



# New Technologies in Oral Health Education, Patients Motivation, and Patient/Dentist Communication in the Covid-19 Era: The Role of WhatsApp

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**Abstract.** *Background:* The Use of WhatsApp for Dental Care WhatsApp is a popular communication platform millions worldwide use. The app allows users to quickly and easily communicate with one another, and its widespread use has led to its incorporation in various industries, including healthcare. WhatsApp can provide remote consultation, enabling dentists to reach patients who cannot visit the office. *Methods:* PubMed, Web of Science and Lilacs were systematically searched until 31/01/2023. In addition, a manual search was performed using the bibliography of selected articles and a Google Scholar search. It was completed, and the papers were read to assess their eligibility. All of the selected studies had and showed the possible influence of WhatsApp on dentistry; *Results:* 327 articles were selected. Specifically, 126 articles were found in PubMed, 11 from Lilacs, and 190 from Web of Science. Randomized clinical trials (RCTs) and clinical trials were selected as inclusion criteria. Therefore, six articles that met the inclusion criteria were selected; all of the selected studies had and showed the possible influence of WhatsApp on dentistry. The results showed the possible

potential of WhatsApp, especially for oral hygiene maintenance, to promote oral health. It is also helpful for diagnosing various diseases within socioeconomically deprived areas; *Conclusions*: WhatsApp, however, is a valuable tool for enhancing the doctor-patient interaction in orthodontics. This encourages improved patient compliance and gives them a sense of the orthodontist's concern. It is also helpful in increasing knowledge and allows greater data dissemination among dental students.

**Keywords:** WhatsApp · Dentistry · Telemedicine

## 1 Introduction

Social media [1, 2] and technologies [3] are increasingly playing a crucial role in medicine and in Dentistry [4–6]; in fact, these are crucial for the education of patients who increasingly use their smartphones for questions on medical topics; in addition, social media are also helpful in spreading prevention and awareness campaigns in the field of health, among them WhatsApp was undoubtedly crucial in the years when due to the Covid-19 epidemic [7–9], doctor-patient contact was more difficult due to lockdown and restrictions related to the risk of infection from the virus. The Use of WhatsApp is popular communication platform millions worldwide use. The app allows users to quickly and easily communicate with one another, and its widespread use has led to its incorporation in various industries, including healthcare. Dental professionals have recently begun using WhatsApp to provide better patient care. This article will explore the benefits of utilizing WhatsApp in dentistry and discuss its potential pitfalls. The use of WhatsApp in dentistry offers several advantages. It is a convenient way for dentists to communicate with patients, allowing them to provide answers to questions and send reminders about appointments quickly. Additionally, the app can be used to send images and videos, which can help educate patients about dental procedures or assist in diagnosis. Finally, WhatsApp can provide remote consultation, enabling dentists to reach patients who cannot visit the office. However, some potential risks are associated with using WhatsApp for dental care. For instance, the app does not have the same level of security as other healthcare communication platforms, potentially exposing sensitive patient data to unauthorized individuals. Additionally, WhatsApp is not regulated by any healthcare organization, and thus dentists must ensure they follow ethical and legal guidelines when using the app. Overall, WhatsApp in dentistry can be beneficial when used appropriately. The app provides a convenient and efficient way for dentists to communicate with patients and provides an avenue for remote consultations. However, it is essential to be aware of the potential risks associated with using WhatsApp and take the necessary steps to ensure patient data is secure and ethical standards are followed.

## 2 Materials and Methods

MedLine (PubMed), Web of Science, and Lilacs were used for literature searches for MeSH and free text phrases. Subject headings and free-text terms were used in conjunction to conduct all searches for any connections between orthodontics and telemedicine;

the final search strategy was chosen after conducting multiple preliminary investigations. The following keywords were utilized in the search strategy: “WhatsApp” [All Fields] AND (“dentistry” [MeSH Terms] OR “dentistry” [All Fields] OR “dentistry s” [All Fields]). The Cochrane Handbook for Systematic Reviews of Interventions and Preferred Reporting Items for Systematic Reviews (PRISMA) criteria were followed in conducting this systematic review. Only articles that included data from the intervention’s conclusion were included. Exclusion standards included: (1) Studies on patients with lack of multiple dental elements; (2) cross-over study design; (3) studies written in a language different from English; (4) fulltext unavailability (i.e., posters and conference abstracts); (5) studies involving animal; (6) review article; (7) case report. Articles dealing with the use of WhatsApp and dentistry were selected.

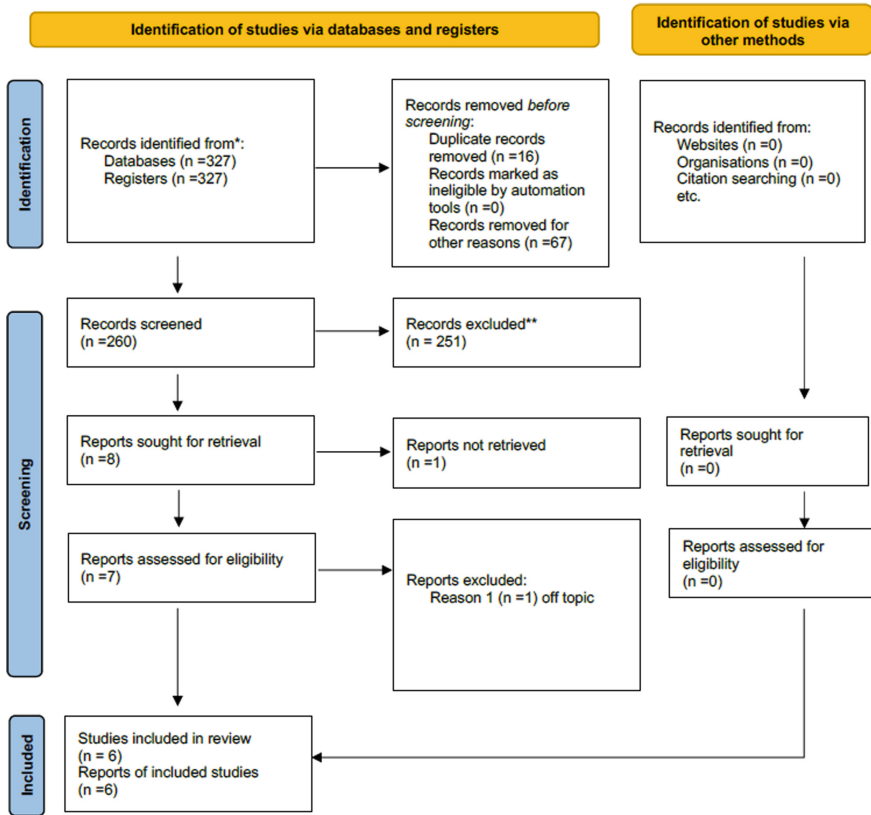
The scientific databases were used in the execution of the review (PUBMED, WEB of SCIENCE, LILACS). The electronic search was conducted between January 3, 2000, and February 2023. “WhatsApp” and “dentistry” have been used with the boolean operator AND (Fig. 1).

Two reviewers (R.F. and G.M.) separately extracted data from the included studies using an individualised data extraction on a Microsoft Excel sheet. A third reviewer was used to obtain consensus in cases of disagreement. The following information was taken out: (1) first author; (2) publication year; (3) nationality; (4) results; (5) main findings.

### 3 Results

The purpose of the Al-Ak’hali study was to evaluate the effectiveness of using WhatsApp instant messages to improve oral hygiene in gingivitis patients. Using a random selection process, 43 patients with gingivitis were randomly assigned: the WhatsApp group ( $n = 24$ ) or a control group ( $n = 19$ ). At the initial visit, the participants received information about oral health, were encouraged to practice good oral hygiene, and were given a booklet with instructions. Throughout the trial, the study group’s participants additionally got WhatsApp messages about dental care every week (3 months). The gingival index (GI) and plaque index (PI) were measured at baseline, one month, and three months. At any stage in the measuring process (baseline, after one month, and three months;  $p$ -value  $> 0.05$ ), there was no evidence of a significant difference in the averages of PI and GI between the two groups. After one and three months, intragroup comparisons showed that the decreases in PI were highly significant (for the WhatsApp group,  $-0.26$   $0.26$  and  $-0.57$   $0.35$ , respectively, and for the control group,  $-0.24$   $0.27$  and  $-0.64$   $0.4$ , respectively;  $p$ -value range: 0.001 to 0.001). The GI decreases in each group were comparable (for the WhatsApp group,  $-0.17$   $0.46$  and  $0.67$   $0.05$ , respectively; for the control group,  $-0.28$   $0.29$  and  $-0.69$   $0.41$ , respectively;  $p$ -value 0.001) [10].

To ascertain the impact of electronic mail reminders and WhatsApp (Facebook Inc., Menlo Park, CA, USA) on orthodontic patients’ compliance with dental hygiene, Saxena et al. Performed a clinical study. Fifty-four individuals receiving orthodontic care at a university clinic were the subjects of a double-blind, randomized, parallel-group study. They were randomly divided into three groups, each with 18 participants: the WhatsApp (W) group, the email (E) group, and the control (C) group. While group (C) did not get any reminders, groups (W) and (E) got oral health messages once per week via



**Fig. 1.** Prisma flowchart

WhatsApp and email, respectively. At baseline (T0), after four weeks (T1), and after eight weeks (T2), the plaque was assessed (T2). After applying a plaque-disclosing agent, intraoral pictures of each subject were obtained, and planimetry was used to measure the amount of plaque on teeth 12, 13, 43, 22, 23, and 33. SPSS was used to examine the data (version 22, IBM Corp., Armonk, NY, USA). ANOVA with mixed methods was employed to compare plaque scores both within and across groups. The study was completed by 54 subjects (14 men and 40 women), with a mean age of 22.43 years. At eight weeks, there was no statistically significant difference between the groups' mean plaque scores at the various time points ( $p = 0.201$ ) [11].

Poblete et al. Evaluate the function and the frequency of responses between WhatsApp and conventional email in dentistry education. A comparison study involving two groups was created. Dental students received four multiple-choice questions through email (group eM) and WhatsApp (group WA). Data were gathered with an emphasis on student reception and response times. While an email tracker was employed for the eM group, WhatsApp specifications were used to collect data. Data analysis was done using Stata/IC version 15.1 and Excel software. To participate in this experience, seventy-four dental students. Nonetheless, 59 people (80%) responded. There were 44 females and

15 men. The WA group received 27 members randomly, and the eM group received 32. A substantial difference between the groups was found via statistical analysis: The WA group had a rapid response in the WhatsApp group (P values of .0286 for reception time and .0448 for response time) [12].

The study Santos evaluates the extent to which patients are made aware of the importance of daily flossing and excellent dental hygiene using WhatsApp text messages, as well as tests the null hypothesis that daily text messages have no impact on patients' flossing practices. The study included 44 participants with a mean age of 14.3 years wearing fixed orthodontic appliances. Male and female patients ( $n = 22$ ) were randomly divided into two groups: group 1 got daily WhatsApp texts for the trial, and group 2 (control) received no texts. At baseline and 30 days later, the plaque index, gingival bleeding index, and halitosis were measured. The data was processed, and the Mann-Whitney, Wilcoxon signed-rank, Fisher exact, and normality tests were run on the results. In group 1, there was a substantial change in flossing behaviours ( $P .05$ ) and a significant decline in plaque and gingival bleeding indicators. Halitosis was significantly reduced in Group 1 ( $P .05$ ) [13].

To determine whether educational messages are beneficial in helping poor socio-economic children reduce early childhood caries (ECC). A single-blinded, randomized, parallel-group study was carried out with 104 pairs of parents and kids from preschools in Bauru, Brazil, aged 36 to 60 months. Stratified by parental eHealth literacy levels (eHEALS) and children's caries experience, the participants were randomly divided into control and intervention groups (1:1). WhatsApp was used to send text messages to the intervention group's parents every two weeks. During baseline, 3- and 6-month follow-ups, the Visible Plaque Index (VPI) and the International Caries Detection and Assessment System (ICDAS) were evaluated. In contrast, eHEALS and dietary habits were identified at baseline and 6-month follow-up. Even though the groups were equivalent, the intervention raised parental eHEALS scores, affecting the reports about the kids' consumption of sugar-free treats and regulating the severity of ECC [14]. The study of Zotti evaluates a group of adolescent patients using fixed multibracket appliances to assess the impact of an app-based method in a protocol for maintaining domestic oral hygiene.

Eighty teenage patients due to begin an orthodontic multibracket treatment were randomly allocated into two groups of forty. All patients' plaque index (PI), gingival index (GI), white spots (WS), and presence of caries were noted. During the first year of treatment, patients received instructions on maintaining domestic oral hygiene on the day the braces were applied ( $t_0$ ) and every three months ( $t_1$ ,  $t_2$ ,  $t_3$ ,  $t_4$ ). Patients in the study group (SG) were required to participate in a WhatsApp chat room competition and send the other participants two self-portraits (selfies) each month displaying their level of oral hygiene. The SG patient participated frequently and actively in the chat room for the observation. Compared to the control group, SG patients had significantly reduced PI and GI values at  $t_2$ ,  $t_3$ , and  $t_4$  and a lower incidence of new WS and caries [15].

## 4 Discussion

The studies analyzed in this review agree with implementing oral health and patient collaboration.

Regarding changes in PI and GI over time in gingivitis patients, implementing WhatsApp instant messages does not seem to benefit the standard motivation and education on oral hygiene activities in this aspect; several scientific studies have evaluated the influence of social media. The study of Al-Ak'hali examined how well weekly reminders delivered via WhatsApp and email alerts affected orthodontic patients' compliance with oral hygiene. Most participants (aged 18 to 27) were secondary school and university students, and they were comfortable using WhatsApp and email as the study's primary communication tools. The teeth 12, 13, 43, 22, 23, and 33 were chosen for plaque scoring. According to numerous research, the maxillary laterals, or maxillary canines, and mandibular canines are most frequently affected by white spot lesions. They often occur symmetrically and without any clear gender preference. The disparity in the gender distribution was caused by the higher proportion of female patients receiving orthodontic care at the university clinic.

According to several studies, the first few months following the bonding of braces can be difficult for patients as they need time to acclimatize to fixed equipment and pick up new oral hygiene skills. In their study sample, Jewair et al. discovered that oral hygiene performance declined in the first month after the bonding of fixed equipment and improved after five months [16, 17]. Levelling and alignment that was evident about three months after starting treatment explained this improvement. Hence, levelling may improve gingival scores near initially crowded teeth. The clinicians chose a sample of patients who had been receiving orthodontic treatment for at least three months and who had been punctual with their appointments to avoid any bias resulting from crowding. Given that it is formatted like a letter, email is seen as an official method of communication. It can convey the same message to numerous recipients and is frequently seen as a formal method of transmission [18, 19]. Emails can be traced, and accurate documentation of the sender, date, and time make retrieval simple. This study considered email reminders rather than WhatsApp notifications because many dental clinics could prefer official communication with their patients. Planimetry was utilized to measure plaque in patients who received text message reminders in a related study conducted in 2015 by Bowen et al. They discovered that text messages promoted oral hygiene compliance in patients over three months. Eppright et al. also discussed texting parents' success in encouraging patients' oral hygiene. Only one study employed planimetry to determine plaque in a systematic review by Lima et al. to evaluate the impact of verbal hygiene reminders. They concluded that the reminders might enhance plaque and gingival indices, reducing the frequency of white spot lesions. Sarwen's former study also showed increased oral health from using WhatsApp. The use of a smartphone app appeared to be a helpful tool for teaching students about oral health, and both conventional and digital methods of oral health education had a beneficial influence on the decline in PI. The study by Poblete et al. also showed that WhatsApp has a better impact on patient oral health and more excellent patient reception of news.

Subburaman's study also showed how digital technology could help increase patient compliance.

The intervention delivered via the WhatsApp app dramatically raised KAP and users' oral health status [20, 21]. The study by Lotto et al. also showed how socials could help diagnose and prevent ECC in areas with low socioeconomic status. Adolescent patients'

compliance and oral health during orthodontic multibracket treatment are improved by incorporating new “social” technology into a standard oral hygiene motivating strategy.

## 5 Conclusion

WhatsApp, however, is a valuable tool for enhancing the doctor-patient interaction in orthodontics. This encourages improved patient compliance and gives them a sense of the orthodontist’s concern [22–26]. Ensuring patients are aware of contact frequency is crucial to avoid mistaking it for spam, which could negatively impact the connection between the orthodontist and the patient. It is also helpful in increasing knowledge and allows greater data dissemination among dental students.

Most studies have shown that using WhatsApp to spread videos and news about how to maintain proper oral hygiene. The dissemination of videos and pictures allows patients and parents to increase awareness of maintaining good oral hygiene. Several studies have shown a decrease in tooth decay in children. While in patients with braces, there was a substantial decrease in plaque indices and improved health.

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