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Exploring Knowledge, Attitudes, and Practices of Dentists in Libya on Tele dentistry: A Cross-Sectional Online Survey

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ABSTRACT

Teledentistry (TD) combines digital technology with dentistry, letting dentists and patients communicate remotely. As it becomes more important, it can help dentists understand new requirements and gain the skills needed to provide good dental care for their community. Aim: to assess the knowledge, attitudes, and practices of Libyan dentists regarding TD. Materials and method. This cross-sectional study involved 257 dentists in Libya. They were provided with a self-administered questionnaire through Google Forms online to collect information on their awareness, usage patterns, and perceptions of TD. Results: 257 dentists from different Libyan cities joined the study. About 65.5% were female and around 34.5% were male. Most participants (79%) had a bachelor's degree. indicated that 62% of dentists were aware of it as a tool for telemedicine either solely or in combination with other tools. While 78% of participants expressed confidence in TD's ability to protect patient privacy, nearly 80% raised concerns about the reliability of patient-provided information. A Significant association in awareness was observed based on academic qualification ($p \leq 0.05$) indicating a positive correlation. Key challenges highlighted by participants included information accuracy, limitations in physically examining the patient, and patient cooperation.

Keywords: Tele dentistry, dentists, attitude, questionnaire, Libya.

استكشاف معارف ومواقف وممارسات أطباء الأسنان في ليبيا فيما يتعلق بطب الأسنان عن بُعد: دراسة استقصائية مقطعية عبر الإنترنت

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ملخـــــــــص البحـــــــــث

التطبيب عن بُعد هو أسلوب يجمع بين التكنولوجيا الرقمية وطب الأسنان، مما يتيح للأطباء والمرضى التواصل عن بُعد. يمكن أن يساعد الأطباء في فهم المتطلبات الجديدة واكتساب المهارات اللازمة لتقديم رعاية أسنان جيدة لمجتمعهم. الهدف: تقييم معرفة واتجاهات وممارسات أطباء الأسنان الليبيين بشأن التطبيب عن بُعد. منهجية البحث: شملت هذه الدراسة المقطعية 257 طبيب أسنان في ليبيا. تم تزويدهم باستبيان يتم تعبئته ذاتيًا باستخدام نماذج جوجل عبر الإنترنت لجمع معلومات حول وعيهم، وأنماط استخدامهم، وتصوراتهم بشأن التطبيب عن بُعد. النتائج: كان حوالي 65.5% من المشاركين من الإناث و34.5% من الذكور. كانت الغالبية العظمى من المشاركين (79%) حاصلة على شهادة البكالوريوس. أشار 62% من الأطباء إلى أنهم على دراية بالتطبيب عن بُعد ـــ كأداة للتطبيب عن بُعد سواء كانت تستخدم بمفردها أو بالاشتراك مع أدوات أخرى. بينما عبر 78% من المشاركين عن ثقتهم في قدرة التطبيب عن بُعد على حماية خصوصية المرضى، أبدى نحو 80% قلقهم بشأن موثوقية المعلومات المقدمة من المرضى. تم ملاحظة وجود علاقة ذات دلالة إحصائية في الوعي بناءً على المؤهل الأكاديمي ($p \geq 0.05$)، مما يشير إلى وجود علاقة إيجابية. التحديات الرئيسية التي أشار إليها المشاركون تضمنت دقة المعلومات، والقيود المتعلقة بإجراء الفحوصات المباشرة للمرضى، وتعاون المرضى.

الكلمات الدالة: طب الأسنان عن بعد، أطباء الأسنان، الموقف، الاستبيان، ليبيا

1. INTRODUCTION

Advances in communication technology have transformed the way healthcare professionals interact with patients, improving disease detection, patient-provider communication, and overall healthcare services [1]. One notable advancement in this field is teledentistry (TD), which uses modern communication tools to facilitate effective interactions between dentists and patients [1], [2]. TD typically involves video conferencing but can also include other methods, such as text messaging, phone calls, and email communication [3], [4].

This approach provides quick access to essential information, allows simultaneous communication with multiple individuals, reduces healthcare costs, and shortens patient waiting times [5]. By using TD tools, dentists can promptly consult with specialists, accelerating diagnosis and treatment. Furthermore, TD has the potential to bridge the gap in oral healthcare between rural and urban areas, thereby improving patients' quality of life [3], [6], [7].

TD is associated with challenges like data security and privacy, diagnostic precision, as well as, technical requirements (such as program licensing, privacy concerns, and connectivity issues). However, the TD approach is still endorsed [8], [9], [10].

Libya has a big geographical area and varied climate, ranging from coastal to deserts and mountains. The negative impact of this environmental diversity is exacerbated by the underdevelopment of public transportation [11] and emergency medical systems[12]. Because of that, introducing Telehealth systems, including TD, could help address significant challenges. To ensure the success of such a system, it is crucial to understand how Libyan dentists view and use TD. Without sufficient knowledge and acceptance, the adoption of TD by both dentists and patients may face significant barriers.

Previous research has examined the perspectives of dental school interns in one Libyan city, offering valuable insights[13]. However, the attitudes and experiences of practicing dentists across different regions, with varying levels of experience and education, remain unexplored. This study aims to address this gap by evaluating the awareness and attitudes of Libyan dentists towards TD.

Using an online survey, the study will collect information about dentists' knowledge, opinions, and experiences with TD. The survey will also explore their views on patient cooperation, the type of information shared during consultations, and the challenges they face in using TD tools. The findings of this study will help guide improvements in health policies and regulations and support the development of educational programs to integrate TD into routine dental practice in Libya.

2. MATERIALS AND Mythology

This cross-sectional study involved 257 dentists practicing within Libya's borders and having access to internet communication channels. Responses with substantial missing data were excluded. A self-administered questionnaire was distributed in the Arabic language using a Google Form over the course of one week in November 2024. The form included inquiries about gender, level of education, city of practice, and additional questions inspired by previous research [14]. The questionnaire featured questions with yes or no responses, multiple-choice questions, and open-ended questions to assess general dentists' Knowledge, Attitudes, and Practices regarding TD (Supplementary: 1). We used Jamovi software 2024 version (2.6) for statistical analysis, R statistical package was used also for visualization. The Chi-Square association test was adopted to assess the association between level of awareness and dentist's qualification, years of experience and gender. A p-value < 0.05 was considered significant.

3. RESULTS AND DISCUSSION

The research collected 257 responses from dentists residing in various Libyan cities. The proportion of male participants (34.6%) was less than females (65.4 %). The vast majority (78.9%) of the participants have a bachelor's degree, followed by Master's holders (17.8%), and a smaller percentage have a PhD. Less than a third (29.2%) of participants had practiced for less than five years, while 70.8 % had accumulated over five years of experience Table 1.

This survey found that over 60% of dentists knew about TD and found it useful, showing a notable level of awareness among the participants. This result is corroborated with findings from a study on dental intern students in Sabha, Libya [13], as well as other studies assessing dentists in Indonesia [15], Pakistan[16], and Saudi Arabia[17]. In contrast, a study by Nassani et al. revealed that only 38% of dental interns and practicing dentists in Saudi Arabia were familiar with TD[18]. This discrepancy could be attributed to the earlier timeframe of the latter study, published three years prior, highlighting the rapid advancements in TD .

There is a significant association between dentists' awareness levels and their academic qualifications (Table: 1). This finding shows that formal education helps dentists learn about new methods, including TD. Although no significant association was found concerning age or clinical experience, dentists with more than five years of practice demonstrated a trend of having more knowledge about TD. It is also possible that continuous clinical development in the field has allowed them to stay updated regardless of their academic development. These findings are consistent with previous studies[14], [18] and underscore the significance of continuous education and training, alongside formal qualifications, to ensure that dentists stay abreast of the latest knowledge.

We found that 41.8% of participants described the frequency of their usage of TD tools using "Sometimes", while 24.3% of participants reported using it "mostly", and 14.3% used "always". Slightly over half of the respondents identified the patient's remote location as the most common reason for utilizing TD. The survey shows that 67.3% of dentists are using phone calls (including VOIP services such as WhatsApp, Viber etc.). Specifically, 29.2% of dentists solely relied on phone calls alone, while 23.3% of individuals combined phone calls with social media. This demonstrates that phone-based communication remains a cornerstone of TD, likely due to its ease of use, accessibility, and familiarity for both practitioners and patients. In comparison, 57.2% of dentists preferred social media, either exclusively (21% of participants) or in conjunction with other communication tools. The shift to social media tools indicates a move towards interactive quick responses and visual content. Less than 10% of the participants opted for alternative options such as video calls, emails, and digital platforms, and one of the participants did not use any tool Figure 1.

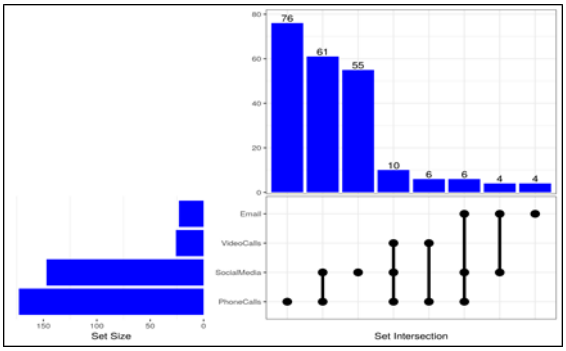

Fig 1. Upset plot of the TD tools used.

Upset plot is designed to visualize the intersection and overlap among multiple sets. The dot matrix defines the intersections using dots to represent the sets and lines connecting those in overlap. The top bar chart represents the size of each intersection. While the left bar chart displays the total size of each individual set, regardless of intersections.

When it comes to the dentists' opinion regarding the benefit of TD, 84% of them Upset plot is designed to visualize the intersection and overlap among multiple sets. The dot matrix defines the intersections using dots to represent the sets and lines connecting those in overlap.

The top bar chart represents the size of each intersection. While the left bar chart displays the total size of each individual set, regardless of intersections believed that TD improves dental care. This percentage closely aligns with the opinion of Saudi dentists as well [19].

Despite the prevalent positive attitude and practice towards TD, nearly 80% of dentists expressed concerns about trusting the information provided by the patients through TD. Moreover, only about a third of dentists believed that TD practices could become the standard for oral healthcare. These views align with what has been reported in Turkey, where most participants doubted the reliability of TD information [14]. Similarly, only a small percentage in that study, along with a study conducted in Indonesia, believed TD could be the future standard in oral healthcare [15]. This hesitation may be due to poor facilities and a lack of clear rules of TD. Interestingly, half of the dentists prefer combining traditional clinic-based care with TD approaches for patient management, signaling a promising integration of TD into conventional dental practice. In line with this, the findings reveal a strong alignment between the information patients provide and the needs identified by dentists. While 71.2% of dentists prioritized X-rays and medical history (Figure 2), 70% of the information shared by patients consisted of medical history, followed by X-rays. This alignment not only demonstrates the potential for more efficient practices but also highlights the feasibility of implementing such practices in the near future, creating a more streamlined and adaptable approach to dental care. This also reflects the awareness of patients, probably their health education or experience.

The majority of dentists 78.4% showed confidence in TD when it comes to ensuring patient privacy. This finding is in line with a survey conducted among 190 dentists from Pakistan and Saudi Arabia [20]. In contrast, this stands in opposition to a study that surveyed 100 dental professionals in Sangli, where 90% expressed concerns about patient privacy [21].

The variation could be related to the TD experience, and familiarity with its application, as well as disparities in regulations and cultural attitudes towards privacy across the two regions. Consequently, nearly 70% of dentists agree to share information about patients' conditions with their colleagues in order to reach the correct diagnosis and treatment, which is supported by previous literature [14].

Table 1. Demography of the research sample, and the association between awareness and the major demographic variables (Discrepancy between totals and individual responses are due to missing answers).

	N	Aware	Not aware	p value
Gender				
Male	88	54	34	0.92
Female	166	101	62	
Academic degree				
Bachelor	195	111	81	0.04*
Master	44	32	11	
Ph D	8	7	1	
Experience				
⩾ 5 years	182	113	31	0.45
< 5 years	75	43	66	

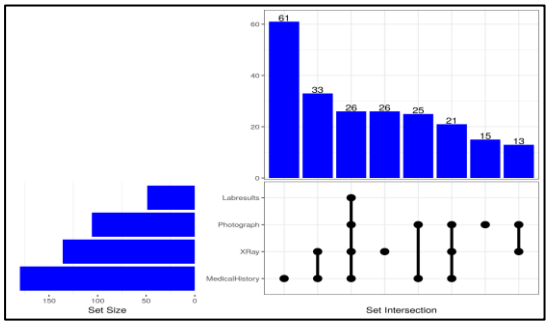

Fig 2: Data provided by patients during TD sessions.

The discrepancy in responses to awareness and to attitude and practice -related questions can be attributed to dentists in Libya frequently utilizing TD tools without explicitly acknowledging them as part of TD. As Participants gained more context through later questions which were detailed, their attitude

became clearer. That mandates teaching the dentists about the regulatory concept of TD and familiarizing them with it in a professional and regulation-controlled manner.

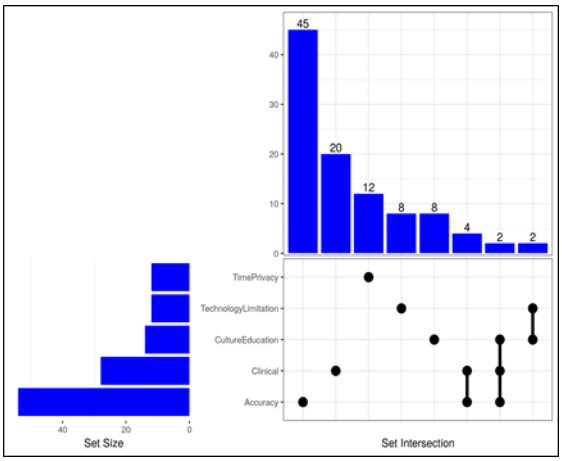

Fig 3: Challenges related to TD practice identified by participants

In response to an open-ended question about challenges in the study, dentists highlighted the significant issue of guaranteeing the accuracy of information shared via TD platforms (Figure 3). Furthermore, many dentists stressed the challenges of conducting specific treatments without the patient physically present, underscoring a limitation of TD. The dentists' own privacy concerns also emerged as a noteworthy challenge. In addition, a small group of dentists expressed concerns about infrastructure technical issues and patient attitudes, which align with the limitations discussed in a previous research editorial on TD[22].

Among the limitations of this study is using online forms. However, despite its low reliability, it allows to collect information from a wide practicing geographical area which can be considered as a strength.

4. CONCLUSIONS

This study shows that more dentists in Libya are getting interested in TD. They want to use it for care and working with others. This excitement suggests a positive change in how dental care is evolving in Libya. However, challenges persist regarding trust in accuracy and the sustainability of TD.

5. RECOMMENDATIONS

We recommend enhancing the accuracy of information obtained through TD tools, by adopting standardized protocols and secure verification systems. Training programs should be implemented to improve dentists' technique. Awareness campaigns should educate dentists and the public on TD's benefits and limitations. Conducting larger studies in the future and upgrading technology are essential to optimize TD's effectiveness in dental practice.

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