

ORIGINAL ARTICLE

Methods of Instruction on Knowledge Retention Among Orthodontic Patients: A Randomized Controlled Trial

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ABSTRACT

Introduction: Delivering oral hygiene instruction is one of the integral parts of orthodontic treatment. However, there is scarce information regarding the impact of audiovisual method on knowledge retention among orthodontic patients. This study aimed to assess knowledge retention of the patient after instruction delivered in audiovisual (AV) method and compare it to the standard written and verbal (WV) method. **Methods:** This prospective clinical trial was conducted on 60 patients aged 13 to 40 years. They were randomized into the audiovisual group (n=30) and written & verbal group (n=30). Patients' knowledge retention was measured using a self-administered questionnaire in Google form, immediately after instruction given as short-term retention and long-term retention for three time-point, i.e., 1-month, 3-month, and 6-month. **Results:** There was a significant improvement in knowledge for both AV and WV methods at immediate and 1-month assessment and the knowledge retained until 6-month follow up. The AV method demonstrated a significantly higher increase in knowledge retention at immediate and 1-month than the WV method. **Conclusion:** The AV method was significantly more effective in improving patient's knowledge retention compared to the written & verbal methods. Repetition of instruction also influence the retention of knowledge.

Keywords: Instruction, Orthodontics, Compliance

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INTRODUCTION

In dentistry, oral health education is very beneficial to patients as it empowers patients to take care of their teeth and oral health in general. In orthodontics, provision of the information regarding appliance care and diet, oral hygiene care as well as the effect and the risk following fixed appliance treatment need to be well understood by the patient. It is crucial that all of this information is being delivered before commencing the treatment (1). Adequate oral hygiene instruction must be conveyed to prevent dental complications including caries and gingivitis. The consequences will lead to unsatisfactory results, or sometimes, the treatment has to be ceased early before completion of the treatment (2).

The effectiveness of the instructions can be determined by the learning outcome or behavioural changes of the patients. The cognitive domain involves in the development of intellectual skill and the ability to recall knowledge (3). Duration of information retention plays an important role in improving patient compliance

towards treatment. Previous study has demonstrated that patients tend to forget the information after six weeks (4). Therefore, a good method of delivering information to the patient should be recognized, as it is one of the factors that affects information retention.

Nowadays, the use of video as electronic health education material has grown rapidly (5). Although most of the published literature has shown that the audiovisual method has advantages over written and verbal methods, the evidence is still not conclusive. There was paucity in the literature regarding the effects of audiovisual instruction to the orthodontic patient, especially on long-term knowledge retention after receiving the instruction. This study aimed to assess knowledge retention of the patient following instructions delivered in audiovisual method and compared it to the standard written and verbal methods. The null hypothesis was that no significant difference exists in knowledge retention between the audiovisual method and written & verbal method of instruction.

MATERIALS AND METHODS

Ethical approval for this study was obtained from the Research Ethics Committee of Universiti Kebangsaan Malaysia (UKM PPI/111/8/JEP-2017-575). A short

briefing and information sheet were given to all patients in this study. Written consent was obtained from the patients if they agree to participate prior to the start of this study.

This study was designed as a prospective clinical trial. In this two-arm parallel study, patients were randomly allocated in a 1:1 ratio. They were given instructions in audiovisual (AV) as an intervention group or written & verbal (WV) as a control group. The instructions were given after bonding up the bracket, and during one-month, three-months and six-months follow-up as a reinforcement. The outcome measure of this trial was the knowledge retention assessed by the questionnaire.

Sample size calculation

The sample size was calculated using PS software (Dupont and Plummer 1998), based on the previous study (6), using an alpha value of 0.05, difference of 2.4 between the two groups and common SD of 3.0, sample size of 26 in each group would have 80% power to detect the difference and reject the null hypothesis. After considering an attrition rate of 20%, the sample size was 30 patients for each group, and the total sample size for the trial was 60 patients.

Study sample

Samples were recruited from patients who were undergoing orthodontic treatment at Orthodontic Clinic, Faculty of Dentistry, Universiti Kebangsaan Malaysia (UKM). Eligibility criteria for participant were: (i) Age range 13 - 40 years old (ii) Patient undergoing fixed orthodontic appliance treatment and no previous orthodontic treatment (iii) Proficient in local Malay language.

Randomization and Blinding

This was simple randomization where 60 patients undergoing fixed appliance treatment were randomly allocated into 2 groups. Randomization was done by labelling 60 pieces of paper and labelled into the audiovisual group (AV) and written & verbal group (WV) with a sample size of 30 in each group. The papers were placed into an opaque box and randomly selected by a researcher's assistant at patient's recruitment. Data collection and analysis was done by one examiner and was blinded to the method of instruction allocated to the patients.

Knowledge retention assessment

In the written & verbal method (WV) group, patients were asked to read a pamphlet that was produced by Oral health division, Ministry of Health Malaysia, in Malay language. It contained pictorial and textual information. The information was explained by the dental nurse according to what has been written in the pamphlet only. The pamphlet was not allowed to be taken home. Patients were also given a demonstration on oral hygiene

instruction based on information in the pamphlet by a dental nurse using teaching aids. This includes brushing technique, how to use floss, interdental brush, and mouthwash. Total duration for instruction was about ten minutes. In the audiovisual method (AV) group, the patients were instructed to watch a four minutes video. The video was produced by investigator containing live acting and also voice recording, in Malay language. The information in the video is similar to the information provided in the pamphlet with the combination of live acting of the demonstration on oral hygiene instruction. All the instructions were given by a research assistant.

A questionnaire was given to patients to assess their knowledge retention and the format was adapted from previous studies (4,7). The questions were knowledge-based, relating to the instructions given to the patients and they were a closed-ended question in Multiple Choice format (MCQ). The questionnaire was in Malay language. It has eight-item recall questions with a maximum score of 32. Face and content validity were done by two senior specialists by assessing the relevance of each question, provide feedback on overall content and structure, missing and redundant questions, readability and feasibility and instructions for respondents. The questionnaires have been constructed in Google Form and patients were asked to use the computer provided in the clinic to answers all the questions. The questionnaire was pretested on 20 patients who were screened for orthodontic treatment at the beginning of this study. All the respondents were asked on the clarity, wordings, comprehensiveness of statements, formatting and any confusing statement of the questionnaire. A score was calculated based on the correct answers given by the patients.

A baseline knowledge assessment was done using the questionnaire and was given prior to bonding of the fixed appliance. Immediate after the bonding procedure, oral hygiene instruction was given for the first time. Knowledge retention assessment using the same questionnaire was done after 20 minutes. The knowledge retention assessment was repeated during fixed appliance review visit at 1 month, 3 months, and 6 months.

Statistical analysis

Data obtained from this study were subjected to computerized statistical analysis using Statistical Package for Social Sciences (SPSS, version 22.0; IBM, Armonk, NY). The statistical analysis, included the descriptive analysis for demographic data (age, gender, race and educational status). Owing to the non-normal distribution of the data, a Friedman test was undertaken to detect differences in the audiovisual and written & verbal group. For post hoc analysis, Wilcoxon Signed Rank test was used. Mann-Whitney test was conducted to compare audiovisual and written & verbal method.

RESULTS

Demographic Profile

A total of 60 patients were enrolled into the study, 30 patients (22 females, 8 males) were allocated to the audiovisual group (AV) and 30 patients (24 females, 6 males) to the written & verbal group (WV). A CONSORT flowchart (Fig. 1) shows that all 60 patients were analysed by intention to treat analysis. The demographic distribution of age, gender, ethnicity and educational status of the patients were shown in Table I.

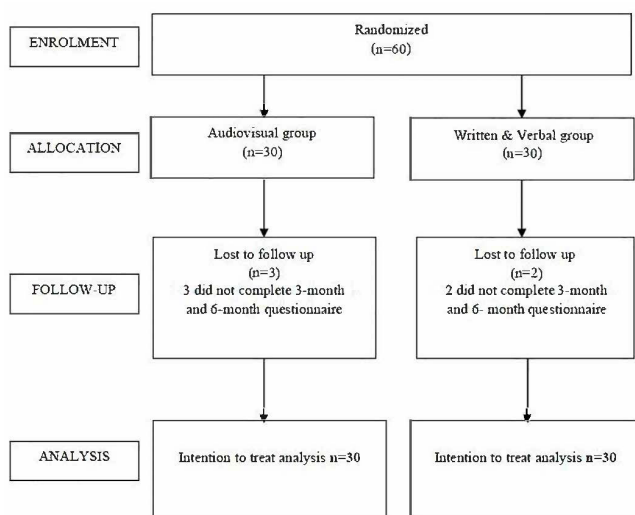


Figure 1: A CONSORT flowchart showing the flow of subjects through the trial

Table I: Demographic Profile of The Patients

Variables	Audiovisual (n = 30)	Written and verbal (n = 30)	p-value
Age (mean ± SD)	19.87 ± 5.07	19.93 ± 4.46	0.38
Gender, n (%)			
Male	8 (26.7%)	6 (20.0%)	0.54
Female	22 (73.3%)	24 (80.0%)	
Ethnicity, n (%)			
Malay	24 (80.0%)	26 (86.7%)	0.69
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%)	0.60
Tertiary education	15 (50.0%)	17 (56.7%)	

Pearson Chi-square, significant p < 0.05

Table II: Comparison of mean rank score in audiovisual group and written & verbal group across the time-point

Group	Baseline	Immediate	1-Month	3-Month	6-Month	Omnibus	Baseline vs immediate	Baseline vs 1- month	1-month vs 3-month	3-month vs 6-month
	Mean rank score					p-value	p-value	p-value	p-value	p-value
AV	1.40	3.97	3.22	3.02	3.40	0.000*	0.000**	0.000**	0.860	0.502
WV	1.42	3.40	3.13	3.42	3.63	0.000*	0.000**	0.000**	0.167	0.202

Friedman test, * p<0.05, Wilcoxon Signed Rank test, **p<0.013

Knowledge Retention

Assessment of knowledge retention in AV and WV groups were conducted by comparing the mean rank score at different time-points. Table II showed the mean rank score in AV and WV groups at baseline, immediately after instruction, one month, three months and six months interval. A Friedman test was conducted and indicated that rankings of score for both AV and WV groups changed significantly across four time-point (p=0.000).

Post hoc analysis showed that for both groups, there were statistically significant difference of questionnaire's score at immediate and one month when compared to questionnaire's score at baseline (p = 0.000). Highest improvement of questionnaire's score can be seen immediately after instruction was given in AV and WV groups. A significant improvement was observed at one month compared to baseline, even though the questionnaire's score at this time was lower than immediate (Table II).

Comparison of knowledge retention between AV and WV was done using a Mann-Whitney test. The results showed in Table III demonstrated that the questionnaire's score in AV group at immediate and one month were significantly higher than those of the WV group, p=0.009 and p=0.016, respectively. Meanwhile, there was no significant difference between both groups at three months (p=0.569) and six months (p=0.472) followed-up.

DISCUSSION

Retention of knowledge can be influenced by many factors i.e. by the sender of information (dentist) or by the receiver of information (patient). The patient's attitude towards information such as their attentiveness, anxiety, and intelligence might influence knowledge retention (6). Gender and ethnicity are not the factors that affecting retention of information (6). In this study, the baseline characteristics of subjects were homogenous and comparable as there was no significant difference in the proportion of gender, ethnicity, and educational status between the two groups. Study by Patel et al (6) also showed that knowledge retention was not affected by age. It is undeniable that participants might have

Table III: Comparison of Mean Rank Score between 2 Groups of Instruction i.e. AV and WV

Examination	Mean rank score		p-value
	Audiovisual (n=30)	Written and verbal (n=30)	
Baseline	29.55	31.45	0.671
Immediate	36.30	24.70	0.009*
1-month	35.85	25.15	0.016*
3-month	31.77	29.23	0.569
6-month	32.08	28.92	0.472

Mann-Whitney U, significant * $p < 0.05$

difference in understanding, thus the questionnaire was designed to be simple and easy to understand by subject of all ages. There was also no significant different of age distribution between 2 groups after randomization.

Apart from patient's factor, other factors that influence the recall of information are the sender's methods of instruction given to the patients. There are various methods are available to deliver information to the patient. Generally, the methods of instruction given to orthodontic patients are in written pamphlets, verbal instruction, oral hygiene demonstration, video (CD/DVD or internet-based application) or the combination of these methods.

Recent studies showed that patients are more likely to retain information given in audiovisual format, in the short term and long-term duration (6,8). Therefore, this study has developed a video i.e. audiovisual method to delivering instructions to orthodontic patients. This study was proposed to evaluate whether this new method of delivering instruction can be suggested for our clinical use in order to reduce chairside time and to be more cost-effective.

There was a paucity of literature available on the duration of knowledge retention in orthodontic patients. Most of the studies had evaluated knowledge retention by comparing the baseline knowledge with short term (immediate after instruction) and long-term knowledge in three weeks duration (8) and was up to eight weeks duration (6,9). In this study, an assessment was made as short-term knowledge retention (immediate after instruction) and long-term knowledge retention (one-, three- and six-months). However, different approach was made to evaluate the knowledge retention, whereby the same instruction was repeated at every time interval as reinforcement (at one-, three- and six-months). This approach almost similar to study by Al-Silwadi et al (10) where they sent a YouTube link to an intervention group as reinforcement. All the patients were supplemented

with written and verbal instructions at an initial consultation. They found that there was a significant improvement in patient's knowledge after eight weeks of intervention by audiovisual. However, in our study, the instruction was repeated in both groups, in order to avoid bias.

A questionnaire is the best method to evaluate knowledge retention as a cognitive domain of learning (8). The format of the questionnaire was adapted from previous studies and was translated into Malay language (4,7). Patients were asked to answer all the questions in Google form, at every time-point.

Improvement of the questionnaire's scores for audiovisual and written & verbal group was the highest at immediate assessment, indicates that both methods were effective in delivering the information to the patients in the short-term. The questionnaire's score in both groups slightly reduced during one-month followed-up, but still, no significant difference noted when compared to baseline. These findings were in accordance with the study by Patel et al, where they found that the questionnaire's score in the visual group and written group slightly decreased after eight weeks (6). This finding proves that the knowledge retention reduces as the time passes, even though no significant difference in scores between immediate and eight weeks assessment (6).

For the comparison between the audiovisual and written & verbal methods, there was no significant difference in the questionnaire's score at baseline, demonstrated that baseline knowledge was similar for all the patients. The audiovisual group scored higher than written & verbal group at immediate and one month, indicate that audiovisual method more effective in knowledge retention than written & verbal. These findings were in accordance with results reported by Moshkelgosha et al (8). They assessed after three weeks of intervention and found that the audiovisual method was more effective and significantly improved dental health knowledge compared to the verbal method. In their study, even though both groups showing an improvement of knowledge from baseline, an audiovisual group showing the significant higher score at immediate and one-month assessment compared to written & verbal group (8). These findings suggested that knowledge retention does not mainly affect by time, but also the methods of instruction. Furthermore, patients with low literacy are more receptive towards audiovisual-based education compared to written & verbal (11).

Comparison of audiovisual and written & verbal showed that patients still can recall the information given, after three months and six months. Patients with low baseline knowledge have improved after receiving the instruction and maintain knowledge throughout the study. This indicates that the patient's knowledge retention was the same for long-term, regardless of the methods of

instruction. Furthermore, repetition of instruction was given after the assessment at specified time-point (one-, three-, and six-months), thus influence the retention of knowledge. A repetition of instruction was decided to be provided because it was unethical to neglect patient with poor oral health.

Furthermore, repeating instruction was suggested to be done once every one to three months to achieve compliance (12). A study by Haleem et al showed that repetition of oral health education was better for memory (13). They observed that, after one year, knowledge retention gained by one-time instruction group was less compared to the group that received repeated instruction. Another study by Ahn et al (14) also suggested that repetition of information need to be done at every follow-up. In their study, they found that knowledge recall was diminished after 6 weeks regardless of any methods of instruction given to the patient.

The audiovisual instruction has more advantage over the written & verbal instruction where it can be used repeatedly, without having additional cost of printing and no human resource needed for delivering the instruction (15). In fact, the short duration of video will reduce the chairside time (16). In this study, the audiovisual instruction only takes about four minutes duration; meanwhile for the written & verbal instruction takes about ten minutes. One to one approach in delivering the instruction is time-consuming and not practical when there is a lot of patients who need to be attended (17).

Thus, due to its effectiveness and advantages, the audiovisual method can be suggested to be used in delivering instruction to orthodontic patients, as well as reinforcement during monthly follow-up in the clinic.

CONCLUSION

Audiovisual and written & verbal methods are effective in short-term and long-term knowledge retention. Significant improvement for both methods was seen at immediate and one-month assessment. The audiovisual method is significantly more effective in improving patient's knowledge retention immediately after instruction and one-month compared to written & verbal method. Repetition of the instruction at specified time-point (one-, three-, and six-months) influence the knowledge retention. Therefore, the audiovisual method is more preferable compared to the written & verbal methods as it can be used repeatedly, without having additional cost of printing, reduce chairside time and no human resources are needed to deliver the instruction.

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