main code that are shown by a letter and two numbers (World Health Organization, 1995). In classification of questions, main groups were determined according to the chapters of ICD-DA, and category classes were determined according to the main categories of ICD-DA with main codes.

3 Strategies of communicating chief complaints.
4 The condition of the person in the question was also categorized according to the existence of any underlying diseases, being pregnant or a child, and without any special conditions.
5 The content of the questions and the dentists' response
6 The length of the questions and answers. To determine the length of the questions according to the number of the words, the combination of three functions (SUBSTITUTE, LEN, and TRIM) was used in Excel, and the exact amounts were calculated.
7 The response of the dentists to the users' questions, to assess whether the dentist's responses have addressed the need of the users.

All the aforementioned items were saved in $Excel_{2013,}$ and the data was analyzed using descriptive statistics.

2.4. Qualitative analysis

For the qualitative analysis, we used inductive and deductive reasoning as described subsequently. The following presents an overview of concepts related to qualitative content analysis. A meaningful unit is word, sentence or paragraph containing the main idea of the questions or the purpose of the questions. A code is a label given to a meaning unit. The codes introduce a data characteristic that seems attractive for the analyst. A category is a group of content that has common features or attributes. Categories are internally homogeneous and externally heterogeneous. Concept is something that themes focuses on it. A theme to be a thread of condensed meaning units, codes or categories. A theme expresses the latent content of the text. A condensed meaning unit, a code or a category can fit into more than one theme. A theme can be divided into sub-themes (Graneheim and Lundman, 2004).

To analyze the content of the dentists' answers and identify the aims of the users from asking the questions, a thematic analysis employing an approach of inductive reasoning was applied (Nowell et al., 2017). A six-phase framework was applied for the thematic analysis to categorize and summarize the data. This framework includes the following steps: data familiarization, coding, theme development, revision, naming, and writing up (Braun and Clarke, 2006).

In the first step of identifying the primary purpose of the users from asking the questions, data familiarization occurred by reviewing the data several times. To achieve this purpose, the collected content of the extracted questions was read several times and compared with the original questions to have an overall idea and to become familiar with the overall content. Then, in the second step, to make the initial codes, the meaningful units were extracted from the original content of the extracted questions. These meaningful units were coded and labeled in an open coding process and all the similar meaningful units received the same initial code. In this second step, 1354 questions led to 1591 meaningful units, which were assigned to 270 initial codes. Then, in the third step, the theme can be emerged after merging similar categories. The initial codes were integrated to achieve the final codes (n = 182). In the fourth step, the finalized codes became integrated, reanalyzed, and categorized one more time, to reach sub-themes according to the study's objective. In the fifth step, the main themes (n = 6) were named by categorizing the sub-themes (n = 59) according to their main concepts, these main themes finally were reviewed and labeled, and at the last step, the main themes and sub-themes were tabulated and the thematic map was designed for better illustration and comprehension.

Like all the other qualitative analyses, to assure the robustness and accuracy of the analysis, Lincoln and Guba's criteria were applied (Loh, 2013). To achieve the credibility of the data, the researchers allocated the required time for data collection. They also have reached a complete familiarization of the data through continuous reviewing of the whole data several times. Moreover, one of the research team members (PB), an expert in the scope of qualitative research, assessed the whole study protocol, data collection form, the extracted codes and the final themes with no conflict of interest.

To analyze the dentists' answers to users' questions, the thematic approach was used as described above. Overall, 1182 meaningful units, with each answer leading to a meaningful unit, were assigned to 35 initial codes. In addition, all the similar meaningful units received the same initial code. Then, different initial codes were reviewed and categorized into potential themes, and different themes were classified into 7 themes. Finally, 5 themes emerged.

The deductive reasoning approach was also used to achieve the "Strategies of communicating chief complaints" item in the data collection form. Based on Chiu study, strategies of communicating chief complaints were classified in three types of communication style: contextual, focal and emotional (Chiu, 2016).

To achieve this purpose, the content of the questions was read several times. Then, they were classified into three categories, contextual, emotional and focal strategies. In "contextual strategy", the client/patient has used the symbols, signs, examples and details of his/her problem to clarify the situation. In the "focal strategy", the users' questions are related to reality, not personal opinion or emotion o feeling. Thus, this strategy is opposite to the previous one. And finally, in the "emotional strategy", the users' statements are generally based on negative emotions, including anger, anxiety, depression, hopelessness and bafflement.

3. Results

To have a comprehensive description of the results, the present quantitative and qualitative findings are mentioned in 6 sections as follows:

3.1. The demographic characteristics of the users

Descriptive results show that 388 of the studied users (28.66%) were female whereas 238 users (17.58%) were male, with 728 (53.77%) of the users not mentioning their gender in the webpages. Other descriptive findings also show that the average age of the users was 27 years with the minimum age of 10 years old and the maximum age of 78 years old. Also, out of 1354 questions, most questions were asked by users for themselves and their children with 89% and 8%, respectively. The rest questions were asked by users for parents, relatives, partners, and siblings. Also, the health condition of the person under question was not clear in 94% of the questions. And the rest of the questions were about subjects related to the health of children, mothers, and people with underlying diseases.

3.2. The Q according to the International Classification of Diseases to Dentistry and Stomatology (ICD-DA)

Table 1 shows the frequency of the questions according to the chapters of ICD-DA. Of the 1354 questions, 866 (64%) were medical questions and classified according to ICD-DA. These questions classified into 10 main groups according to the chapters of ICD-DA, and 38 category classes (main codes) according to the main categories of ICD-DA. The most

Table 1. The frequency of the questions according to the chapters and main categories of ICD-DA.

Chapters	Category class of ICD-DA	ICD-DA Main Code	Count of code (%)
XI	Diseases of the digestive system		576 (42.5)
	Other diseases of hard tissues of teeth	K03	95 (7.1)
	Other disorders of teeth and supporting structures	K08	94 (6.9)
	Dentofacial anomalies [including malocclusion]	K07	90 (6.6)
	Dental caries	K02	74 (5.5)
	Diseases of pulp and periapical tissues	K04	45 (3.3)
	Gingivitis and periodontal diseases	K05	39 (2.9)
	Disorders of tooth development and eruption	K00	37 (2.7)
	Other disorders of gingiva and edentulous	K06	33 (2.4)
	Embedded and impacted teeth	K01	22 (1.6)
	Diseases of tongue	K14	9 (0.7)
	Other diseases of lip and oral mucosa	K13	8 (0.6)
	Other diseases of jaws	K10	4 (0.3)
	Cysts of oral region, not elsewhere classified	K09	3 (0.2)
	Diseases of salivary glands	K11	3 (0.2)
	Stomatitis and related lesions	K12	20 (1.5)
XIX	Injury, poisoning and certain other consequences of external causes		215 (15.9)
	Complications of procedures, not elsewhere classified	T81	159 (11.7)
	Complications of internal orthopedic prosthetic devices, implants and grafts	T84	10 (0.7)
	Foreign body in alimentary tract	T18	2 (0.1)
	Fracture of skull and facial bones	S02	34 (2.5)
	Other and unspecified injuries of head	S09	5 (0.4)
	Dislocation, sprain and strain of joints and ligaments of head	S03	3 (0.2)
	Open wound of head	S01	2 (0.1)
XVIII	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified		28 (2.1)
	Other symptoms and signs involving the digestive system and abdomen	R19	26 (1.9)
	Other general symptoms and signs	R68	2 (0.1)
XX	External causes of morbidity and mortality		27 (1.9)
	Other misadventures during surgical and medical care	Y65	17 (1.2)
	Systemic antibiotic	Y40	3 (0.2)
	Unintentional cut, puncture, perforation or hemorrhage during surgical and medical care	Y60	2 (0.1)
	Anesthetics and therapeutic gases	Y48	5 (0.4)
V	Mental and behavioral disorders		11 (0.8)
	Somatoform disorders	F45	10 (0.7)
	Eating disorders	F50	1 (0.1)
II	Neoplasm		2 (0.1)
	Neoplasm of uncertain or unknown behaviour of other and unspecified sites	D48	2 (0.1)
X	Diseases of the respiratory system		2 (0.1)
	Acute sinusitis	J01	1 (0.1%)
	Acute pharyngitis	J02	1 (0.1%)
XII	Diseases of the skin and subcutaneous tissue		1 (0.1)
	Erythema multiforme	L51	1 (0.1)
XVII	Congenital malformations, deformations and chromosomal abnormalities		2 (0.1)
	Congenital musculoskeletal deformities of head, face, spine and chest	Q67	1 (0.1)
	Cleft palate	Q35	1 (0.1)
I	Certain infectious and parasitic diseases		2 (0.1)
	Herpes viral [herpes simplex] infections	B00	1 (0.1)
	Unspecified human immunodeficiency virus [HIV] disease	B24	1 (0.1)
Medical questions, classifiable according to ICD-DA			866 (64)
Administrative/managerial questions, not classifiable under ICD-DA (Other)			488 (36)
Total			1354

medical questions belonged to the chapter of "Diseases of the digestive system" (576 questions = 42%). The other 488 (36%) questions were not allocated to any of the categories of ICD-DA, thus were categorized as non-medical and administrative questions. The following are examples of "other":

- Hello doctor, how much do Braces Cost?
- Hello doctor, how much does an Implant Cost?
- Hi, what is the difference between teeth bleaching and cleaning?
- Hi, why do we sometimes have to temporary glue the dental veneers?
- Hello, is dental laminating done in your clinic?
- Hi. I called the numbers you gave me at 13 pm to make an appointment, but they did not answer.
- What should I do? Do I have to call at a specific time?

Table 2. Communication styles to present chief complaints.

Main strategy	N (%)	Meaningful unit examples from questions
Contextual strategy	708 (52.32)	"Good morning. I am 19 years old, and it is six days since my surgery on the mandibular third molar. The pain related to the sutures and the surrounding teeth is disappearing, even less than in the past days. However, I have a sense of toothache in the area of the mandibular central incisor. Is it probable that the nerves in this area have been damaged or irritated? Will the area feel better after removing the sutures? Because I felt a little ache after the surgery and now I think it increasing" # Question 41.
Emotional strategy	92 (6.79)	"Please, somebody help me ☹ my fore tooth has severe pain, and it has not decreased even for a second. It became black a long time ago, and the dentist made it okay, but now it is again aching a lot. In these pandemic days, that everywhere is closed. I am going to become mad. I do not know what to do. Please somebody help me!!!" # Question 227.
Focal strategy	554 (40)	"What is the difference between Porcelain laminate and dental composite? # Question 608".
Total	1354	

Table 3. Categorization of the main content of dentists' answers to the users` questions

Main category	N (%)
Suggestion to online consultation and request for checking para clinical results by a dentist	37 (3.13)
Offer a face-to-face visit by the *respondent dentist	112 (9.47)
Offer a face-to-face visit by the patient's own dentist	78 (6.59)
Definitive answers to patient questions without any suggestion	946 (80.03)
Feedback to the vague questions	9 (0.76)
Total	1,182 **

* The respondent dentist: who answer to patient questions on website.
** There were 172 questions without an answer,

- Can all teeth be implanted in one session? What time can I make an appointment in person or by phone?
- Hi, how long does a composite filling last?

3.3. Communication styles to present chief complaints

Inquiries have used three communication styles to present their main complaints, including contextual, emotional and focal strategies. In "contextual strategy", the client/patient has used the symbols, signs, examples and details of his/her problem to clarify the situation. In "focal strategy", the users' questions are related to the reality not the personal opinion or emotion. And finally, in the "emotional strategy", the users' statements are generally based on negative emotions the same as anger, anxiety, depression, hopelessness and bafflement (Chiu, 2016). There weren't any complex strategies in the data related to chief complaints. Table 2 describes the frequency of each of the strategy.

3.4. The status of responding to the questions by the dentists

According to the results of the thematic analysis, the main content of dentists' responses to the users' questions was categorized into five categories. Out of 1354 questions, dentists have answered 1182 questions (Table 3).

3.5. The length of the asked questions

The results show that the overall average of the questions' length was about 41.43 words. The longest average of length was related to category of "Cleft palate" comparing with the shortest one that was related to category of "Erythema multiform, unspecified" (see Table in Appendix 1).

3.6. The main purpose of the question

According to the thematic analysis of the questions' content, the primary purpose of questions was categorized into six themes (Table 4). The most frequent was related to the theme of "treatment seeking", and the less common theme was "recommendations after dental procedures". These are also illustrated in Figure 2.

4. Discussion

The Internet can be used as an effective source of health information. This potentiality can lead to an increase in community health literacy, better patient education, and improved public health. According to the available evidence, patients can benefit from using the Internet to enhance their oral and dental health (McCollough, 2010).

Results of this study have emphasized that a variety of Iranian users of different ages and genders have used the potentiality of the Internet to seek their oral and dental information. Results also have shown that the majority of the users who asked the questions (89.2%), were searching for their problems. However, eight percent were parents who asked about their children's problems. These findings can be justified knowing that adults usually seek the related information individually via the Internet and, in their role as a parent, they try to find the solution for their children's problem by applying sophisticated websites. These results are confirmed by (Chiu, 2016) According to their study, 84% of the dentistry questions were asked by their clients. Meanwhile, the clarity of the users' identity was considered as an important criterion in online consults. Other present results also confirmed that the users asked the questions for their parents, spouses or relatives other than their children and themselves. The results of one study confirmed that web users may ask health-related questions on behalf of their friends or family members (Hong et al., 2020).

Findings of the study regarding the classification of questions according to the ICD-DA showed that most of the questions (42.5%) fell in the chapters of "Diseases of the digestive system" and its main categories such as "the complications of procedures", "not elsewhere classified", "other diseases of hard tissues of teeth", "other disorders of teeth and supporting structures", "dentofacial anomalies [including malocclusion]", and "dental caries". Such results can greatly help the websites' managers to design their websites according to the requests and needs of the users. At the same time, these results have focused on the significance of empowering the role of the Internet in the public's oral and dental information (Ríordáin and McCreary, 2009) and, simultaneously, have developed the risk of misinformation or lack of mutual contraction between the users and the virtual dentists. As a recommendation for the latter situation, it is highly recommended to guide the patients to get accurate and timely information via online health communication or validated websites in the scope of their health needs (Kanthawala et al., 2016).

Other present results demonstrated that the average length of the dentistry questions was 41.43. The item of the question's length is mentioned as one of the effective characteristics in the quality of the question (Oh and Worrall, 2013). This can be justified as long questions require a lot of time to be read, understood and answered (Chiu, 2016). The length of the question can also be affected by the type and severity of complications. For instance, those who suffer from aphthous ulcer or sinusitis tend to give detailed descriptions and expect detailed answers (Brockes et al., 2012). The result of a study has indicated the average length of the dentistry questions to be about 172.2 words among consulting websites (Chiu, 2016). Is it possibly due to the different nature of the Persian language compared to English. To clarify, in the Persian

Table 4. Categorization of the primary purpose of questions

Main themes and sub-themes	Frequency of meaningful units	Percentage
1- Recommendations after dentistry procedures	23	1.4**
Eating possibility	7	30.43 **
Health care recommendations	16	69.57
2-Treatment seeking	453	28.38
The feasibility of a treatment procedure	10	2.21
The necessity of a treatment procedure	9	1.99
Solutions for eliminating the side effects of the procedures	36	7.95
Request for medication prescription	10	2.21
Choosing the treatment procedure	60	13.25
Finding the alternative options for treatment procedures or medicines	21	4.64
Treating pain and other dental conditions in the patient.	267	58.94
Solutions for controlling stress and fear of the dentistry procedures	9	1.99
Obtaining the specialists` opinion about the possibility of treatment with medicines	3	0.66
Obtaining knowledge about the effectiveness of a home remedy	6	1.32
Use or not use of antibiotics	9	1.99
Obtaining information about medicines and their usage	6	1.32
Finding the immediate solutions for problems	7	1.55
3-Information seeking	561	35.75
a) Non-medical information	312	55.61
The services provided in the clinics and service provision	41	13.14
The office times schedule and how to make an appointment	28	8.97
Research and seeking for the appropriate clinics and specialists	16	5.12
Higher education and the market circumstances	6	1.92
Dentistry procedures costs	145	46.47
Official and legal issues	3	0.96
Insurance coverage	18	5.76
The quality of dental materials and supplies in a treatment procedure	18	5.76
The durability of an intervention	18	5.76
An appropriate time for doing a procedure	5	1.60
The duration of a dental procedure	14	4.48
b) Medical information	249	44.38
Obtaining information about oral diseases	6	2.40
The growth process and structure of teeth	41	16.46
The process of a particular treatment, its benefits and indications	72	28.91
The pre-requisites of a dentistry procedure	10	4.01
The difference between two types of treatment	16	6.42
Dangers and side effects of a treatment	53	21.28
Alternative interventions	6	2.40
The range of perceived pain through an intervention	9	3.61
The appropriate average age of an intervention	21	8.43
The priority of the therapeutic interventions	11	4.41
The recommendations before a surgery	4	1.60
4-Seeking for causes and reasons	237	14.84
The cause of the pain and other symptoms which manifest in the patient	129	54.43
The cause of pain and other symptoms that appear in the patient following a dental intervention.	95	40.08
The cause of problems in tooth eruption	7	2.95
The cases of side effects after brushing	6	2.53
5-Seeking for oral and dental health recommendations	41	2.56
Ways to promote oral and dental health	19	46.34
Information about the performance and usage of tooth brush, tooth paste, dental floss, toothpick, mouthwash	22	53.66
6-Seeking for the dentist's diagnosis or opinion	276	17.29
Natural or non-natural status of wisdom teeth	1	0.36
Natural or non-natural status of deciduous teeth	2	0.72
Diagnosis	21	7.61
The probability of high-risk problems	20	7.25
The possibility of correction of a problem	40	14.49
Judgement about the procedures have been done by another dentist	25	9.06
The necessity of refer to the clinics	8	2.9

(*continued on next page*)

Table 4 (*continued*)

Main themes and sub-themes	Frequency of meaningful units	Percentage
The probable problems caused by postponing a procedure	14	5.07
Confirmation about the issues related to dentistry procedures	17	6.16
The possibility of recurrence of a problem	8	2.9
The feasibility of a procedure	54	19.57
The feasibility of replacing a procedure with the other	11	3.99
The natural or non-natural status after a treatment	13	4.71
The natural or non-natural status after a dentistry intervention	11	3.99
Doing or refusing dentistry actions or using or not using a medicine during pregnancy	26	9.42
The possibility of erupting baby teeth	5	1.81
Total number of meaningful units	1591*	100

* 1591 meaningful units were extracted of 1354 questions in qualitative analysis.
** Total number of meaningful units (1591). Total number of meaningful units and frequency of meaningful units related to each main theme were used to calculate frequency percentages of main themes. Also, the frequency of meaningful units related each main theme and sub-theme were considered to calculate percentages of sub-themes in each main theme group.

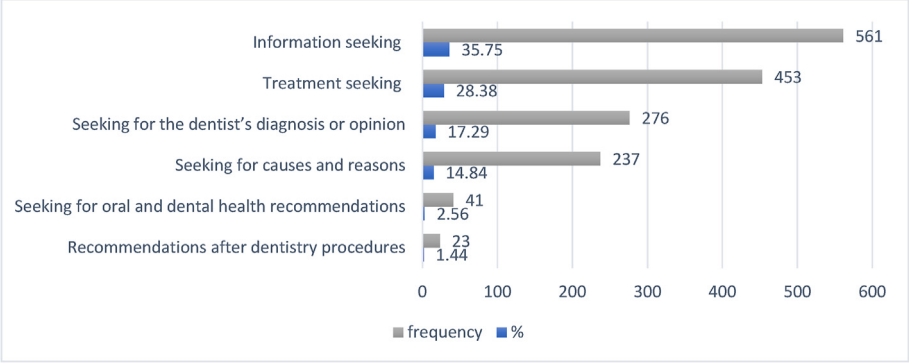

Figure 2. The primary purpose of questions.

language compared to English, sentence length is generally shorter (Hesarzadeh et al., 2020).

Other results about the strategy for communicating chief complaints on the dentistry websites by consultation seekers or inquires have demonstrated that contextual and then the focal strategies are among the patients' interests while only about 7% of the users have preferred to use the emotional strategy to ask their questions or send their message to the dentists. Such a result can be considered from the dentists' viewpoints as a criteria of communication and decision making for the patients. The results of a study have shown that about 76% of the dentistry strategies were related to contextual comparing the only 26% and 12% that were restricted to focal and emotional strategies, respectively (Chiu, 2016).

The results also indicate that most users were looking for dental treatment through web searches and posting comments. Searching for causes and reasons, oral and dental health recommendations, and seeking for special dentistry diagnosis, comments and information are among the other purposes of the studied users. Sen et al. (2016) have claimed that, although people may have various purposes in searching the health-related web pages, this process can affect the patients' thinking and lead them to use much more oral health information based on the Internet (Sen et al., 2016). Similarly, a study has mentioned that the patients have nine different purposes from posting the questions on medical consultation websites. They may seek facts, causes, empathy, advice, diagnosis, emotions, confirmation, explanation or recommendations (Benetoli et al., 2015; Chiu, 2016). Some of these aims are similar to those we have found in dentistry questions posted on the related websites. In other words, these various purposes may be because of the potential tendency of the users for seeking the information before any diagnostic or therapeutic procedure.

At the same time, regarding the purpose of the questions, simply it can be stated that the dentistry and oral and dental health-related information request may appear at any stage of the user's health or illness. However, the expected and the received information will likely differ at the different stages of health and illness.

According to the present results, seeking for the treatment, seeking for the information and looking for the experts and dentists' opinion are among three categories that covered most of the proposed questions. In the first category, seeking treatment, 59% of the questions were related to treating pain and other dental conditions in the patient. This can be supported by the fact that the health information via the Internet can be easily accessed to all the community (Helve, 2014). At the same time, the solutions of online health care are increasingly popular (Jiang et al., 2020). In the user informatics area, according to 10 levels of Dr Ferguson, the first level is related to seeking the information via the Internet, with the possible contact between the users and the clinician occurring at the subsequent stages (Lewis et al., 2005). Furthermore, according to Brockes et al. (2012), in online consulting services about maxillofacial surgery, the users are seeking telediagnosis, cost information, general information about the probable treatments and appropriate specialists (Brockes et al., 2012). Also, in the "seeking information" category, looking for non-medical information (n = 312, 55.61%) was more than medical information (n = 249, 44.38). In addition, Among the non-medical information, get information about the cost of dental procedures, obtain information on the services provided in the clinics, and obtain information regarding the queuing status of the clinics are mostly discussed by the users. This can be supported by the fact that one of the barriers to access dental health services is financial or cost of treatment especially in developing countries (Ajayi and Arigbede, 2012; Bastani et al., 2021). Under these circumstances, it seems that people would like to be aware of the cost of dentistry procedures before carrying out a procedure; And they choose a clinic according to their budget and the services offered by the clinics. Then, they look up information about the

office schedule and make an appointment. In case of "medical information", seeking information about the process of a particular treatment, its benefits and indications, as well as the dangers and side effects of the treatment are the topics that have been of most interest to users. Clearly, individuals have the right to be aware of the pros and cons of taking a treatment decision in order to make an informed decision (Wells and Kaptchuk, 2012; WHO, 2017).

Also, in relation to the category "Search for Diagnosis and Opinions", the results showed that asking questions in order to obtain a physician's opinion on the "feasibility of an action" is one of the topics that has been of more interest to people. In addition, asking questions to get the diagnosis and opinion of dentists on topics such as "The possibility of correction of a problem", "Doing or refusing dentistry actions or using or not using a medicine during pregnancy", "Judgement about the procedures have been done by another dentist", "The probability of high-risk problems", and "diagnosis" have been considered by people. These findings in this study are consistent with the objectives of remote consultation, which are to establish communication between patients and health care providers (Reed-Fox, 2015). Indeed, this communication is carried out for the diagnosis, treatment, guidance, and education of patients (Deldar et al., 2016). Additionally, seeking the opinions of health care providers to develop the best plan to manage the patient's condition is one of the objectives of remote consultation (Tesfalul et al., 2016), which is very apparent in the purpose of the questions. Thus, asking these questions also appears to indicate the patient's involvement in the treatment and self-care process, which is a key goal of communication between the patient and health care providers (Lewis et al., 2005; Reed-Fox, 2015).

Also, an important issue emerging from the findings is that the patients' questions on the website focused on the issue of pain and other dental condition that appeared in the patient. In such a way that the category of "seeking treatment" has been focused on "Treating pain and other dental conditions in the patient" and the category of "Seeking for causes and reasons" has been concentrated on "The cause of the pain and other symptoms which manifest in the patient" and "The cause of pain and other symptoms that appear in the patient following a dental intervention". This finding is supported by the fact that when people are faced with pain and other dental problems, using online consultation as one of the teledentistry applications is one of the easiest and most affordable ways to access oral and dental health care services when people are faced with pain and other dental problems (da Costa et al., 2020; Irving et al., 2018). In fact, teledentistry has been used in the different specialties of dentistry such as oral medicine and diagnosis, oral and maxillofacial surgery, endodontics, orthodontics, prosthodontics, pediatric and preventive dentistry, and periodontics. So teledentistry answers to concerns on toothaches, dental-pain, gums-swelling, removal of temporary crown, broken dentures, cracked or chipped or loose teeth, cold sores, falling of filling, and other problems (Estai et al., 2018; Jampani et al., 2011).

Regarding the dentists' answers to the users' questions, the present results showed that about 80% of the answers were related to the category of "Definitive answers to patient/users questions without any suggestion, which was the in-person visit or virtual consult the same as online consults via social networks". A likely reason for the limited usage of social networks for online consults by the dentists in this study can be the lack of knowledge and skill of the dentists in this area. Considering all the above, it seems that virtual relationships between the patients and the dentists can be applicable for different purposes and may lead to various advantages for the patients and the whole community. In this regard the new areas of attention may be opened for policymakers in the area of oral and dental health, among them the unmet dentistry needs of the community (Song et al., 2013), the needs of the less literate part of the population or those less able to afford or access to the Internet should be highly reiterated. On the other hands, according to the finding of present study, there were 172 questions without an answer. This can happen for several reasons, such as improper website management to keep track of users' questions, lack of site updates, dentists are not interested in online activities and does not have time for online consultation, avoid answering questions online as a result of legal challenges. These results are confirmed by the fact while there are many advantages (Estai et al., 2018; Tella et al., 2019) to using teledentistry services, barriers and challenges to the use of teledentistry are also present, such as legal, ethical, financial, technical, personal, and management barriers (Kumar, 2014; Tan et al., 2021).

5. Conclusion

According to the present results, most of the Iranian users sought dentistry information for themselves via related web pages. Most of their questions were in the categories of complications of procedures, not elsewhere classified other diseases of hard tissues of teeth ،other disorders of teeth and supporting structures, dentofacial anomalies [including malocclusion] and dental caries. Also, the majority of them used contextual strategy to communicate with the dentists virtually. These results can be used for designing specific customized websites of dentistry with the feasibility of online chat. The users' information needs for diagnosis, recommendations, treatment and interventions based on the main strategies they used to ask their questions and complaints can help these website managers for better optimization of the websites. All these interventions can pave the way for developing teleconsulting in dentistry for middle-income countries like Iran. Also, dental students can use the online consultation on the websites as an educational tool to learn about new cases and how to manage patients' conditions under the supervision of their professors. Websites can be promoted in such a way that specialists can communicate with each other to manage the patient's condition in the best way. Considering everything, it seems that health policymakers should establish guidelines and rules for the use of online consultations in dentistry through websites and other ICT tools. Also, the health care providers can be used these guidelines to preserve patients' privacy and confidentiality, to more effective use of online consultation, and to mitigate barriers and challenges. In this respect, patients should also be aware of any negative aspects and benefits of these services and use them with informed consent.

Declarations

Author contribution statement

Peivand Bastani: Conceived and designed the experiments; Analyzed and interpreted the data; Wrote the paper.

Fatemeh Niknam & Mahnaz Samadbeik: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Mahboobeh Rezazadeh: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Giampiero Rossi-Fedele: Analyzed and interpreted the data; Wrote the paper.

Sisira Edirippulige: Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Data availability statement

Data included in article/supp. material/referenced in article.

Declaration of interest's statement

The authors declare no conflict of interest.

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