

Description and Evaluation the Effect of One-Sided Versus Interactive Digital Interventions in Oral Health; A Scoping Review

Moustafa El Maghraby*

*Maghraby_dentist@yahoo.com

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A. Abstract:

World Health Organization (WHO) estimated that around 3.5 billion people worldwide are suffering from variable oral diseases, and it has a direct effect on overall health. Hence, oral health is playing a prominent role in the overall health and well-being of any individual in all societies regardless of any disparities, With the great improvement in technology and the high pace of life, many digital interventions have appeared to improve knowledge and awareness of oral health.

Objective: describing and classifying the digital health interventions used in oral health and identifying the role of digital health interventions in oral health promotion. **Materials and methods:** searching in the literature using the keywords; Digital health intervention (DHI), social media (SM) platforms, teledentistry (TYD) and oral health promotion as an outcome via PubMed, Google Scholar and Cochrane Library between Jan 2016 till the end of 2023. 16 publications were selected carefully after reviewing titles, abstracts and full articles with inclusion criteria. 11 articles were involved in the first group One sided intervention (OSG) and 5 articles were added to the second group interactive interventions (ICG). **Results:** although all of the publications confirmed that multiple digital health interventions have an effective role on oral health care and patient decision related to dental practices, two articles doubted in the reliability of presented information in the different social media platforms. **Conclusion:** It is concluded that, DHI have an authentic effect on oral health promotion despite the lack of valid rules that could regulate the use of these interventions.

Keywords: Digital health intervention (DHI), social media (SM) platforms, teledentistry (TYD) and oral health promotion.

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B. Introduction

Invading technology into our daily activities and digitizing everything in our lives has become real after the great progress in technology and the development of new innovative digital communication tools. There are many technological inventions appeared in the last decades, however, the advent of the internet is considered the most important one which has made a lot of changes in many fields. Although there was an old belief that accessibility to technology and the internet is not a basic life need as accessibility to energy, electricity, clean water, and sanitation, there are around 57% of the population used Internet access for social networking via Facebook, Instagram, Twitter, and YouTube. Add to this, the percentage has increased significantly after the COVID-19 pandemic by more than 10% in the first year of the pandemic to become the largest annual increase since the Internet's appearance. With Covid, Quarantine is becoming mandatory, and usual accessibility to daily activities

has become difficult, relying on technology and internet was cultivating obviously. This led all populations of different ages seeking to learn, get, and use accessible reliable internet with different technological tools. Even though digitizing our life will come sooner or later, the pandemic rapid it to depend on mobile applications in quarantine tracking, clinical management recommendations, information updating, selling, and buying, studying and even work remotely (Winkie & Nambudiri, 2023). Moreover, this made using technology in the medical field is becoming extremely necessary to meet the population's needs with a new level of quality. This happened with the spreading of many digital interventions in different aspects of the medical field. The internet has become a big source of health information, and anyone can access it easily. For example, YouTube is sharing a huge amount of free educational videos about different health issues. There are also many examples of different social media platforms that became gradually

a communication ring between patients and multiple healthcare professionals. No one could deny that technology has made many improvements in the curative aspect of the medical field starting from the innovation of different X-rays and depending on many technologies in the treatment plans such as laser therapy. In 2013, Harold Thimbleby mentioned in his study that healthcare is changing every day and it will change completely within the next years from anesthesia and antibiotics to magnetic resonance imaging scanners and photodynamic therapy. The study emphasized that healthcare is changing with the huge development in technology, future transforming healthcare will be expected with new innovative devices, new techniques in the industry to make new lines of drugs and treatment, and finally the appearance of new social media platforms that could change completely the pathway of patient communication with the healthcare professionals through the digital interventions that could help and present many services of communication, follow-ups and even the initial diagnosis of patients (Harold Thimbleby, 2013). In a study published in the Hong Kong Journal of Emergency Medicine, the study affirmed that medical technology in 2023 became more advanced, more effective, and maybe in many cases more costly; however, it also became a must in most cases and even if not a must, it makes a great change in comparison to conventional devices and methods in both diagnostic and therapeutic health care facilities. In the same study, the author mentioned that although the American healthcare system is the safest one in the world and many countries use it as a role model, it is black fact that around 44.000 to 98.000 Americans die each year from multiple medical errors in the hospitals which is greater than the people died annually because of car accidents. This black fact is supported by another recent study that estimated deaths that occurred from medical errors are greater than 7000 deaths annually. The study emphasized that medical technology in all facilities allowed to decrease the morbidity and mortality from medical errors through the different diagnostic and therapeutic tools such as electronic drug prescriptions, educational videos on different platforms of social media, continuous 24-hour communication between patients and healthcare professionals and finally development of new innovative therapeutic devices. The same study showed explicitly three examples that illustrate how medical technology changes healthcare dramatically for both providers and receptors. The first one was the significant change in the diagnosis and therapy of breast cancer. Despite the increased average cost of breast cancer by about 20.000 US\$, it has been claimed that the survival rate increased clearly. The second example was using technology in heart attack management. Studies confirmed that more than half of the patients were managed by surgical interferences in 1998 rather than 90% of the patients were managed medically in 1984.

Not only that, but around 70% improvement in the survival rate due to the changes in the technology that involve bypass surgery, clot-dissolving drugs, angioplasty, and stents. Even though all statistics showed that spending on heart attacks has increased from 3\$ billion in 1984 to 5\$ billion in 1998, the number of heart attacks has decreased. The third example mentioned in this study was Telemedicine which is a new system of telecommunications technology that allows healthcare professionals to examine patients and help them as possible distantly (Tan & Ong, 2002). The success of telecommunication intervention created more ideas and thoughts for more digital health interventions, especially during the time of pandemic Covid and also with the spread of technological devices (such as smartphones, smart watches, tablets, and laptops) that have been attacking our society recently. Digital health interventions are complex interventions that use many digital tools and components for multiple goals in public health. Digital health interventions could be classified as preventive and curative interventions. Preventive interventions depend on providing information, and knowledge and increasing awareness about a healthy life. It could be educational about healthier habits like (physical activities- safer sex-healthy eating habits) and it could be about urging the stoppage of unhealthy habits like (smoking – alcohol consumption- life stress). Preventive interventions are considered more important than curative or therapeutic if society succeeds in transforming them into habitual cultural activities in the home, schools, universities, and workspaces. Curative interventions are aiming to help patients in his/her treatment plans to improve the outcomes in patients with long-term conditions. It is usually managed actively by healthcare professionals to ensure everything about the condition. The real benefits of curative interventions are helping people in remote areas that facing difficulty in continuous accessibility to healthcare facilities and upgrading the level of quality for the treatment line in comparison with the conventional methods (Murray et al., 2016). This means that the main problem in both preventive and curative interventions is the accessibility of continuous communication between the patient and the service provider. Thus, supplying different digital interventions with one-sided information presentations or interactive communication will be very beneficial, and it will lead to a great impact on health promotion.

There are many studies discussing the impact of using digital health interventions in health promotion. Most studies supporting that, digital interventions have a positive imprint on health, consequently studies discussing oral health promotion started to appear.

If there is a prominent impact on public health generally by digital health interventions, it has also a dramatic effect on promoting oral health globally, especially with the great increase in the number of smartphones and social media. Oral health relies on

two main parts; service presenting, and instructions provided, and both were done by oral healthcare professionals face to face. With the increase in digital applications on smart devices, oral care applications started to appear, and they became necessary apps for users. For example, oral care apps are registered in the top ten research priorities in oral and dental health PSP (National Institute for Health and Care Research, 2018). With the increase in the interest in digital interventions in oral health, COVID-19 succeeded in converting this interest to mandatory facts on the ground. Covid-19 created many restrictions and one of them was the practice of face-to-face dentistry. Thus, apps became inevitable and necessary for maintaining oral health care, especially in situations where face-to-face appointments are restricted. Oral healthcare apps appear in two categories: one-sided interventions and interactive interventions lastly. One-sided intervention is the most common and the oldest pathway. It is presented mostly for educational goals, behavior-changing habits, and improved knowledge and information about something related to oral health. It is provided by videos on different social media platforms, SMS directly on smartphones, and different pathways that provide users with oral care experience from one side. Although one-sided intervention was limited to general knowledge for all users and not specific according to the user's condition, it has a great impact on promoting oral health. A systematic review assessing the impact of digital media on oral health promotion mentioned that DHI helped a lot in increasing knowledge, attitudes, and changing behaviors related to oral health. The review concluded that DHIs have a positive impact on enhancing oral health (Sharma et al., 2022). Add to many publications reported that just Instagram posts could improve the knowledge of oral care, increase the awareness, changing bad habits and affect the selection of the treatment plan and also the selection of health professional.

After the one-sided intervention was the rapid entrance of interactive interventions such as information exchange by WhatsApp chat between the dentist and patient to discuss something related to a specific condition, and after that the appearance of teledentistry (TDY). Interactive interventions aim to be more accurate and closer to the patient through direct information which could be improved by photos and X-rays. TDY is an old US project launched in 1994 and the term teledentistry (TDY) was used formally in 1997 by Cook (Jampani et al., 2011). It expanded from just chatting about signs and symptoms to include video conferences between the oral health professional and the patient. TDY includes four modalities; synchronous by virtual video call and real-time reaction, asynchronous by examination and investigating the patient through data video transfer, remote patient monitoring by continuous video calls for surveillance, and mobile health that allows patient and oral health

professionals to be in contact (Maqsood et al., 2021). Many studies evaluated TDY as an innovative tool for examining, diagnosing, and implementing a clear treatment plan with the patient. A study in 2022, found that around 23% of dentists used TDY or virtual platforms, and the study confirmed that widening the accessibility for oral care is a greater value for TDY (Tiwari et al., 2022). Interactive digital interventions will be the future of oral health care for all populations around the world without disparities if the governments and non-governmental organizations succeed in following an obvious strategy to implement TDY within strict rules and regulations.

C) Methodology:

This review depended on the literature search on the role of digital interventions in promoting oral health. Regarding the search for the outcome, it relied on gathering a range of literature for oral health education, knowledge, information, attitudes, practices, and promotion.

Research question:

The key research question was: "To identify the role of (DHI) in the promotion of oral health" There were two key objectives: (a) to describe and classify the digital health interventions used in oral health and (b) identify the role of using digital health interventions in oral health promotion for population.

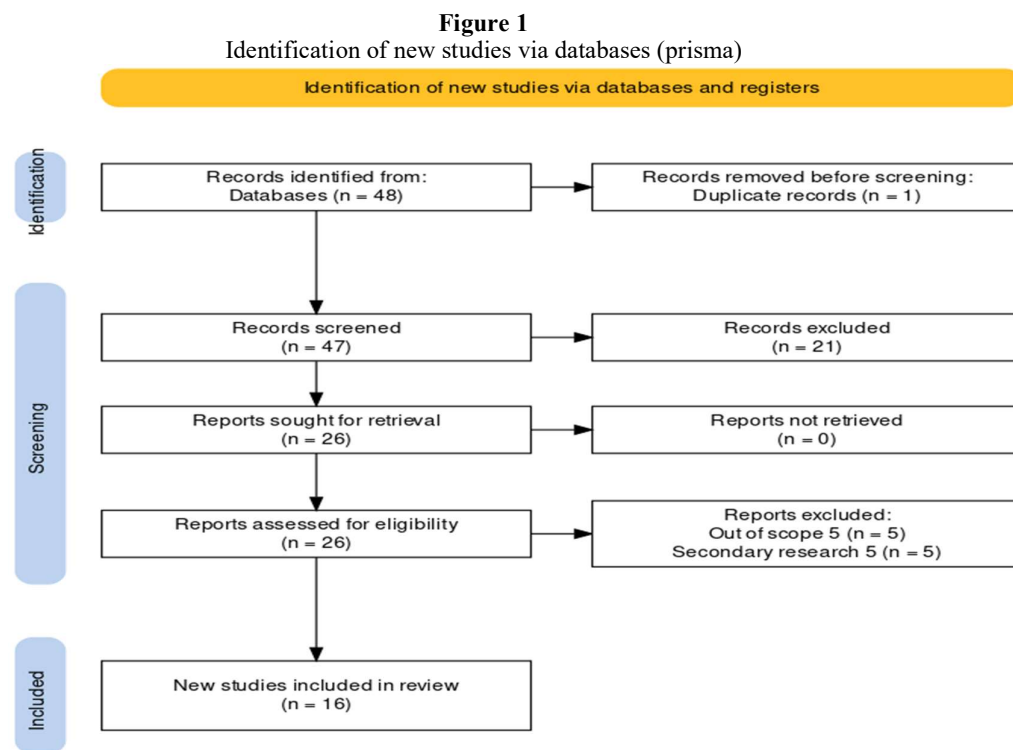
Search strategy:

This scoping review was performed in accordance with Arksey and O'Malley in 2005. The protocol of the study was drafted and reported in accordance with Rayyan software guidelines. The literature search was done between Jan 2016 and the end of 2023. The search was carried out via PubMed, Google Scholar, and Cochrane Library.

Selection of the articles:

Publications involved in this review are related to oral health care improvement and promotion by DHI. The articles were selected initially by titles, then abstracts and full papers were revised through Rayyan software. Inclusion and exclusion criteria were applied in this review. Inclusion criteria included oral health care promotion by digital interventions that should be the focus of the study, time of the study should be after Jan 2016 and all publications should be primary research and should be conducted in English language. All secondary research or publications before Jan 2016 and studies whose scope was far from the review's scope were excluded. 48 articles were identified from the database and just one was automatically removed because of duplication. 21 articles were excluded after reviewing titles and abstracts via Rayyan software. 26 publications were reviewed with a full article to exclude ten articles; five for its main scope was far from the review's scope and another five publications

were excluded because it was secondary research. 16 articles were included in this review and divided into: (11 in OSG and 5 in ICG).



Data collection and presentation:

Ten publications were excluded after full article reviewing and 16 articles were filtered and divided into two groups on Rayyan software. First group was One-sided intervention which involved 11 publications and second group was Interactive intervention and included 5 publications. Data filtered and organized via Rayyan tools to present results of the review.

D) Results:

A final selection of 16 publications was included in this scoping review out of 26 publications. 11 publications were added in OSG and five publications were involved in ICG. (Table 1 -2). Ten publications were excluded due to a variety of reasons after full article reviewing.

Table 1
One Sided interventions Group (OSG)

Study title	Author	Country/Year	Aim	Conclusion
Periodontists' perceptions and attitudes toward the use of social media for professional purposes in Saudia Arabia.	Alnufaiy B; Alzahrani HG; Alqahtani AS; Gufran K; Alhamdan A; Alhamdan K	KSA/ 2023	Investigate the perception and attitude toward social media use for professionalism and dental practice promotion among periodontal specialists working in KSA.	Social media platforms can improve periodontal practice in terms of dental health education, counseling, advertising and oral health services.
Delivery of information to orthodontic patients using social media.	O'Brien S; Duane B	Dublin/ 2017	Assess social media platforms in delivering informations during orthodontic treatment.	Presenting audiovisual information through the youtube website to orthodontic patients resulted in a significant improvement in patient knowledge.
The effect of Instagram posts related to	Turkey/Guler AY	2022	Assess the quality of the posts about wisdom teeth on Instagram in terms of	The results of the study showed that Instagram posts do not contain

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Wisdomteeth on patients.			patients benefit.	reliable information for patients.
Effect of social media on patient's perception of dental aesthetics in KSA	Baik KM; Anbar G; Alshaikh A; Banjar A	KSA/ 2022	Evaluate the impact of SM on patients seeking aesthetic dental treatment.	The impact of SM on patients is high, but it is the responsibility of dentists to educate patients about the best treatment option.
Promoting oral health using social media platforms: seeking Arabic online oral health related information (OHRI)	Almaiman S; Bahkali S; Alabdulatif N; Bahkaly A; Al-Surimi K; Househ M	KSA/ 2016	Estimate the prevalence of social media users among the Saudi population and identify the preferred SM platforms and its impact on seekers knowledge, attitudes and behaviour.	SM platforms have a high impact and there is an inevitable need for saving more sources with high quality and trusted information.
Influence of the use of social media on patients changing dental practice; a web-based questionnaire study.	Freire Y; Sánchez MG; Suárez A; Joves G; Nowak M; Díaz-Flores García V	Spain/ 2023	Analyze the influence of patient use of dental practice SM on their decision to change practice.	SM platforms are considered a factor that could affect the selection of new dental practice.
The use of social media for professional purposes among dentists in KSA.	Al-Khalifa KS; Al-Swuailem AS; AlSheikh R; Muazen YY; Al-Khunein YA; Halawany H; Al-Abidi KS	KSA/ 2021	Investigate the dentists' opinions toward SM use in daily practice and the expected limitations from its use in KSA.	The majority of clinicians believe that SM plays an active role in patients' decision regarding the healthcare provider's selection.
An Evidence-Based Digital prevention program to improve oral health literacy of people with a migration background; Intervention mapping approach.	Weil MT; Spinler K; Lieske B; Dingoyan D; Walther C; Heydecke G; Kofahl C; Aarabi G	Germany/ 2023	Describe the development process of an ew application called MuMi app.	It is the first evidence-based app that addressed OHL among people with a migration background.
Digital application for promoting Evidence-based children's oral health to control early childhood caries; Randomized control trial on parental acceptance and efficacy.	Abdul Haq J; Splieth CH; Mourad MS; Vielhauer A; Abdulrahim R; Khole MR; Santamaría RM	Germany/ 2023	Evaluate the acceptance and the efficacy of a digital application based on evidence-based caries control recommendations for parents of children aged 6-72 months.	Digital application can serve as an innovative tool to promote evidence-based oral hygiene recommendations among parents of children to control ECC.
The effect of social media interventions on the knowledge of oral health during pregnancy among pregnant women in KSA.	Aboalshamat K; Alharbi J; Alharthi S; Alnifae A; Alhusayni A; Alhazmi R	KSA/ 2023	Evaluate the effects of social media dissemination of health-promoting interventions on knowledge of oral health during pregnancy among pregnant women in KSA.	Using SM is a promising method for improving women's knowledge about oral health during pregnancy for short term.

Promoting early childhood oral health and preventing early childhood caries on Instagram.	Lee VHK; Kyoon-Achan G; Levesque J; Ghotra S; Hu R; Schroth RJ	Canada/ 2022	Determine if and how young children's oral health is promoted and supported on Instagram.	As more people engage with SM, health professionals should consider the potential for Instagram as a tool to promote early childhood oral health and to prevent ECC.
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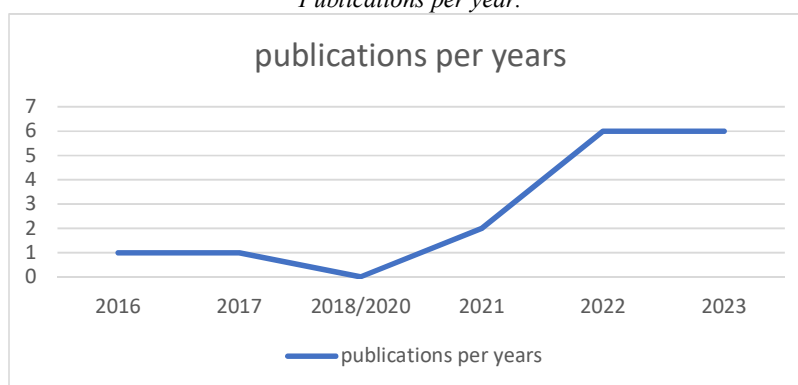
Table 2
Interactive Interventions Group (ICG)

Study Title	Author	Year	Aim	Conclusion
Teledentistry in management of patients with dental and temporomandibular disorders.	Minervini G; Russo D; Herford AS; Gorassini F; Meto A; D'Amico C; Cervino G; Ciciù M; Fiorillo L	Albania/ 2022	Provide an overview of the different teledentistry approaches in the care of patients with dental and TMJ disorders.	Teledentistry could be applied to support traditional care of different oral diseases.
Teledentistry from research to practice; a tale of nineteen countries.	El Tantawi M; Lam WYH; Giraudeau N; Virtanen JI; Matanhire C; Chifamba T; Sabbah W; Gomaa N; Al-Maweri SA; Uribe SE; Mohebbi SZ; Hasmun N; Guan G; Polonowita A; Khan SB; Pisano M; Ellakany P; Baraka MM; Ali AA; Orellana Centeno JE; Pavlic V; Folayan MO;	19 country/ 2023	Report on policies and strategies related to teledentistry practice as well as barriers and facilitators for this implementation in 19 countries.	Teledentistry has been growing efficiently during Covid, but still it is limited in some countries.
Effects of remote digital monitoring on oral hygiene of orthodontic patients; a prospective study.	sangalli L; Savoldi F; Dalessandri D; Bonetti S; Gu M; Signoroni A; Paganelli C	Italy/ 2021	Assessing remote digital monitoring during orthodontic treatment in improving oral hygiene monitoring.	Integration of a remote monitoring system during orthodontic treatment was effective in improving plaque control and reducing carious lesions onset.
The accuracy of teledentistry in caries detection in children – A diagnostic study.	AlShaya M; Farsi D; Farsi N; Farsi N	KSA/ 2022	Assessing the accuracy of non dentist teledentistry in caries detection compared with the clinical dental examination of a sample of 5-10-year-old schoolchildren.	Teledentistry has acceptable accuracy for caries detection in schoolchildren compared to a clinical dental examination.

Awareness regarding teledentistry among dental professionals in Malaysia.	Khokhar RA; Ismail WA; Sunny A; Shaikh GM; Ghous S; Ansari M; Zia SH; Arshad S; Alam MK	Malaysia/ 2022	Explore the perceptions of dental professionals of Malaysia regarding teledentistry.	Generally, the results of this study point towards the readiness of dental professionals of Malaysia to engage in teledentistry practice
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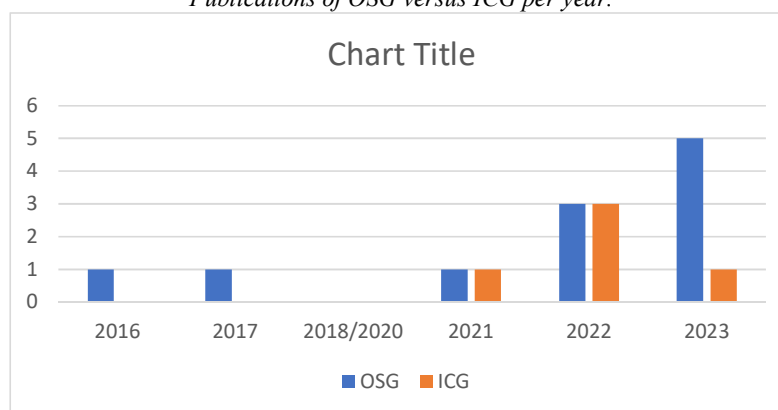
All included papers were published between year 2016 and year 2023, of which 14 were published within the last three years. Six publications were reported in 2023, with 5 studies discussing the one-sided interventions and only one evaluating the interactive interventions. Another six publications were in 2022, with three papers in each group: OSG and ICG. Two articles were released in 2021, with one article in every group OSG and ICG. Two publications were published in 2016 and 2017, and both were involved in OSG. In total, 87.5% of the reported publications were performed in the last three years with 37.5% published in 2023 and 37.5% published in 2022, and 12.5% in 2021. 12.5% from the total articles were released before the pandemic Covid-19.

Figure 2
Publications per year.



In the OSG, 45.5 % of publications were published in 2023 (five articles), 27% were in 2022 (three articles), and one article in every year from 2021, 2017, and 2016. 81.8 % of articles in the OSG were released in the last three years which means a prominent potential toward depending on social media as a communication tool in oral health care. In the ICG, around 60% (3 articles) were reported in 2022, and one article was in 2021 and one in 2023. 100% of involved articles in the ICG were published in the last three years after the pandemic Covid-19, which reflects the great intention toward these ICG at this time.

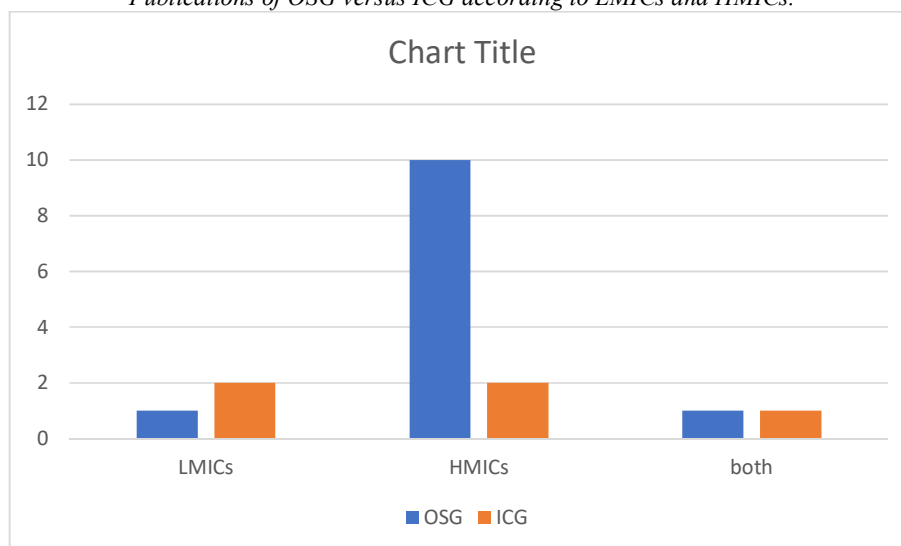
Figure 3
Publications of OSG versus ICG per year.



The publications also were done in a variety of countries. Totally, approximately more than 75 % of publications were carried on high income countries. In the OSG, around 91% of the included articles were performed in high income countries and just one study was released in upper-middle income country.

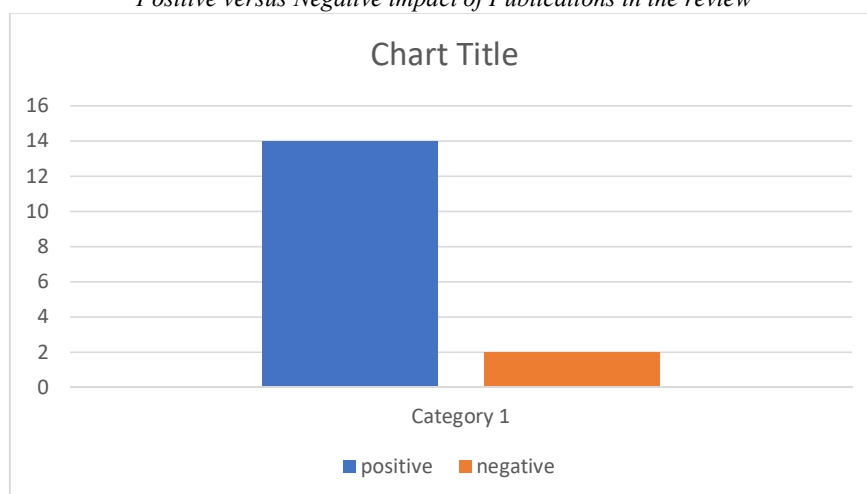
In the ICG, two articles from the total five articles were done in High income countries and another two were done in low middle-income countries. One article was reviewing the policies and strategies of implementing digital interactive interventions in 19 countries with high and low middle-income countries.

Figure 4
Publications of OSG versus ICG according to LMICs and HMICs.



100% of the publications confirmed that multiple digital interventions have an effective role on oral health care and patient decision related to dental practices. 87.5% from the total articles reported that using digital interventions regularly improve oral health and around 12.5% (two articles) doubted in the reliability of presented information in the different social media platforms.

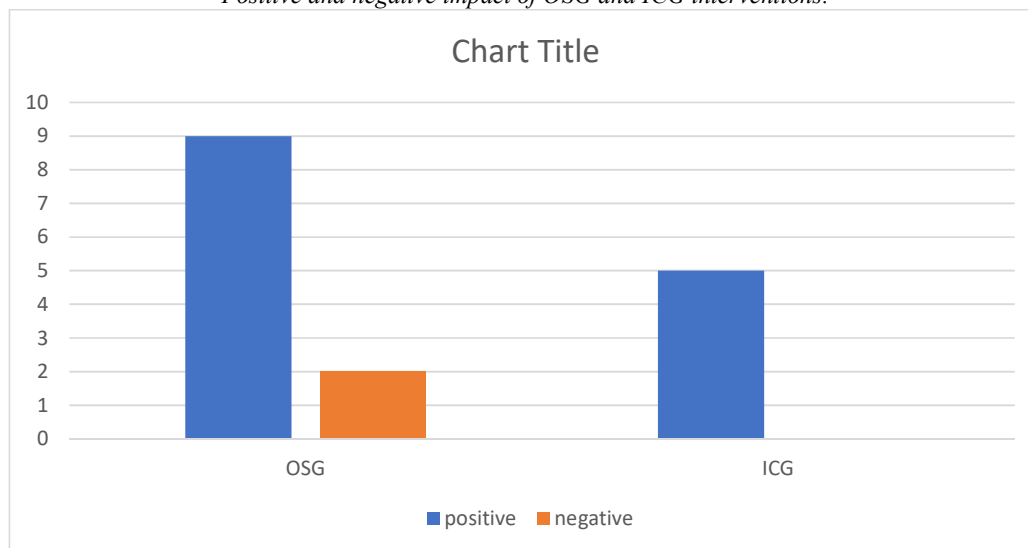
Figure 5
Positive versus Negative impact of Publications in the review



In the OSG, 82% from the articles confirmed that social media platforms are very beneficial in oral health promotion, and 18% showed efficacy of these platforms but it doubted in the accuracy of information and recommended to be under full control of professional oral health.

In the ICG, 100% percent from the studies showed that interactive teledentistry with data and photos exchange were very effective in oral health promotion and in follow ups for long term treatment plans. 60% from the publications mentioned that the great and prominent effect of interactive teledentistry require addressing special rules and licenses regarding laws, training, and health professional education.

Figure 6
Positive and negative impact of OSG and ICG interventions.



F) Discussion:

The impact of digital health interventions became very prominent in the last years after the great technology in smartphones and social media platforms. Furthermore, multiple benefits could be gained from different social media platforms for the population regarding their oral health. The revolution in the development of social media enhanced information and knowledge sharing across the world, and gave people real opportunities to learn, realize, and access more facts. This creates a world of virtual life on social media platforms versus ordinary life. Over time, social media became the first source for our wonderings due to its convenience and accessibility. This scoping review describes, classifies, and determines the role of digital health intervention that is used in oral health promotion. The finding of this review reveals that many digital interventions are working on oral health promotion by different pathways. Interventions could be classified into One-sided interventions and Interactive Interventions.

One-sided interventions are digital applications that permit patients to receive information

Via different social media tools such as Instagram, Facebook, WhatsApp, Twitter, YouTube, and SMS text. On the other hand, interactive interventions are applications that allow a pathway of direct communication between the patient and health professional by data exchange behind the screens of electronic devices in the world of virtual life. A survey for parents in Germany to examine the effect of utilizing digital interventions on promoting oral health for children was filled by parents to test usage, acceptance, usefulness, content, and satisfaction. Parents affirmed that digital communication via different social platforms is more effective than conventional for their children to send efficient

messages in early caries childhood (Abdul Haq et al., 2023). Similarly, in this review, more than 5000 patients from different backgrounds were surveyed by variable methods to evaluate the real impact of social media on promoting oral health. (Baik et al., 2022). A huge number of 2652 Twitter followers were surveyed, to collect different data about the role of social media in oral health promotion. The study emphasized that patients seeking oral health care, are looking for oral health information through different social media platforms. (Almaiman et al., 2016). Also, Around 85.6 % of the respondents reported their experience in changing their decisions regarding dental practice via social media. (Freire et al., 2023).

If most of the opinions of the patients are positive regarding the role of one-sided intervention, this is not different from the views of the health professionals themselves. Despite the limitations that oral health clinicians realized in relying on social media platforms as an effective tool, two publications in this review confirmed that one-sided intervention has an authentic role in changing the map of oral health globally. In an electronic survey distributed in person or online using WhatsApp, Snapchat, or Email during October 2022 and till March 2023. The survey depended on targeting periodontists in KSA and it was composed of sociodemographics, professional data, daily usage of social media in dental practice, and periodontists' opinions on social media usage. 121 questionnaires were completed, but the author didn't mention the original number of invited periodontists to participate in the questionnaire, and the study didn't clarify the number who participated in the survey manually or in person versus the number who participated electronically. This might lead to the absence of a clear methodology or bias in this study. Add to this is

considered a real gap between the aim of the study and the methodology because the aim was evaluating digital methods and interventions for periodontists, but the methodology relied on in-person or manual questionnaires with a large number of participants instead of using complete online questionnaires. However, the study concluded that different social media via online platforms could improve periodontal practice through dental health education, counseling, and different periodontal services. (Alnufaity et al., 2023).

One of the cumbersome limitations in usage and depending on one-sided interventions is the credibility of information sources and the accessibility to trusted information on different social media platforms. Two publications in this review reported, analyzing, categorizing, and interpreting data that were excluded from Instagram posts. Both studies emphasized that posts have a great effect on patients in oral health education, improving knowledge and even in treatment plans or health professional selection. However, the studies pointed out that there is an urgent need to design a clear strategy that guarantees the source of information in one sided digital health interventions (Guler, 2022).

This review also discussed remote digital monitoring for oral health through interactive digital health interventions by the most updated digital application TDY with active communication supported by video conference and data of photos and X-rays exchange between the patient and oral health professional. Publications in this group have the benefit of interactive communication between the patient and oral health professional which is the opposite of the one-sided intervention that just allows the patient to receive information. Despite the limited number in this review and generally in the literature regarding interactive interventions, there has been a great intention toward this technology in recent years, especially after the pandemic Covid-19. In this review, five publications are in the interactive intervention group and all of them were published in 2021 and 2022 which illustrate the effect of a pandemic. Although there have been many trials for implementing TDY since its development in 1994, Covid-19 played an authentic role in rapidly implementing TDY in most countries due to the conditions of many restrictions provided in the practice of face-to-face dentistry since 2019. Hence, many publications are published after 2020, due to the great intention toward remote digital monitoring of oral health (Maqsood et al., 2021). This intention toward telemedicine and TDY became necessary after the pandemic Covid-19, but it differs from HMICs to LMICs. No doubt that this technology needs a reasonable budget to save stable speed of the internet and specific tools that facilitate communications between the patient and oral health professional. Although all the countries approximately have internet and their populations communicate via social media

platforms, TDY and internet communication between patients and health professionals is different. It is not only life chatting or video conference, but also it needs the exchange of data such as photos which could be intra-oral photos and may be radiographic x-rays which should be a soft copy of high resolution to allow sending it. Maybe it is easy to find everyone in HMICs has a good quality mobile phone and stable speed of internet to practice TDY, but it is difficult to be sure that everyone in LMICs has the device and knowledge that allows them to be involved in the world of TDY. Briefly, the difference between HMICs and LMICs is not only in the money but also in the level of knowledge. The accuracy of diagnosis may depend mainly on the doctor in the ordinary conditions with some information from the patient about signs and symptoms, however, the accuracy via TDY is shared between the doctor and the patient. The doctor loses two main important characteristics in the diagnosis; inspection and palpation. The patient should compensate for this with a good description of symptoms and signs, and with accepted photos. Unfortunately, this needs a high level of knowledge in the patients, and this means that TDY is directed toward high-level societies. This review is a survey directed to oral health professionals in LMICs to assess the perception toward TDY and its applications and limitations. 70-80% of the respondents believe that the diagnosis via TDY will not be completely accurate and could be misleading. However, 60% of the confirmed that TDY as a tool, will be beneficial in the communication and guidance of patients (Khokhar et al., 2022). This explains the gap between LMICs and HMICs in the knowledge, science, organization, and absolutely the budget that could be directed to this technology.

One of the game changers that could have an effective role in TDY is the education of health professionals on how to practice TDY. Furthermore, educating the patients on how they could communicate with their health professionals. Despite that is difficult and needs huge efforts from the governments, non-governmental organizations, and health associations, it will have a great effect in transforming the industry of health completely all over the world. Remote digital monitoring for patients via TDY is easy if the patients learn the tools that allow them to communicate regularly with their health professionals. In this review, a study supplied the patients with scan boxes and check retractors to allow them to take photos intraorally for regular monthly follow-ups. The study compared two groups of patients under orthodontic treatment; the control group was monitored by conventional regular visits and the intervention group was followed by TDY after the patients were learned how they could take intra-oral photos. The difference between the two groups was insignificant and the study recommended using TDY in the follow-up visits of orthodontic treatment to maintain oral health (Sangalli et al., 2021).

Consequently, this demonstrates how education programs and training strategies could be a game changer in implementing TDY in any country or society.

In the same way as the necessity of education and training programs for health professionals and also for the patients, there are many other limitations or issues such as patient safety, license regulation regarding TDY practices, confidentiality, security issues, digital forgery, software and hardware incompatibility and reliability of equipment. Thus, conforming to special rules and license laws for TDY practice is urgent after training and education (Minervini et al., 2022). For instance, 100% of the studies in this review showed that interactive TDY with data and photo exchange were very effective in oral health promotion and in follow-ups for long-term treatment plans; however, 60% of the publications mentioned that the great and prominent effect of interactive TDY requires specific regulations to be fully controlled and to prevent any miscommunication or any misuse like digital forgery of data.

Although the number of publications in this group is considered small or at least half of the number of publications in the other group's one-sided intervention, we shouldn't overlook that TDY is a recently accepted tool, and it became widely demanded after the pandemic Covid-19. Furthermore, all of these publications are in the last two years, and this reflects the real intention of the world toward TDY and virtual life.

The two groups in this scoping review confirmed that digital interventions are playing a very important role in the improvement of oral health, and despite some limitations in some publications, many strong points emphasize using digital interventions in oral health became a must and not optional, especially with the high pace of life and the great technology, because most of the studies in the literature affirmed that there is a positive impact on using digital intervention on oral health promotion with both types; one-sided as social media platforms or interactive interventions as TDY. Both types of interventions lack clear rules and trusted sources to provide patients with high-quality care and safety. It is just about addressing some rules and conforming to clear laws and prominent regulations that separate the world from implementing the complete strategy of TDY and telemedicine that will change the industry of health completely around the world.

Conclusion:

Digital oral health interventions already have been used vastly and have become inevitable in our society in the last few years. Indeed, it has the potential to change the industry of health completely with some regulations and laws. Based on the findings of this scoping review, it was concluded that digital oral health interventions could be described and classified in this review into two

types, The first one is the one-sided interventions (social media platforms) that allow the patient to receive information and knowledge about oral health or even about specific oral care such as impacted wisdom teeth or risks of smoking on oral health. The second type is the interactive intervention which allows the patient to be in direct contact with the health professional via live chatting and video conference (Teledentistry). This intervention differs from a one-sided intervention, because it is about a virtual meeting that permits the patient to explain and discuss the specific treatment plan with the health professional like the ordinary meeting in the clinic, and it could facilitate regular and continuous follow-ups. Both interventions are playing a pivotal role in improving oral health and increasing the knowledge and specific information about oral care. It is recommended to widen the scale of studies to compare between the two interventions in LMICs and HMICs and their effect on the population according to their socioeconomic level.

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Appendices :

WHO	World health organization
LMICs	Low middle-income countries
HMICs	High middle-income countries
DHI	Digital health interventions
OSG	One sided intervention group
ICG	Interactive interventions group
TDY	Teledentistry
SM	Social media