

# WhatsApp-assisted Oral Health Education and Motivation: A Preliminary Randomized Clinical Trial

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## ABSTRACT

**Aim:** The study aimed to assess the efficacy of using WhatsApp instant messages in enhancing the oral hygiene in patients with gingivitis.

**Materials and methods:** Forty-three systemically healthy male dental patients with gingivitis were recruited consecutively and randomly divided into two groups: WhatsApp group ( $n = 24$ ) and a control group ( $n = 19$ ). At baseline visit, the participants were educated and motivated about oral health and given a folio on instructions about the oral hygiene preventive measures. The participants in the study group further received WhatsApp messages about the dental care at weekly intervals throughout the study (3 months). Plaque index (PI) and gingival index (GI) were measured at baseline and after 1 and 3 months.

**Results:** The averages of PI and GI were not significantly different between both groups at any time point of measurement (baseline, after one, and three months;  $p$  value  $>0.05$ ). Intragroup comparisons revealed that the reductions in PI were highly significant after 1 and 3 months ( $-0.26 \pm 0.26$  and  $-0.57 \pm 0.35$ , respectively, for WhatsApp group, and  $-0.24 \pm 0.27$  and  $-0.64 \pm 0.4$ , respectively, for the control group;  $p$  value range: 0.001 to  $<0.001$ ). Similar were the reductions in GI in each individual group ( $-0.17 \pm 0.46$  and  $-0.67 \pm 0.05$ , respectively, for WhatsApp group, and  $-0.28 \pm 0.29$  and  $-0.69 \pm 0.41$ , respectively, for the control group;  $p$  value  $< 0.001$ ).

**Conclusion:** Implementing WhatsApp instant messages does not appear to add extrabenefit to the traditional motivation and education on oral hygiene practices in terms of changes in PI and GI over time in patients with gingivitis.

**Clinical significance:** Although the results were not motivating, this does not preclude the dental professionals from using WhatsApp and the similar technology to deliver oral healthcare advices.

**Keywords:** Gingival index, Oral health, Plaque index, WhatsApp.

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## INTRODUCTION

The main focus of dental profession is achieving optimal oral health through oral preventive efforts. In a preventively oriented dental practice, the main goal is to encourage patients to practice appropriate oral self-care behaviors. In this context, patients are asked to follow an oral self-care regimen based on a target or benchmark (e.g., brush twice a day), hoping they will be able to control or regulate their behaviors to achieve that task.<sup>1</sup>

On top of that, the success of periodontal treatment is highly dependent on the patients' side; their ability to maintain good oral hygiene is of utmost importance. Indeed, many studies have unveiled the negative effects of noncompliance on outcomes of periodontal treatment, along with an increased incidence of root caries.<sup>2-5</sup> Recently, digital technology is around us everywhere. Smartphone use, for example, has become a part and parcel of life, not only for general day-to-day communication but also extensively in medical practice. They are utilized for the purpose of patient care, monitoring, rehabilitation, diagnosis, teaching, and research purposes. This is done simply through many applications uploaded on the smartphones, including instant messaging services. The most widely used application among these is "WhatsApp"—an instant messages application. It is a new-generation mobile application that allows easy exchange of text messages, images, and audio and video files through Internet.<sup>6</sup> Nowadays, WhatsApp has 1.5 billion monthly active users (MAUs) exchanging nearly 60 billion messages on a single day. It is a simple, cheap, and effective means of communication even within the clinical health sector, and its use is expected to grow exponentially.<sup>7,8</sup>

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**Conflict of interest:** None

Dentistry is not an exception. Many studies have conducted aiming at studying the utility of several smartphone applications across various dental disciplines, including using them as adjunctive tools for oral health education and motivation.<sup>9-14</sup> With regard to WhatsApp instant messages, a few studies sought to assess the

efficacy of using WhatsApp instant messaging application on patient's oral hygiene compliance, although mostly in context of orthodontic discipline. These studies reported variable results but mostly encouraging.<sup>15-20</sup> Hence, the aim of this study was to evaluate the efficacy of using WhatsApp instant messages in enhancing the oral hygiene in patients with gingivitis.

## MATERIALS AND METHODS

### Study Design and Settings

This study was a preliminary randomized clinical trial conducted at the Division of Periodontology, Department of Preventive Sciences, College of Dentistry, Jazan University in period from October 2019 to March 2020. It was approved by the Scientific Research Ethics Committee, Jazan University (Number: REC41/1-022), and was conducted in compliance with the Helsinki Declaration on medical research on human subjects. All participants signed informed consents after being informed about the study aims, benefits, and potential risk.

### Study Sample

A sample of 43 male dental patients with gingivitis was recruited consecutively from outpatients' periodontal clinics, college of dentistry, Jazan University, during the period from October 2019 to March 2020. These patients were enrolled if they fulfilled the following criteria: age range 15–45 years and being systematically healthy. Patients with periodontitis or reduced periodontium (probing depth >4 mm), those who reported sensitivity to any oral health care products or using medications in the past three months, or had orthodontic appliance were excluded. The participants were randomly divided into two groups: WhatsApp group ( $n = 24$ ) and control group ( $n = 19$ ). Demographic and habit data were collected using structured interview form.

### Oral Health Education and Examination

At first (baseline) visit, all participants in both groups were educated and motivated about oral health and received regular oral hygiene instructions, including education on proper brushing technique on brushing model using "Modified Bass Technique" and information on use of interdental aids. Comprehensive explanations were given to clarify patients' worries, if any. Additionally, a folio that contains instructions about the oral hygiene preventive measures and home care practices was given to each participant.

The participants in WhatsApp group further received WhatsApp instant messages, including dental health reports, paragraphs, photos, and audios and videos about the dental care at weekly intervals for the study period that lasted 3 months. These messages were sent in Arabic language. The main purposes of these messages were reminding/motivating of doing the already given instructions or/and oral health educational material.

The examinations were performed in a dental clinic. The gingival status of all teeth was assessed excluding the third molars. The parameters used in the gingival assessment were plaque index (PI) (Silness and Loe)<sup>21</sup> and gingival index (GI) (Loe and Silness).<sup>22</sup> Prior to recording, the teeth were dried with air and then examined using a periodontal probe which was gently passed along the gingival margin at the mesial, distal, lingual, and buccal aspects of each tooth. PI and GI were measured by two examiners (Y.M. and A.Y.) at the three time points of the study: baseline, after 1 month, and 3 months. Changes in both indices from baseline were calculated. To ensure calibration within and

between examiners, five patients were selected (not included in the sample) and examined twice by the two examiners (YM and AY) with 1 day interval. Intraclass correlations (ICC) were calculated for that purpose. Professional scaling and polishing were done for all participants twice: after one and three months from the baseline.

### Statistical Analysis

All statistical analyzes were performed using the SPSS 21.0 (Statistical Package for Social Sciences [Armonk, NY: IBM Corp.]) for Windows. Qualitative data were presented as frequencies with their corresponding percentages, while the mean of the quantitative outcomes (PI and GI), and changes in both indices from baseline were calculated and presented as means along with standard deviations and analyzed using paired and independent *t* tests as appropriate.

## RESULTS

The ICC coefficient values for inter- and intraexaminer calibration for PI and GI ranged from as low as 0.86 to as high as 0.91. Table 1 presents the mean age of patients and the distribution of patients based on different grouping factors: smoking and qat chewing. The mean age for WhatsApp group and control group was  $26.83 \pm 5.27$  and  $26.58 \pm 4.72$ , respectively, with no significant difference between both groups ( $p$  value > 0.05). Nearly a third of WhatsApp group (29%) were smokers compared to only 16% of control group with no significant difference between the groups ( $p$  value > 0.05). Similarly, 37.5% of WhatsApp group were qat chewers compared to 21% of control group with no significant difference between groups ( $p$  value > 0.05).

The mean values for PI of WhatsApp group and control group were almostly comparable at the baseline, after 1 month, and 3 months ( $1.39 \pm 0.45$  vs  $1.24 \pm 0.55$ ;  $1.13 \pm 0.45$  vs  $1 \pm 0.47$ ; and  $0.8 \pm 0.36$  vs  $0.6 \pm 0.33$ , respectively;  $p$  value > 0.05). Similar were the mean values of the GI at the same time points ( $1.38 \pm 0.39$  vs  $1.26 \pm 0.6$ ;  $1.21 \pm 0.43$  vs  $0.98 \pm 0.5$ ; and  $0.68 \pm 0.39$  vs  $0.6 \pm 0.33$ , respectively;  $p$  value > 0.05). The mean changes in PI were comparable too between WhatsApp and control groups after 1 and 3 months ( $-0.26 \pm 0.26$  vs  $-0.24 \pm 0.27$  and  $-0.057 \pm 0.35$  vs  $-0.64 \pm 0.4$ , respectively;  $p$  value > 0.05). Similar were the mean changes in GI ( $-0.17 \pm 0.46$  vs  $-0.28 \pm 0.29$  and  $-0.67 \pm 0.05$  vs  $-0.69 \pm 0.41$ , respectively;  $p$  value > 0.05; Table 2).

Overtime, however, the reductions in PI in each individual group were highly significant after 1 and 3 months ( $-0.26 \pm 0.26$  and  $-0.57 \pm 0.35$  for WhatsApp group and  $-0.24 \pm 0.27$  and  $-0.64 \pm 0.4$  for the control group; Table 3). Similarly, the reductions in GI in each individual group were also highly significant after 1 and 3 months ( $-0.17 \pm 0.46$  and  $-0.67 \pm 0.5$  for WhatsApp group and  $-0.28 \pm 0.29$  and  $-0.69 \pm 0.41$  for the control group; Table 4).

## DISCUSSION

It is well known that oral health plays an important role in the general health and well-being of individuals. The role of dental

**Table 1:** Characteristics of the study sample

Variable	WhatsApp group ( $n = 24$ )	Control group ( $n = 19$ )	<i>p</i> value
Age	$26.83 \pm 5.27$	$26.58 \pm 4.72$	0.869
Smokers	7 (29.2)	3 (15.8)	0.470
Qat chewers	9 (37.5)	4 (21.1)	0.324

professionals in advising their patients about how they can make choices that improve and maintain their dental and general health is pivotal. Usually, they do so traditionally through giving verbal instructions. Recently, using the technology, including WhatsApp messages, between patients and physicians has been extensively used in medical fields<sup>23-27</sup> but scarcely in dental field. The current study assessed the extent to which using WhatsApp for giving oral health instructions, motivations and reminding will affect patients' oral health. The results reflected comparable oral health among WhatsApp and the control groups over 3 months. There was statistically significant improvement in oral health indices, namely PI and GI, in both groups, but it was reported equally in

both groups, indicative no additional effects for using WhatsApp instant messages for the above mentioned purpose.

Examination of plaque accumulation and gingival inflammation are considered the most reliable methods for evaluation of gingival health. The current study used PI and GI which reflect plaque accumulation and gingival inflammation, respectively. Gingival health in both groups was improved overtime: a decrease in the accumulation of dental plaque, and improvement of gingival inflammation after 1 and 3 months of oral hygiene education and 2 months of the second oral hygiene education along with the professional scaling and polishing. Using WhatsApp in oral health education did not reveal any superiority to the traditional method of oral hygiene delivering in the dental clinic. This may be ascribed to the amount and quality of information given at the beginning of the study for both groups. These included learning on brushing techniques and use of dental flosses, involving images and models in doing so and showing them on the mouth directly. They also included prescribing brushes, dental flosses, and mouth wash and asking them to bring these dental hygiene aids upon next visit to ensure that they were using it. On the basis of such intensive instructions, the effects of WhatsApp messages might be attenuated and did not add anymore. However, the result of this study contradicts the results of Jadhav et al. study which examined 400 young students and reported a statistically significant reduction in plaque in the text message group when compared to that of the control group after 6 months.<sup>28</sup>

There are many limitations worth mentioning in our study. The first was the small sample size. In fact, we did not calculate the sample size, as we planned to be as a preliminary study for a large-scale future study. The second was the short follow-up period. Owing to the lockdown forced by the global burden of COVID-19 pandemic, we terminated our study, considering the current sample size and the follow-up period as being somewhat sufficient. The strength of our study compared to Jadhav et al.'s study<sup>28</sup> is that the participants were not students; instead, they were dental patients

**Table 2:** Intergroup comparison of PI and GI scores at different time intervals

Variable	WhatsApp group (n = 24) <sup>†</sup>	Control group (n = 19) <sup>‡</sup>	p value <sup>‡</sup>	
PI	Baseline	1.39 ± 0.46	1.24 ± 0.55	0.346
	1 month	1.13 ± 0.45	1 ± 0.47	0.346
	3 months	0.8 ± 0.36	0.6 ± 0.33	0.105
GI	Baseline	1.38 ± 0.39	1.26 ± 0.6	0.453
	1 month	1.21 ± 0.43	0.98 ± 0.51	0.104
	3 months	0.68 ± 0.39	0.6 ± 0.33	0.539
Change in PI after 1 month	-0.26 ± 0.26	-0.24 ± 0.27	0.874	
Change in PI after 3 months	-0.57 ± 0.35	-0.64 ± 0.4	0.614	
Change in GI after 1 month	-0.17 ± 0.46	-0.28 ± 0.29	0.332	
Change in GI after 3 months	-0.67 ± 0.5	-0.69 ± 0.41	0.905	

<sup>†</sup>n = 21 upon 3 months follow-up visit; <sup>‡</sup>n = 13 upon 3 months follow-up visit; <sup>‡</sup>Independent sample t test; PI, plaque index; GI, gingival index.

**Table 3:** Intragroup comparison of PI and GI scores at different time intervals within WhatsApp group

Variable	WhatsApp group (n = 24) <sup>†</sup>	p value <sup>‡</sup>		
		Baseline vs 1 month	Baseline vs 3 months	1 month vs 3 months
PI	Baseline	1.39 ± 0.46	<0.001	
	1 month	1.13 ± 0.45		<0.001
	3 months	0.8 ± 0.36		<0.001
GI	Baseline	1.38 ± 0.39	0.001	
	1 month	1.21 ± 0.43		<0.001
	3 months	0.68 ± 0.39		<0.001

<sup>†</sup>n = 21 upon 3 months follow-up visit; <sup>‡</sup>paired sample t test; PI, plaque index; GI, gingival index

**Table 4:** Intragroup comparison of PI and GI scores at different time intervals within control group

Variable	Control group (n = 19) <sup>‡</sup>	p value <sup>‡</sup>		
		Baseline vs 1 month	Baseline vs 3 months	1 month vs 3 months
PI	Baseline	1.24 ± 0.55	<0.001	
	1 month	1 ± 0.47		0.001
	3 months	0.6 ± 0.33		<0.001
GI	Baseline	1.26 ± 0.6	<0.001	
	1 month	0.98 ± 0.51		<0.001
	3 months	0.6 ± 0.33		<0.001

<sup>‡</sup>n = 13 upon 3 months follow-up visit; <sup>‡</sup>paired sample t test; PI, plaque index; GI, gingival index

who are attending dental clinics with wider age range (15–40), so participants in our study are more representative of the dental patients, and, to less extent, the general population.

Other studies<sup>15–20</sup> concluded that the text message reminder system is effective in terms of improving oral hygiene compliance. Iqbal et al. found lower plaque and bleeding scores in the text message group compared to control group. Zotti et al. found that engaging adolescent patients directly through WhatsApp activity seems to increase regularity in wearing removable retainers, attendance to follow-up schedule, and yield better long-term outcome in terms of orthodontic stability and compliance. However, the aim of these studies was to evaluate the effects of WhatsApp message on compliance of orthodontic patients who might be more aware about any message they will receive because they want to complete their orthodontic treatment without any complications.

## CONCLUSION

Implementing WhatsApp messages, when compared to the traditional motivation and education, does not appear to add extra-benefit to oral hygiene practices in terms of changes in PI and GI over time in the patients with gingivitis. Hence, large-scale studies with larger sample sizes and longer follow-up periods are highly encouraged. Although the results were not motivating, this does not preclude the dental professionals from using WhatsApp and the similar technology to deliver oral health care advices.

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