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Effectiveness of Different Media Approaches for Orthodontic Oral Hygiene Instruction: A Randomized Controlled Trial

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ABSTRACT

Introduction: Treatments with fixed appliances require extra oral hygiene care, as its components will predispose to plaque retention. Orthodontists can prevent oral health problems such as caries and gingivitis by giving effective oral hygiene instructions to patients.

Aim: This study aims to compare the effectiveness of the different media approaches on oral hygiene instructions on orthodontic patients over different time points.

Materials and methods: Sixty patients who were undergoing fixed appliance treatment were randomised to receive video instruction, or written instructions accompanied by oral hygiene demonstration. The instructions were given for both groups after fitting patients' fixed appliances and reinforced them at one-month, three-month, and six-month follow-ups. Oral health assessment for both groups was recorded and repeated at the follow-ups.

Results: There was an increase in plaque and gingivitis in both groups at one-month follow-up, but we have observed a decline at the three-month follow-up. The written media group shows a statistically significant difference in the presence or absence of plaque (p=0.023) and gingivitis (p=0.008) over the time-points. At the six-month follow-up, the written media group had a slightly higher plaque than the video media group. Overall, oral health assessment found no statistically significant difference between both groups at all-time points (p>0.05).

Conclusion: Generally, video and written media approaches can effectively provide oral hygiene instructions to improve oral health. However, video media has more advantages than written media, and can be suggested to be preferable way in delivering oral hygiene instruction to orthodontic patients and reinforcement during monthly follow-up in the clinic.

Key words: Oral health, Oral hygiene instruction, Orthodontic, video, Pamphlet, Plaque, Gingivitis

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INTRODUCTION

Orthodontists face the most significant challenge when treating orthodontic patients is preventing caries and gingivitis due to poor plaque control. Therefore, it is crucial for orthodontic patients to have good oral hygiene with healthy periodontium at the beginning of treatment. In addition, components of the fixed appliance undoubtedly predispose plaque retention in the mouth; thus, proper oral hygiene care is essential [1]. The orthodontist must provide an effective plaque control measure to patients before starting the fixed appliance treatment to prevent dental diseases such as caries and gingivitis.

An orthodontist can use the changes in the behaviour of patients to determine the effectiveness of oral hygiene instructions. The cognitive domain entails the development of intellectual abilities and the ability to recall information [2]. On the other hand, patients acquired psychomotor skills through practice. Thus, it

is critical to ensure that, following instruction delivery, patients can comprehend the instructions and perform proper oral hygiene practices based on what they have learned [2].

Different interventions should be included and tested for their effectiveness [3]. Evaluation of oral health status is an outcome measure to investigate the effect of instruction methods given to the patients. Improvement of oral hygiene demonstrated good compliance from the patient, consequently shows that the instruction given was adequate [4]. Thus, the aim of this trial was to compare the effectiveness of two different media approaches of oral hygiene instructions, a) video media and b) written media with oral hygiene demonstration, on orthodontic patients. The primary outcome of this trial was the oral health status of the patient measured by plaque and gingival indices.

MATERIALS AND METHODS

Ethics approval and consent to participate

Before the study, ethical approval was obtained from the Universiti Kebangsaan Malaysia (UKM) Ethics Committee (Reference number: UKM PPI/111/8/JEP-2017-575). Then, the principal investigator gave a short briefing and information sheet to all patients in this study. In addition, written consent was obtained from the patients if they agreed to participate before the start of this study. The design of this trial was two-armed parallel, randomized controlled trial. The clinical trial has been registered on ISCRTN (Reg. No:14146882).

Sample size was calculated based on the previous study [5], with an alpha value of 0.5 and 80% power; sample size of 26 was needed on each group to detect the difference and reject the null hypothesis. Considering the 20% attrition rate, the final sample size for each group was 30 patients, with a total sample size of 60 patients for the trial.

60 samples were gathered from the list of patients getting orthodontic treatment at the Orthodontic Clinic, Faculty of Dentistry, Universiti Kebangsaan Malaysia (UKM), using random number tables. The list of patients must fufill the eligibility criteria of (a) age range of 13 - 40 years old, (b) undergoing fixed orthodontic appliance treatment for the first time, and (c) being proficient in the Malay language. Patient was randomly allocated in a 1:1 ratio by giving identification number on piece of paper. The pieces were placed into an opaque box and randomly selected by a research assistant. They were allocated equally into either the video media group or written media group, with a sample size of 30 subjects in each group. The principal investigator conducted the data collection and analysis and was blinded to the media allocated to patients.

Oral hygiene protocol

A dental nurse gave the oral hygiene instructions to subjects either in a video media (intervention group) or written media (control group) after fitting the fixed appliances. In the video media group (intervention), the dental nurse instructed the subjects to watch a four-minute video containing live acting and voice recording of oral hygiene instructions, including information on brushing technique, flossing technique, use of an interdental brush, and mouthwash. This video was developed in Malay, using similar content from the written media. A dental public health specialist validated the content of the video.

In the written media group (control), the dental nurse instructed the subjects to read a Malay-language pamphlet [MOH/ K/ GIG/ 8.2007 (PT)] produced by the Ministry of Health, Malaysia, containing similar content as in the video, but in pictorial and textual information. After reading the pamphlet, a dental nurse demonstrated the oral hygiene instruction based on the information in the pamphlet. The total duration for the education was about ten minutes. The subjects were not allowed to bring home the pamphlet to eliminate any bias. The same media of oral hygiene instruction was reinforced to patient at one-month, three-month, and six-month follow-ups.

Oral health assessment

The principal investigator evaluated each subject for dental plaque and gingival scores before receiving oral hygiene instructions (both groups). Subjects were instructed to chew a disclosing tablet (i-C2 Dual Action Disclosing Tablets, Ortho Care, UK). Then, they must spread the crushed pill across the tooth surfaces with their tongue and rinse immediately with water. The disclosing tablet detected dental plaque as bright red, and the scores were recorded. The plaque scoring method by Lees et al. (2000) was based on three teeth: lower right canine, lower left central incisor, and lower left first or the second premolar was used in this trial [6]. Loe et al. Plaque Index [6] codes zero to three were used (Table 1). The principal investigator counted the plaque scores on four surfaces of each tooth: mesial (M), distal (D), gingival (G), and incisal (I). Table 2 shows the examples of recording scores on the tooth surface.

Löe the Silness (1963) gingival index was used for gingival assessment [7]. The grades were 0 (absent), 1 (mild), 2 (moderate), and 3 (severe), according to the level of gingiva inflammation. The same three teeth were used as the plaque score to calculate the gingival index using a periodontal probe repeated at one, three-, and six-month follow-ups. The intraclass correlation coefficients (ICC) score for intra-examiner reliability was 0.89 for plaque index and 0.70 for gingival index.

Outcome measures

The outcome measures of this trial are the assessment

Table 1: Criteria for plaque index system.

Score	Criteria Silness and Löe Plaque Index
0	Absence of microbial plaque
1	Thin film of microbial plaque
2	Moderate accumulation with plaque
3	Large amount of plaque

of plaque and gingival indices of subjects [6,7]. We recorded the plaque, and gingival index data as the mean scores for three teeth examined: Plaque index for each tooth, A=(a+b+c+d) (Table 2). For data analysis, we recorded both plaque and the gingival index as absence or presence of plaque or gingivitis [6]. The scores were decoded into the nearest score and entered into SPSS. For example, we recorded a score of 0 as an absence of plaque and gingivitis, based on criteria on plaque and gingiva index systems. We recorded a score of 1 for the presence of plaque and gingivitis. For example, we decoded a score of 0.47 to 0 (absence) and 1.33 to 1 (presence).

Data analysis

Data collected were entered and analysed using Statistical Package for Social Sciences (SPSS, version 22.0; IBM, Armonk, NY). In addition, descriptive analysis was done for demographic data (age, gender, ethnicity, and educational status). Due to the non-normal distribution of data, Cochran's Q test was used to determine the differences of subjects' plaque and gingivitis scores at one, three- and six-month follow-ups. In addition, Chi-square test was used to compare the proportion of patients with the presence and absence of plaque and gingivitis between both groups.

Table 2: Example of scores on a tooth surface.

Surface	Score
Mesial	a
Distal	b
Gingival	c
Incisal	d
Plaque index for each tooth, eg: A =(a + b + c + d)	

Table 3: Socio-demographic profile of the subjects.

Variables	Video Group (n =30)	Pamphlet Group (n =30)	p-value
Age (mean ± SD)	19.87± 5.07	19.93± 4.46	0.377
Gender, n (%)			
Male	8 (26.7%)	6 (20.0%)	0.542
Female	22 (73.3%)	24 80.0%)	
Ethnicity, n (%)			
Malay	24 (80.0%)	26 (86.7%)	0.688
Chinese	4 (13.3%)	2 (6.7%)	
Indian	2 (6.7%)	2 (6.7%)	
Educational status, n (%)			
Secondary education	15 (50.0%)	13 (43.3%)	0.605
Tertiary education	15 (50.0%)	17 (56.7%)	
Pearson Chi-square, significant p < 0.05			

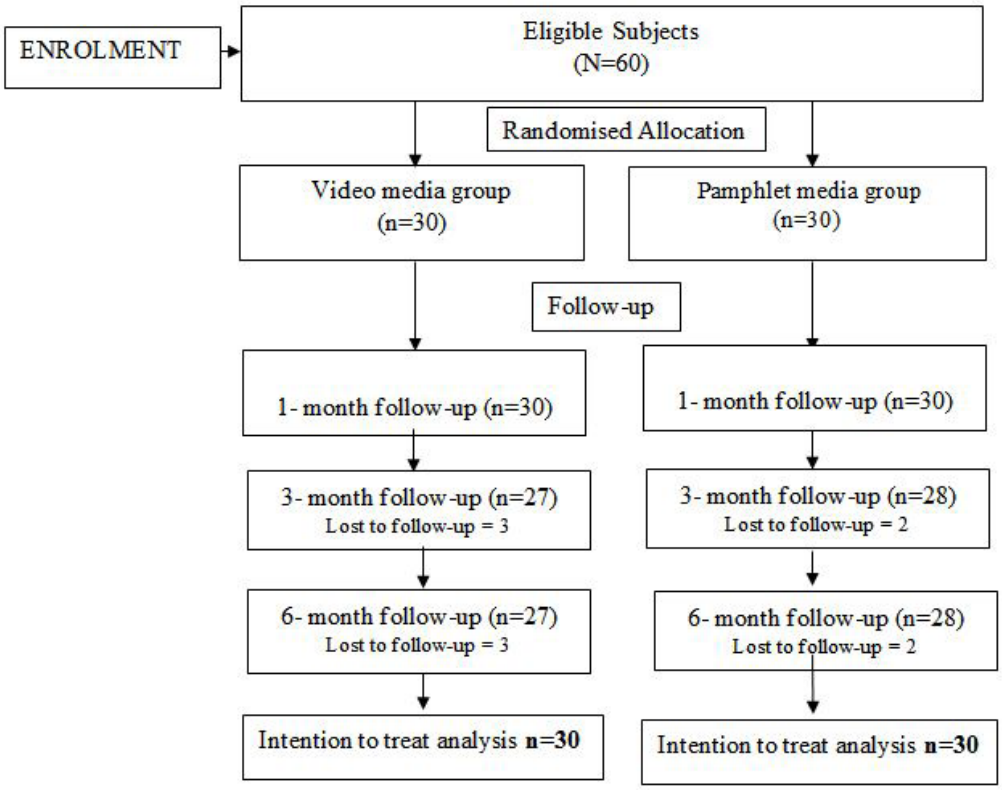

Figure 1: A consort flowchart showing the flow of subjects throughout the trial.

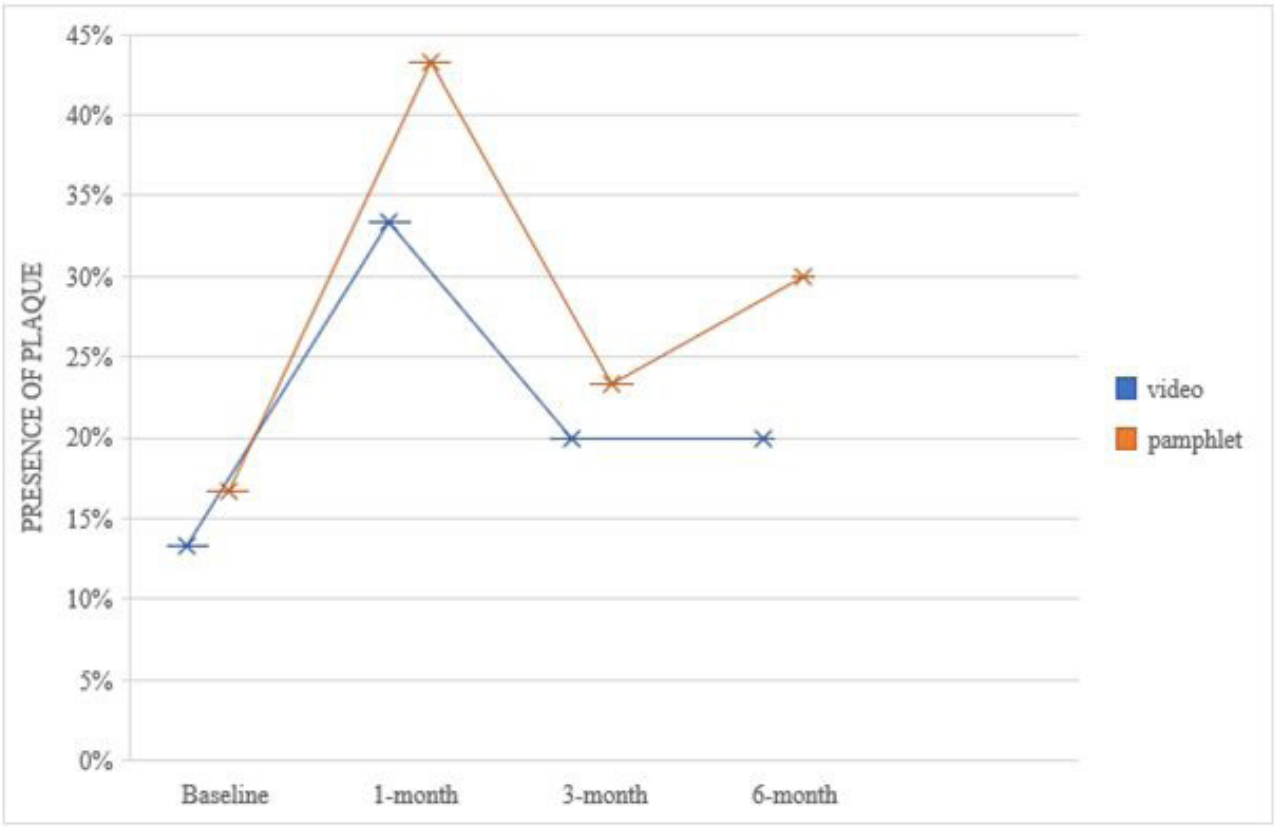

Figure 2: Comparison of subjects' presence of plaque between two groups at different time intervals.

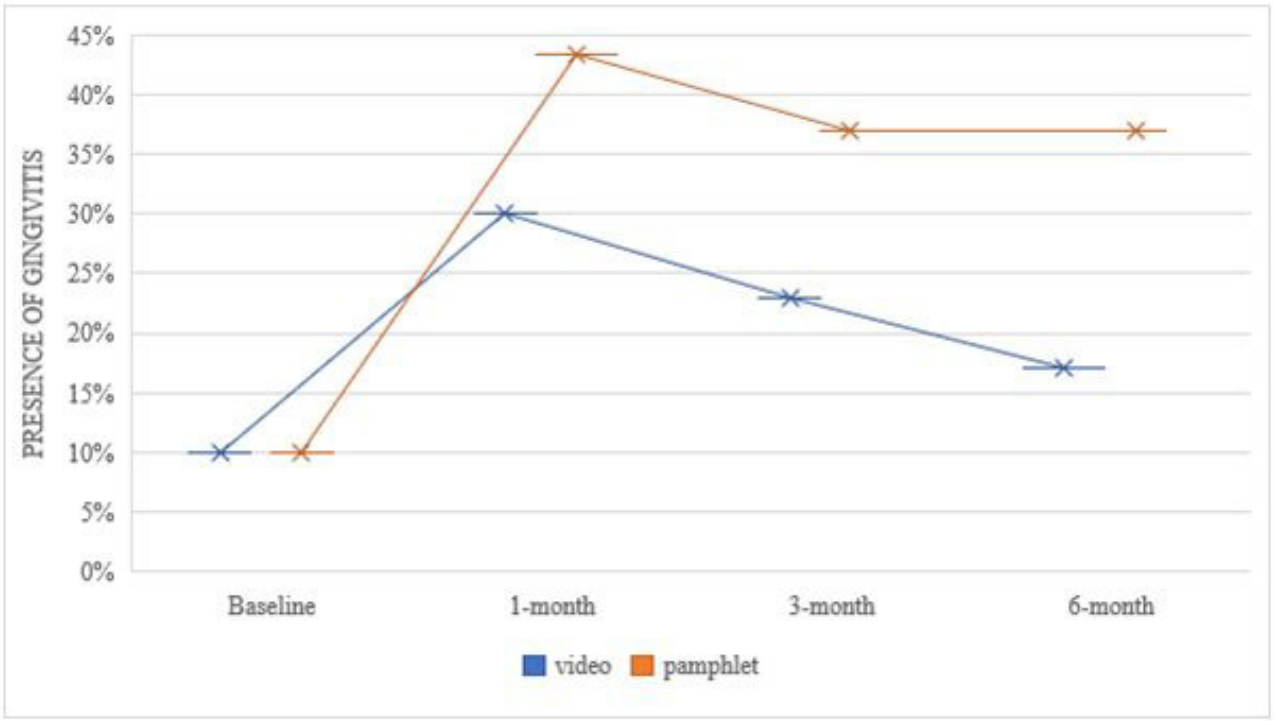

Figure 3: Comparison of subjects' presence of gingivitis between two groups at different time intervals.

Table 4: Comparison of plaque and gingivitis in video group and pamphlet group across the time-point.

		Baseline	1-month	3-month	6-month	p-value
Video group						Plaque
	Absence	26 (86.7)	20 (66.7)	24 (80.0)	24 (80.0)	0.083
	Presence	4 (13.3)	10 (33.3)	6 (20.0)	6 (20.0)	
						Gingivitis
	Absence	27 (90.0)	21 (70.0)	23 (76.7)	25 (83.3)	0.055
	Presence	3 (10.0)	9 (30.0)	7 (23.3)	5 (16.7)	
Pamphlet group						Plaque
	Absence	25 (83.3)	17 (56.7)	23 (76.7)	21 (70.0)	0.023*
	Presence	5 (16.7)	13 (43.3)	7 (23.3)	9 (30.0)	
						Gingivitis
	Absence	27 (90.0)	17 (56.7)	19 (63.3)	19 (63.3)	0.008*
	Presence	3 (10.0)	13 (43.3)	11 (36.7)	11 (36.7)	

Cochran's Q Test, significant at p<0.05

RESULTS

Socio-demographic profile

60 subjects were enrolled in the trial (Table 3). We allocated thirty subjects for the video media group (8 males, 22 females) and the written media group (6 males, 24 females). The mean age for the video media group was 19.87 (SD 5.07) years old, and the written media group was 19.93 (SD 4.46) years old. Most subjects were Malay (83.3%), followed by Chinese (10.0%) and Indian (6.7%). Statistically, there was no significant difference in the proportion of age, gender, ethnicity, and educational status between the two groups (p>0.05). Figure 1 shows the flow of subjects throughout the trial. At the three- and six-month follow-ups, three subjects were lost in the video media group and two subjects in the written media group to follow up during the trial. However, all subjects were included from both groups in the Intention to Treat (ITT) analysis for all follow-ups.

Oral health assessment

The efficacy of the two media was measured by comparing the absence or presence of plaque and gingivitis across the time point follow-ups. Table 4 compares plaque and gingivitis in the video and written media groups across the time-point. The written media group shows a statistically significant difference in the presence or absence of plaque (p=0.023) and gingivitis (p=0.008) over the time-points. There was an increase in plaque and gingivitis in both groups at one-month follow-up but declined at the three-month follow-up. The presence of plaque increased slightly higher in the written media group than the video media group at the 6-month follow-up. However, the presence or absence of plaque and gingivitis over all time points was not statistically significant in the video media group. This finding shows that most subjects in the video media group had maintained good oral health from baseline until the 6-month follow-up. The chi-square test results showed no significant difference in both plaque (Figure 2) and gingival (Figure 3) scores between the video and written groups at 1-month, 3-month, and 6-month.

DISCUSSION

In this study, almost all subjects showed good oral health at baseline. Maintaining good oral hygiene following fixed appliance treatment must be well understood by orthodontic patients, particularly during the early months of treatment. The baseline data was collected before the bracket placement was done. The absence of plaque and gingivitis can be expected as patients are usually asked to keep their oral hygiene good and clean their teeth before orthodontic treatment. However, after placing the fixed appliance in a month, oral health deterioration was seen significantly in the control group. Components of a fixed appliance are plaque retentive, and without proper oral hygiene care, plaque and gingivitis can develop in the mouth [8]. Similarly, a previous study [9] found that oral hygiene of orthodontic patients worsened within the first month after bracket placement. Moreover, oral ulcers could develop due to the reaction and adaptation of wearing a fixed appliance, thus leading to poor plaque control.

In this study, an increased number of subjects with plaque and gingivitis was seen during all follow-ups. This observation was more significant in the written media group than the video media group. Therefore, video media could be more effective than pamphlet media in improving patients' adherence to oral hygiene instructions. This finding is in concordance with another study that found that patients' oral hygiene significantly improved after three weeks of a video intervention [5].

In this study, both groups showed a decrease in plaque and gingivitis at the three- and six-month follow-ups. This finding indicates that both groups could have adapted to wearing the fixed appliance after a while, thus maintaining good oral hygiene. Reinforcement of oral hygiene instructions during follow-up could positively impact patients' awareness and motivation regardless of the method of instruction given. In addition, repeated oral hygiene instructions are required for behaviour change to improve and maintain good oral health [10,11]. A previous clinical trial has recommended that repeated oral hygiene instructions and motivation in orthodontic patients for the first three appointments, at

minimum, may decrease the risk of patients developing dental caries [12].

Video media has more advantages than written media. It is more engaging attractive, has no printing cost, is less resource-intensive, offers standardized messages, and can be delivered in various forms, including media files and streaming video. Additionally, video media was found to be unpredictably effective for modifying health behaviours when they are specifically tailored [13]. Health education through video media is also advantageous in terms of good visualization, as it facilitates the process of knowledge absorption [14]. According to a previous study, patients' compliance towards oral hygiene instructions increased when they were given additional active reminders and good illustrations compared to verbal, oral hygiene instruction alone [15]. Also, video media on delivering health education is more effective than printed written information for short-term behaviour change and long-term retention [16,17].

CONCLUSION

Generally, both video and pamphlet media can effectively provide oral hygiene instructions to improve oral health. Although video media has more advantages than written media, both can be suggested to be used in delivering oral hygiene instruction to orthodontic patients and reinforcement during monthly follow-up in the clinic.

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