

# Influence of Reminders on Oral Hygiene Status in Patients Undergoing Fixed Orthodontic Treatment: A Double-blinded, Clinical Randomized Controlled Trial

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## ABSTRACT

**Aim:** To investigate whether weekly text message reminders have an effect on improvement in oral hygiene status of the orthodontic patients undergoing fixed appliance.

**Materials and methods:** In this randomized controlled clinical trial, 30 orthodontic patients were randomly allocated to either text message group or control group. Patients in the text message group received text messages once weekly for 3 months. Plaque index (PI) and gingival index (GI) were measured on Ramfjord index teeth at baseline (T0), 1 month (T1), 2 months (T2), and 3 months after baseline (T3).

**Results:** PI and GI scores were significantly lower in the text message group as compared with the control group ( $p < 0.05$ ).

**Conclusion:** This study demonstrates that text message reminders were effective in improving oral hygiene compliance in orthodontic patients.

**Clinical significance:** Text messages can be sent to the orthodontic patients as a reminder therapy, which will improve the oral hygiene status of the patients.

**Keywords:** Compliance, Oral hygiene, Randomized clinical trial, Text message.

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## INTRODUCTION

Maintaining proper oral hygiene during orthodontic treatment can be challenging because brackets, archwires, and other components can enhance plaque accumulation and impede conventional oral hygiene procedures. As a result, orthodontic patients are more likely to experience gingivitis and enamel decalcifications, which may result in white spot lesions and caries.<sup>1</sup> Poor oral hygiene may elongate treatment time and even jeopardize treatment outcomes.<sup>2</sup> According to the researchers, 5 to 10% of orthodontic patients did not complete their treatment due to poor oral hygiene.<sup>3</sup> These side effects can result in poor results or the premature termination of orthodontic therapy.<sup>4</sup> In general, orthodontists provide orthodontic patients with periodic oral hygiene instructions (OHI), but the effectiveness of OHI may be limited.<sup>5</sup> Professional instructions, appropriate materials, and patient motivation are the key factors in achieving compliance and are all required for an effective oral hygiene. As a result, patient motivation is an important factor and crucial in maintaining good oral hygiene.<sup>2</sup>

In recent years, mobile phone texting has become one of the primary communication activities for relationship maintenance.<sup>6</sup> The mobile phone facilitates doctor-patient interactions.<sup>7</sup> Almost all patients, particularly adolescents, are regular mobile phone users and prefer receiving text messages for information exchange or reminders.<sup>8</sup> Literature studies in dental and medical field have proved the effectiveness of reminder therapy has greatly improved the behaviour changes and disease prevention.<sup>9,10</sup>

Text messaging has been shown in the dental and medical literature to be an effective tool for behavioral interventions and disease prevention. Text messages have also been shown to be successful in increasing smoking cessation rates in adolescents and young adults.<sup>11</sup> Text messages have been effectively used on diabetes mellitus management, and it shows a significant reduction in HbA1c level.<sup>12</sup>

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The purpose of this study was to evaluate if there was a link between reminding patients about the importance of oral hygiene through weekly text message reminders sent to their parents/guardians and improved oral hygiene.

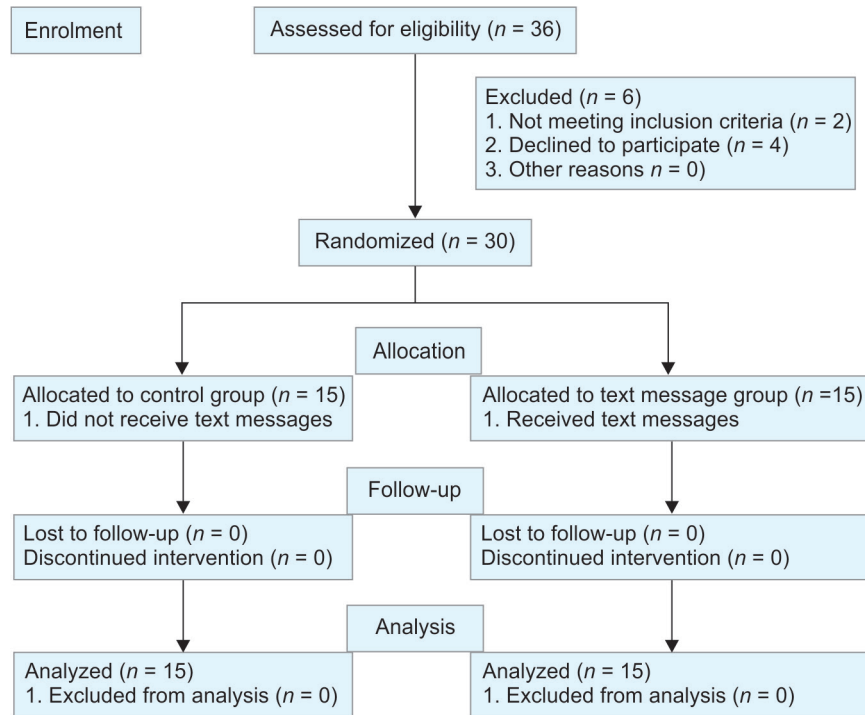
## MATERIALS AND METHODOLOGY

The study research protocol was approved by Institutional Ethical Committee (IEC APPROVAL CODE: XXXXXXXXXXXXXXXX). This randomized controlled trial was conducted on a random sample of 36 consecutively treated patients at the Department of Orthodontics and Dentofacial Orthopaedics, XXXXXXXXXXXXXXXX. The study design followed the CONSORT guidelines (Flowchart 1).

### Inclusion Criteria

- Patients between the age-group of 16 and 25 years,
- Possession of a mobile phone,

Flowchart 1: CONSORT 2010 flow diagram



- Capable of reading and understanding English, and
- Orthodontic treatment with fixed appliances in both arches.

**Exclusion Criteria**

- Periodontally compromised patients
- Syndromic patients, including cleft lip and palate patients
- Functional and orthognathic patients
- Missing of Ramford teeth

The patients were randomly allocated into two groups—the text message group and the control group—using computer-generated random allocation sequence and placed in opaque-sealed envelopes. The text message group consisted of eight males and seven females with an average age of 15.6 years, while the control group consisted of seven males and eight females with an average age of 15.1 years. The power analysis revealed that our sample size was adequate to achieve a power of 80% while maintaining a type I alpha error of 0.05. The text message group was sent one of several standardized text messages (Table 1), and the control group, on the other hand, did not receive any text messages. The attending nurse in the department sent the text messages to the participants once a week, and the treating orthodontist was blinded. The orthodontist gave all patients standardized OHI at the start of the treatment. To give patients enough time to adjust to oral hygiene with fixed appliances, they were not asked to participate in this study until at least two appointments after bonding.<sup>13</sup> Baseline readings, such as mesiobuccal, midbuccal, distobuccal, and palatal/lingual surfaces of Ramford teeth (maxillary right first molar, maxillary left central incisor, maxillary left first premolar, mandibular left first molar, mandibular right central incisor, and mandibular right first premolar), were recorded for gingival index (GI) (Loe and Silness), and plaque index (PI) (Silness and Loe) were taken at time point T0 (Tables 2 and 3). The PI and GI were measured by a senior periodontist at every visit, and periodontist was also

blinded regarding the allotment of group the patient belonged to. To standardize the periodontal probing force and GI, a CPITN

Table 1: Text message example

1	“Healthy teeth gives confident smile, so brush twice daily”
2	“Start a day with brushing!”
3	“Keep your teeth strong by brushing twice a day”
4	“Brushing twice a day keeps dentists away, so keep brushing”
5	“A smile can change the world around you, keep improving your smile, brush twice a day!”
6	“Health begins with the mouth, take care of your oral health by brushing your teeth”

Table 2: Score and criteria of GI

0	Absence of inflammation/normal gingiva
1	Mild inflammation, slight change in color, slight edema, no bleeding on probing
2	Moderate inflammation, moderate glazing, redness, edema, and hypertrophy. Bleeding on probing
3	Severe inflammation, marked redness and hypertrophy, and ulceration. Tendency spontaneous bleeding.

Table 3: Score and criteria of PI

0	No plaque
1	A film of plaque adhering to the free gingival margin and adjacent area of the tooth. The plaque may be seen only by running probe across the tooth surface.
2	Moderate accumulation of soft deposits within the gingival pocket, on the gingival margin and/or adjacent tooth surface, which can be seen by naked eye.
3	Abundance of soft matter within the gingival pocket and/or on the gingival margin and adjacent tooth surface.



Probe was used. To eliminate bias related to appointment time, patients were allowed to brush upon arrival to their appointment with archwires and ligatures in place at each time point.

**RESULTS**

All data were analyzed using SPSS software version 17. Mann-Whitney *U* test and Wilcoxon signed-rank test were used to compare the text message group and control group. There were 36 patients assessed for eligibility, out of which four patients declined to participate and two of them had missing Ramfjord teeth. Thirty patients gave their consent to participate in the study. Fifteen subjects were randomly allocated to the text message or control group (Flowchart 1).

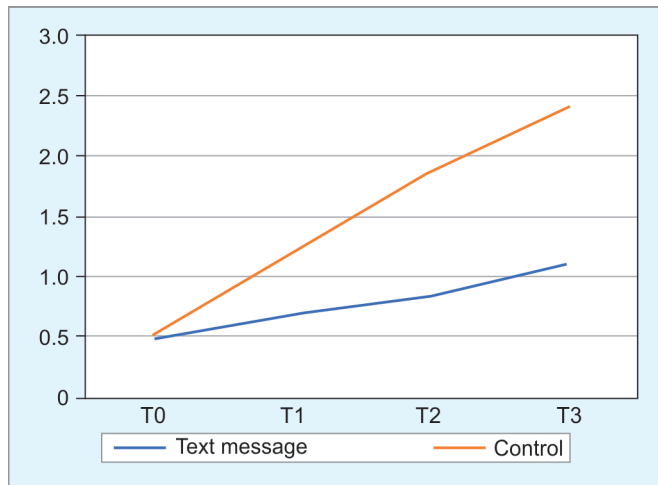
PI at T0 showed no statistically significant difference between the text message group and control group, while at T1, T2, and T3, the values were statistically significant (Table 4, Fig. 1). GI was statistically significant at all the evaluated time periods (T0, T1, T2 and T3) (Table 5, Fig. 2).

**DISCUSSION**

Establishing a good rapport with patients can be aided by text messaging. Text messaging can also help with patient care by asserting that the orthodontist is concerned about the patient’s oral hygiene. Text messages have replaced the e-mails that were

**Table 4:** Mean (SD) PI at T0, T1, T2, and T3

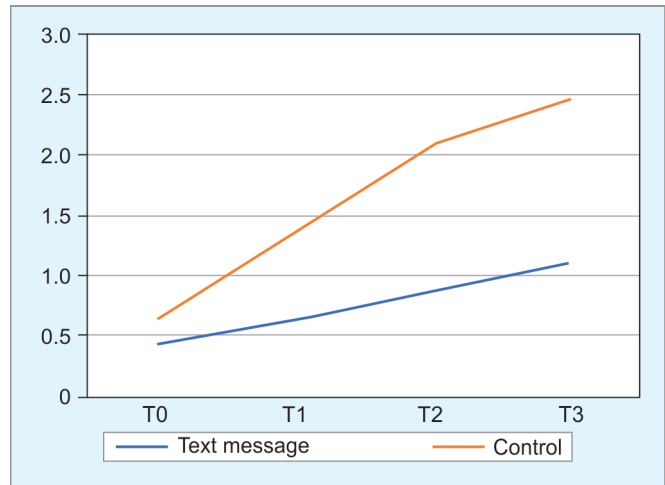
PI	Text message (n = 15)	Control (n = 15)	Significance
T0	0.49 (0.167)	0.53 (0.154)	0.5
T1	0.69 (0.252)	1.20 (0.204)	0.001
T2	0.84 (0.220)	1.873 (0.220)	0.001
T3	1.10 (0.307)	2.42 (0.211)	0.001



**Fig. 1:** Scores of PI

**Table 5:** Mean (SD) GI at T0, T1, T2, and T3

GI	Text message (n = 15)	Control (n = 15)	Significance
T0	0.43 (0.145)	0.63 (0.133)	0.001
T1	0.63 (0.250)	1.35 (0.210)	0.001
T2	0.87 (0.294)	2.09 (0.378)	0.001
T3	1.10 (0.323)	2.47 (0.410)	0.001



**Fig. 2:** Scores of GI

sent earlier for communication, as text messages are relatively easier to send and the majority of the population in the current era have handheld phones/smartphones wherein immediate notifications of the text messages are received.

Patient cooperation is hard to predict using simple methods of psychological or behavioral assessments. It is hence essential that in orthodontic treatment, a repeated and programmed reminder be sent to the patients on compliance-related issues, such as maintenance of oral hygiene, prompt treatment visits, wearing of elastics, etc.<sup>14</sup> Therefore, the purpose of the present study was to determine if the interaction between the orthodontic professional and the patient, with and without the use of a short message service, had any effect on oral hygiene. The current study’s findings revealed that the interaction between the orthodontist and the patient via text messages resulted in a significant difference between the groups. This outcome could be attributed to increased oral hygiene practice, which was influenced by motivational notations and texts sent to the patient’s mobile phone, as well as the frequent communication established between the orthodontist and the patient using this tool.

At time intervals evaluated in this study, the text message group demonstrated statistically significant results over the control group. The GI and PI were used to evaluate the outcome. At T1, T2, and T3, the text message group had significantly lower GI and PI scores. According to the findings of this study, a text message reminder increases the amount of plaque removed at a particular period of time. The reduction in compliance of the patients in the control group may be attributed to the fact that there were no reminders sent to them. The findings of this study clearly show that text messages remind and motivate patients to maintain good oral hygiene. This finding is similar to that of Eppright et al.,<sup>13</sup> who found that sending messages to parents improved oral hygiene compliance in orthodontic patients. Bowen et al.<sup>8</sup> also obtained similar results. Jejurikar et al.<sup>4</sup> concluded that sending weekly once text message is a useful way to improve oral hygiene compliance over a period of 4 months. Huang et al.<sup>2</sup> in their systematic review concluded that additional reinforcements are required to improve oral hygiene motivation for a 6-month period. In his systematic review, Lima et al.<sup>15</sup> stated that reminder therapy is a valuable strategy for promoting good oral hygiene in orthodontic patients. Marini et al.<sup>1</sup> concluded that repeating OHI and motivation to the

orthodontic patients decreased the risks of white spot lesion and caries.

The use of social media and mobile phone technology greatly enhances patient compliance as demonstrated by various studies, such as Zotti et al.,<sup>16</sup> which concluded that sharing selfies of their smiles in a WhatsApp-based chat room contest on a weekly basis is an effective approach for oral hygiene. Similarly, Leone et al.<sup>7</sup> found that in the study group, class II correction using intermaxillary elastics was 3.7 times greater than the control group.

To summarize, it appears evident that text messages promoted the oral hygiene of the patients and also increase compliance and maximize treatment success. Furthermore, they allow orthodontic patients to actively participate in their treatment, making them more responsible for their health. The possible limitations of this study were that the duration of the study was short and that further investigations would be required for evaluating the long-term effectiveness of text messages. The indices used in this study were not specifically designed for orthodontic patients, despite the fact that they had been used in previous studies on the orthodontic population.<sup>17</sup>

## CONCLUSION

Text messages are an efficacious way to remind and promote the oral hygiene status of the patient over a 3-month period.

Orthodontists should incorporate an active reminder system regarding the importance of oral hygiene compliance into their standard treatment protocol.

## CLINICAL SIGNIFICANCE

Text messages can be sent to the orthodontic patients as a reminder therapy, which will improve the oral hygiene status of the patients.

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