

RESEARCH

Open Access



The effect of educational animation compared to leaflets on patients' knowledge regarding root canal treatment: a randomized controlled trial

Afnan A. Nassar¹, Khalid T. Aboalshamat¹, Bader S. Alsanei², Ahmed S. Alghamdi², Ahmed A. Fudah² and Abdelrahman M. Alhilou^{3*}

Abstract

Background Incorporating video as a tool for education offers a multitude of advantages. However, it is unknown what is the best educational tool to use for increasing public awareness, consequently reducing fear about root canal treatment. For this reason, this study aimed to compare the effectiveness of educational animation and leaflets as delivery methods for providing information on root canal treatment to patients and to assess their ability to retain the information.

Methods One hundred fifty adult volunteers were recruited via social media and Umm Al-Qura University Dental Hospital to participate in this randomized control trial study. The volunteers were divided into the study group (SG) and the control group (CG). The SG was provided with information through animations created by the research team, while the CG received the same information through a leaflet. Pre-intervention (T1), immediate post-intervention (T2), and one-month post-intervention (T3) validated questionnaires were completed by the participants to assess the changes in their knowledge. To evaluate the impact of the information delivery method, the knowledge scores of T2 and T3 were compared to T1 within each group using Paired T-tests. Additionally, the study compared the knowledge scores of the two groups using unpaired T-tests. The significance level was set at a *P*-value of less than 0.05.

Results A significant improvement in endodontic therapy knowledge among the participants in both groups (T1 compared to T2 in the same group) was noted ($P < 0.050$). However, when comparing T2 between groups, no significant difference was found in delivering the information and improving the knowledge ($P = 0.080$). Still, the mean differences between T1 and T2, as well as T1 and T3, were greater ($P < 0.050$) in the SG than in the CG. Furthermore, the total knowledge score in the SG at T3 was significantly higher than the CG.

Conclusion Both educational animation and leaflets are practical tools to increase patients' awareness about root canal treatment. However, educational videos are more effective than leaflets in delivering and retaining information about root canal treatment.

*Correspondence:

Abdelrahman M. Alhilou
amhilou@uqu.edu.sa

Full list of author information is available at the end of the article



© The Author(s) 2024. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

Trial registration This study was retrospectively registered as a randomized control trial at the ISRCTN registry with the document number ISRCTN18413241, 15/05/2023.

Keywords Animation, Education, Endodontics, Knowledge, Pain, Root canal

Background

Oral health is a highly individualized concept heavily influenced by a person's culture and socioeconomic background. It is described as the level of oral and associated tissue health that allows a person to eat, talk, and socialize without active disease, discomfort, or humiliation and contributes to overall health [1]. Dental pain, also known as toothache, is one of the most common oral health issues worldwide, affecting anywhere from 7 to 32% of people. This problem can have negative impacts on the individual suffering from it, as well as on society as a whole, in terms of psychological, social, and economic consequences [2]. Dental pain often results from problems with the pulp or tissues surrounding the tooth, which may require immediate attention such as root canal treatment [3]. Root canal therapy involves cleaning and shaping the root canal to remove inflamed, infected or necrotic pulp tissue. After that, the pulp tissue is replaced with a root-filling material. Eighty-one percent of individuals experience pain that necessitates root canal therapy [4].

Patients often experience concern, anxiety, and fear when faced with the possibility of undergoing root canal treatment. These feelings can create obstacles to receiving necessary care [5]. Various factors can contribute to an individual's dental anxiety. For instance, past traumatic experiences, such as experiencing significant pain during previous dental procedures, can be a significant factor. Additionally, environmental factors like the appearance and noise of dental equipment may also play a role. A low pain threshold is another possible contributor. Furthermore, inadequate communication by the dentist, such as performing procedures without adequate explanation or engaging in malpractices, can also contribute to dental anxiety. Lastly, unfavourable information from others about dental procedures can also impact an individual's anxiety levels [6]. Even though dental patients are becoming more knowledgeable and interested in updates about their treatment, they can still be swayed by unclear or misleading information. This type of information can come from sources like fake ads, rumours, doctors with limited education, or influencers who aren't specialized in dentistry. Unfortunately, over time, this information can become accepted as the norm [7, 8] and potentially impact a patient's decision regarding whether or not to undergo root canal treatment.

A variety of educational resources are available to patients seeking information, including pamphlets, healthcare applications, videos, posters, websites and social media [9]. Among these resources, videos can be an effective tool for patient education due to their numerous potential benefits. It can be less expensive, eliminate educator discrepancies, be delivered in various formats and reach a large audience via social media [10, 11]. Some studies indicate that people retain more information when they read printed materials; others suggest that videos are more effective or that both methods are equally effective [12, 13]. However, it is still being determined what is the best educational tool to use for increasing population awareness and reducing fear about root canal treatment. The potential implications of the study findings may impact clinical outcomes depending on which method is more effective than the other in increasing population awareness and reducing fear about root canal treatment; it could help healthcare providers make better decisions regarding patient education strategies. Using the more effective educational tool identified by the study could improve patient understanding, reduce anxiety, and enhance patient satisfaction with treatment. For these reasons, this randomized controlled trial study aimed to compare the effectiveness of using educational animation and leaflets to deliver information about root canal treatment to patients. Additionally, the study aimed to evaluate the patients' ability to retain the information provided through these methods.

Methods

One hundred and fifty invitations were needed to be sent out for the study in order to account for an expected non-response rate, as 70 participants are required to test the hypothesis at a 0.05 significant level and 0.90 power [14]. Participants were recruited for a single-blinded parallel-group randomized controlled trial using personal invitations to patients at Umm Al-Qura University Dental Hospital or invitations through social media. The recruitment process began on January 4, 2022 and ended on December 1, 2022. This study granted ethical approval from Umm Al-Qura University Institutional Review Board (HAPO-02-K-012-2022-01-906) and a randomized control trail registration from ISRCTN registry (ISRCTN18413241, 15/05/2023). The study included Arabic-speaking individuals who reside in Saudi Arabia,

are 18 years or older, and are capable of using WhatsApp social media platforms. Participants were given a link with background information and written consent. However, participants who did not fully complete all three questionnaires, declined to participate in the study or did not provide their consent by signing the required form were deemed ineligible and, therefore, excluded from the research analysis.

The research study involved two distinct groups: the study group (SG) and the control group (CG). Participants in the SG received an animated video (22.19.54.890115df.mp4—Google Drive) created by the research team that focused on the root canal treatment procedure. Meanwhile, participants in the CG received similar information through a written flyer (<https://pdf.ac/1PsrRZ>). Evaluations were conducted at three different times: before the intervention (T1), immediately after (T2), and one month later for a follow-up to assess their retention of the acquired knowledge (T3). The

participants were given an online consent form and T1 questionnaire to fill out. Once they completed the questionnaire, they were given a link to download either the animation or the leaflet. After downloading, they were asked to fill out the T2 questionnaire. One month later, the final questionnaire (T3) was given to them for completion. Participants completed the questionnaires electronically in Arabic. The questionnaires were divided into two sections. The first section asked for demographic information such as age, gender, occupation, nationality and educational level. Section two evaluated the participants' knowledge of the root canal treatment (Table 1). To evaluate changes in knowledge after receiving information through either a leaflet or animation, the responses to T2 and T3 questionnaires were compared to T1 in both SG and CG. Finally, the two groups were compared to determine any differences between the two methods in terms of knowledge of root canal therapy.

Table 1 Knowledge questions regarding root canal treatment

Question	Answer options
1- What is dental pulp? (1 point)	It is the tissues inside the tooth ^a It is the tissues surrounding the tooth It is the part responsible for anchoring the tooth in its place I don't know
2- What is dental pulp function? (1 point)	It is the part responsible for forming the enamel It is the part responsible for nourishing the tooth and forming the dentin ^a I don't know
3- What are the symptoms of dental pulpitis? (3 points) ^b	Pain while breathing ^a Pain while talking ^a Pain while drinking cold drinks ^a I don't know
4- What is root canal treatment? (1 point)	It is the removal of infected pulp and bacteria ^a It is the treatment of infected pulp via medication It is the removal of caries from the tooth I don't know
5- What is the goal of root canal treatment? (1 point)	Preserve the tooth ^a For cosmetic reasons only To stop the bleeding from the tooth I don't know
6- Why do we use radiographs during the root canal treatment? (2 points) ^b	To check the quality of the root canal treatment ^a To locate the pulp ^a To check the condition of the gums I don't know
7- What is the benefit of a dental rubber dam? (1 point)	To stop the entrance of the saliva and bacteria ^a To anchor the tooth during the root canal treatment To stop the patient from closing his mouth during the root canal treatment I don't know

^a Correct answer

^b In this question, the participant can choose more than one choice

The questionnaire went into a pilot phase of 20 participants. The questionnaire was face-validated in terms of syntax, language, flow, logic content and understandability. The questionnaire was adopted from previous research [15, 16] with modification that was made after receiving the comments from the participants in the pilot phase for clarity and understanding.

The person responsible for assessing the outcome was blinded to prevent any bias or influence on the assessment. While participants were not blindfolded due to practical constraints, which is the nature of the interventions (educational animation and leaflets), additional measures were taken to minimize potential biases. Such as, participants were instructed not to discuss their assigned intervention, and the assessor was not in contact with any of the participants. Statistical analysis of the data was done using statistical SPSS Statistical software (IBM Corp., version 27, Armonk, NY, USA). The data was clarified using descriptive statistics. Paired T-tests were conducted to analyze the statistical variations in knowledge and attitude scores for each group. This was done by separately comparing the responses of each group to the T2 and T3 questionnaires with their responses to the T1 questionnaire. Additionally, an unpaired t-test was employed to compare the knowledge scores between groups. A significance level was established at a *P*-value lower than 0.05.

Results

Out of 150 invited participants, 133 completed the T1 questionnaire, resulting in a response rate of 88.7%. The process of randomization involved using computer-generated software (<https://www.randomizer.org>) to generate two sets of unique numbers, ranging from 1 to 133. The SG consisted of 65 participants, while the CG had 66 participants.

In the SG, only 57 out of 65 participants responded to the T2 questionnaire, whereas in the CG, 35 out of 66 participants responded. However, for the T3 questionnaire, the SG had 52 respondents, while the CG had 24 respondents. The study had a total of 57 participants who dropped out (Fig. 1).

Analysis was carried out on those who completed all the T1, T2, and T3 questionnaires. A total of 76 participants answered all questionnaires (T1, T2, and T3). Their demographic data are displayed in Table 2. Participants mean (*m*) age was 24.20 years with standard deviation (*SD*) of 5.15. There was no significant difference in nationality, gender or education between SG and CG, as determined by chi-square, Fisher's exact test, and t-test.

According to the results of the paired t-test, the total knowledge score for SG significantly increased from T1 to T2 ($P < 0.001$) and from T1 to T3 ($P < 0.001$). However,

there was no significant change from T2 to T3 ($P = 0.802$). Meanwhile, for CG, there was a significant increase in the total knowledge score from T1 to T2 ($P < 0.012$) but no significant change from T1 to T3 ($P = 0.102$) or from T2 to T3 ($P = 0.057$). These findings were further confirmed by a post-hoc test of related samples using the Wilcoxon Signed Tank test.

Using t-test, SG and CG were not statistically different in T1 or T2 total knowledge score. However, as shown in Table 3 and Fig. 2, SG was significantly higher for T3 total knowledge score compared to CG. Also, using t-test, the mean difference from T1 to T2 and the mean difference from T1 to T3 were statistically higher in SG than found in CG. However, the mean difference from T2 to T3 was not statistically difference between SG and CG, as shown in Table 3. All these results were confirmed by a post hock test of related samples Mann–Whitney U test. When the participants in the SG were asked about receiving the educational animated video, they had their answers as shown in Table 4.

Discussion

The study discovered that educational animations and leaflets increased the knowledge of endodontic therapy at T2, indicating that both delivery methods directly affected participants' knowledge. At T2, there was no significant difference observed between the groups. Still, the mean differences between T1 and T2, as well as T1 and T3, were greater in the SG than the CG. This suggests that the animation video is better at delivering information than the leaflet.

Finally, at T3, the score for total knowledge was significantly higher in the SG compared to the CG. There was no notable difference in the CG between T1 and T3, while the SG did, highlighting the effectiveness of education animation compared to leaflets in retaining information.

The main aim of the current study was to compare two different methods of delivering information about root canal treatment. This was done by presenting participants with either a customized animation video that elucidates the root canal procedure or a brochure conveying the same information. The study demonstrated that participants' knowledge exhibited enhancement when both methods were employed, with notably greater improvement observed when animation was utilized. This finding is consistent with a previous interventional study, which involved randomly assigning patients undergoing surgical operation under general anesthesia to one of three groups: a standard pre-anaesthetic interview, an interview with a brochure, or an interview with a self-made documentary video. Following preanesthetic visit, each patient's level of information gain was measured

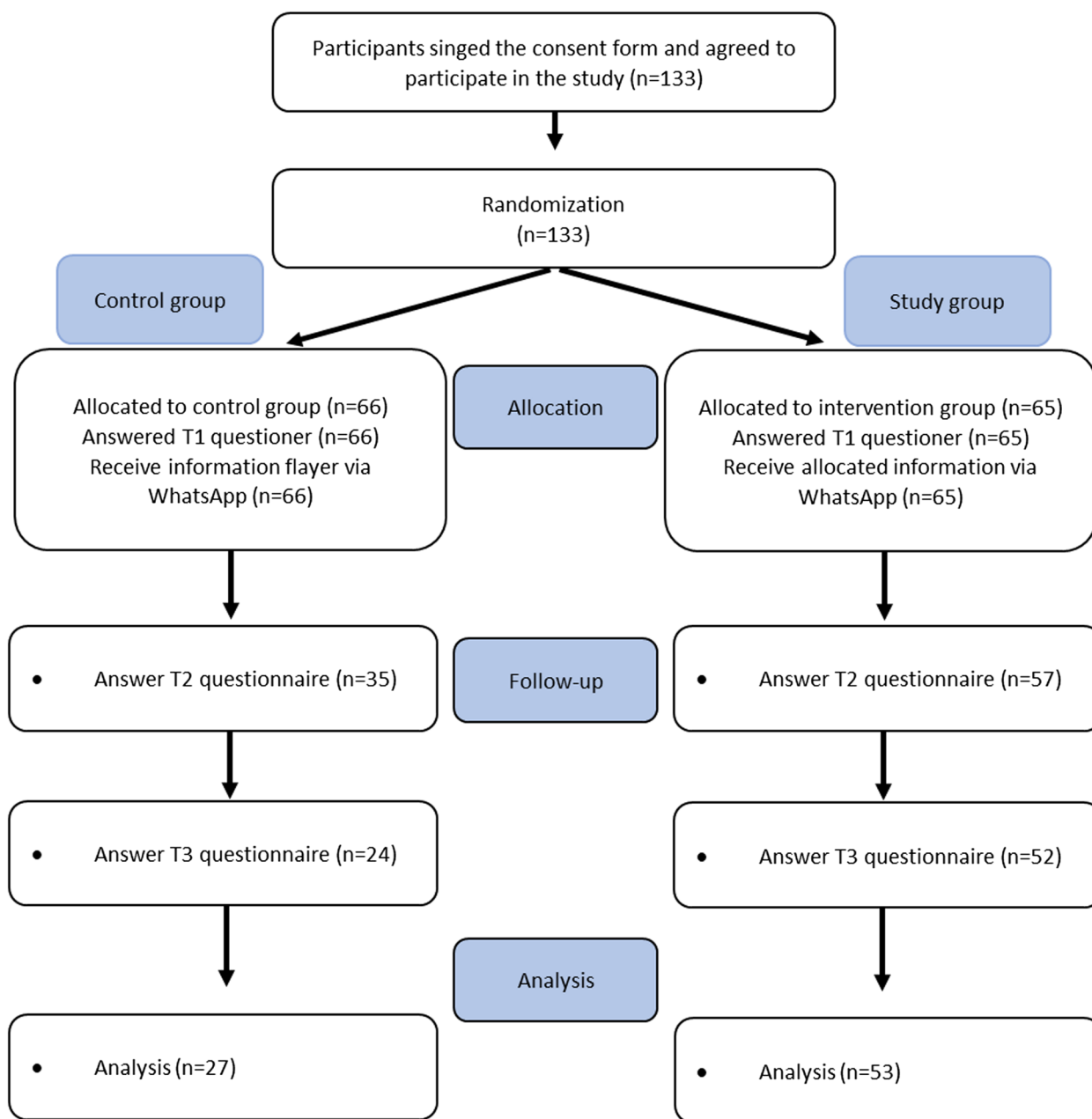


Fig. 1 Participant interaction flowchart

using a questionnaire for each method. Out of the groups who received the information, the ones who watched the video had the highest score of 93% for information gain. On the other hand, the brochure group only scored 80% [17]. In a recent systematic review and meta-analysis that aimed to assess the efficacy of visual-based interventions in enhancing the understanding of health-related material among clinical populations (specifically adults aged 18 and older), a total of 28 studies were examined. The majority of these studies

consisted of randomized controlled trials focusing on health literacy and health knowledge. The analysis revealed that visual-based interventions, particularly the use of videos, significantly improve the comprehension of health-related information when compared to written materials ($p < 0.001$) [18]. According to our research, the average knowledge score immediately following the dissemination of root canal information via animated videos was 7.38. In comparison, the score was 6.75 when information was delivered through leaflets. Although

Table 2 Participants’ demographic data and their awareness of root canal treatment procedures

Variable	Subgroup	N	%
Group	Study group	52	68.42%
	Control group	24	31.58%
Gender	Male	35	46.05%
	Female	41	53.95%
Nationality	Saudi	67	88.16%
	Non-Saudi	9	11.84%
Education	High school or less	18	23.68%
	Bachelor or higher diploma	49	64.47%
	Higher education	9	11.84%
Income	5,000 Saudi Riyal or less	43	56.58%
	5,000—10,000 Saudi Riyal	15	19.74%
	more than 10,000 Saudi Riyal	18	23.68%
What do you know about root canal treatment?	I know a lot	12	15.78%
	I ask about the details	32	42.10%
	I am not interested	8	10.52%
	I do not know anything	12	15.78%
	I know from the media	12	15.78%

The number of participants (N) and their percentages (%) are presented

Table 3 Participants total knowledge score in T1, T2 and T3 and the difference between them

	SG		CG		P-value
	Mean	SD	Mean	SD	
T1	5.54	1.71	5.79	1.18	0.456
T2	7.38	0.80	6.75	1.62	0.080
T3	7.35	1.03	6.33	1.43	0.004
the mean difference from T1 to T2	1.85	1.79	0.96	1.73	0.045
the mean difference from T1 to T3	1.81	1.86	0.54	1.56	0.003
the mean difference from T2 to T3	0.04	1.10	0.42	1.02	0.149

SG Study group, CG Control group

having video for information delivery scored higher than using leaflets there were no statistical differences between them. This can be due to the included pictures in leaflets that were not solely composed of written information, which may have enhanced comprehension and reduced the difference in effectiveness between the two methods. Hence, using videos or pictures enhanced brochures to supplement a patient with root canal information are both effective information delivery techniques.

One objective of the study was to assess the comprehension of participants regarding the root canal treatment process. The current study found that 15% of participants lacked knowledge about root

canal treatment and only 15% knew about it through the media. Studies have yielded varying percentages regarding patient awareness of root canal treatment. A study carried out in 2017 revealed that 29% of patients were not familiar with root canal procedures, and only 7% had heard about it through the media. Another study conducted with a Syrian population by the same author found that 25.3% of respondents were unfamiliar with the treatment [7, 19]. Furthermore, a study conducted with a Kashmiri population indicated that only 10% of questionnaire respondents were aware of the procedure, with 10% of those having learned about it from the media [20]. In a recent study, a moderate level of awareness about endodontic treatments was observed among patients in both urban and rural settings, with 50% of urban participants and 54% of rural participants gaining knowledge through social media and the internet [21]. These results indicate that patients have become more knowledgeable about endodontic treatment over the years. Surprisingly, although technology has made it easier for patients to access healthcare information through videos, the internet, and other electronic devices, low percentages of patients have been found to gather information about root canal treatment from these sources. Hence, it may be inferred that media may not currently serve as the predominant channel for acquiring knowledge on root canal treatment.

There is a lack of consensus in the medical field about the best way to convey information and help patients remember it. Some studies show that people remember more information when they read it on paper instead of watching a video [12]. Other studies suggest that videos are more effective than printed leaflets [13, 22], or that paper and video are equally effective [23]. Another aim of the study was to determine whether educational animations or leaflets are more effective in helping patients remember information about root canal therapy. The information given to each group was compared after one month to assess the effectiveness of each method. The results revealed that the group who watched the animated video had a significantly higher total knowledge score than those who read the leaflet. The group who watched the video also showed a greater difference in knowledge retention between the initial assessment and the one-month follow-up. Animated videos provide a dynamic visual representation that offers an immersive and interactive learning experience, enabling patients to better comprehend the intricate steps and concepts involved in a procedure. The audio-visual format of animated videos allows for the sequential presentation of information, facilitating easier understanding and retention of key

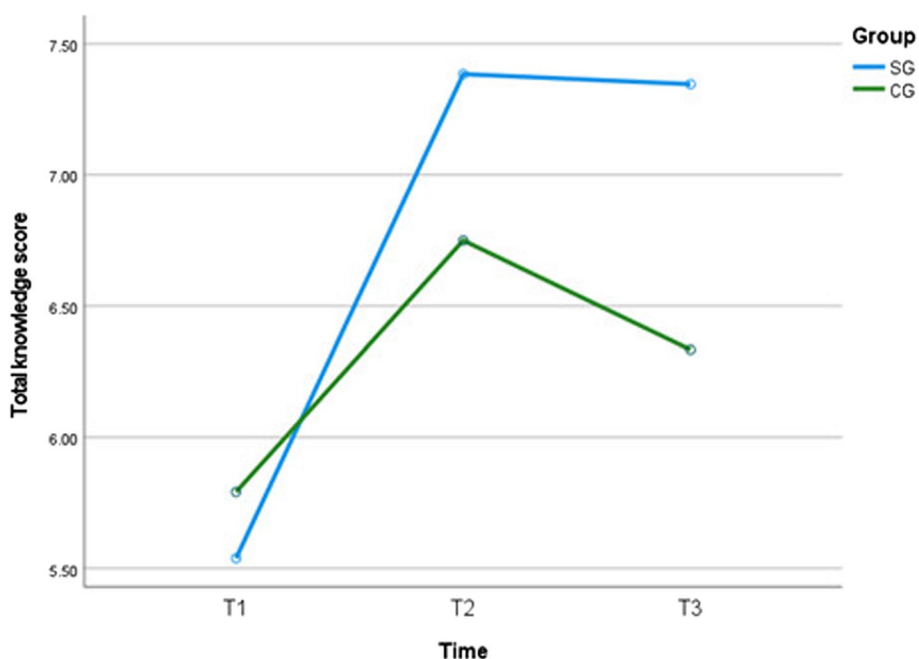


Fig. 2 Changes in root canal treatment total knowledge score in T1, T2 and T3

Table 4 The table presents the participants’ experience and percentage feedback on an animated video for root canal treatment. The mean standard deviation (SD) scores are also reported

	What do you think of teaching oral health information via animated videos?	Was the information in the animated video clear and easy to understand?	Do you agree to use educational animated video instead of conventional brochures?
Very satisfied	29 (55.77%)	26 (50.00%)	18 (34.62%)
Satisfied	19 (36.54%)	22 (42.31%)	17 (32.69%)
Neutral	4 (7.69%)	3 (5.77%)	12 (23.08%)
Unsatisfied	0 (0%)	1 (1.92%)	5 (9.62%)
Very unsatisfied	0 (0%)	0 (0%)	0 (0%)
Mean (SD)	4.48 (0.64)	4.4 (0.69)	3.92 (0.99)

concepts [10–13]. As a result, the engaging nature of animated videos may enhance patient comprehension and retention of information, leading to improved knowledge acquisition and long-term retention, compared to static text-based materials such as leaflets.

The present randomized trial is subject to limitations that warrant discussion. Specifically, one limitation is the occurrence of dropout, which could impact the validity of the results. In addition, the subjectivity of survey responses may also be regarded as a limitation, given that the interpretation of questions on a survey may vary significantly based on respondents’ personal experiences, perspectives, and understanding of the subject matter. Furthermore, the responses provided may be influenced by various factors, including but

not limited to mood, environment, and context at the time of completing the survey [24]. Moreover, since participants were recruited exclusively from a particular region, the generalization of our findings to a wider population may be limited. However, our study’s outcomes can still provide essential insights into the efficacy of educational tools for patient education on root canal treatment. To improve the external validity of the findings, future research could aim to recruit participants from diverse geographic locations.

Conclusion

Educational animation and leaflets are both useful in increasing patients’ awareness of root canal treatment. However, educational animation substantially affects

participants' ability to retain the information more than leaflets. Therefore, utilizing educational animation can improve and retain community knowledge about endodontic therapy.

Abbreviations

SG	The study group
CG	The control group
T1	Pre-intervention
T2	Immediate post-intervention
T3	One-month post-intervention
N	The number of participants
%	Their percentages
SD	Standard deviation

Acknowledgements

Not applicable.

Informed consent

Informed consent was obtained from all subjects.

Authors' contributions

AN and KA contributed to conceptualization, methodology, statistical analysis and results. AA contributed to writing the original draft. BS, AS and AF contributed to Project administration. Finally, all authors read and revised the manuscript prior to submission.

Funding

"This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors."

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study granted ethical approval from Umm Al-Qura University Institutional Review Board (HAPO-02-K-012-2022-01-906) and a randomized control trial registration from ISRCTN registry (ISRCTN18413241, 15/05/2023).

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

¹Department of Preventive Dentistry, College of Dental Medicine, Umm Al-Qura University, Makkah, Saudi Arabia. ²Dental Intern, Faculty of Dental Medicine, Umm Al-Qura University, Makkah, Saudi Arabia. ³Department of Restorative Dentistry, College of Dental Medicine, Umm Al-Qura University, Makkah, Saudi Arabia.

Received: 31 October 2023 Accepted: 23 July 2024

Published online: 29 July 2024

References

- Petersen PE. The World Oral Health Report 2003: continuous improvement of oral health in the 21st century—the approach of the WHO Global Oral Health Programme. *Commun Dent Oral Epidemiol.* 2003;31:3–24.
- Pau AK, Croucher R, Marcenes W. Prevalence estimates and associated factors for dental pain: a review. *Oral Health Prev Dent.* 2003;1(3):209–20.
- Hasler J, Mitchell D. Analysis of 1628 cases of odontalgia: a corroborative study. *J Indianapolis Dent Soc.* 1963;17:23–5.

- Pak JG, White SN. Pain prevalence and severity before, during, and after root canal treatment: a systematic review. *J Endod.* 2011;37(4):429–38.
- Wong M, Lytle WR. A comparison of anxiety levels associated with root canal therapy and oral surgery treatment. *J Endod.* 1991;17(9):461–5.
- Ter Horst G, De Wit C. Review of behavioural research in dentistry 1987–1992: dental anxiety, dentist-patient relationship, compliance and dental attendance. *Int Dent J.* 1993;43(3 Suppl 1):265–78.
- Doumani M, Habib A, Qaid N, Abdulrab S. Patients' awareness and knowledge of the root canal treatment in Saudi population: survey-based research. *Pain.* 2017;44(52):47.
- Janczarek M, Cieszko-Buka M, Bachanek T, Chalas R. Survey-based research on patients' knowledge about endodontic treatment. *Pol J Public Health.* 2014;124(3):134–7.
- Levin L, Zadik Y. Education on and prevention of dental trauma: it's time to act! *Dent Traumatol.* 2012;28(1):49–54.
- Krouse HJ. Video modelling to educate patients. *J Adv Nurs.* 2001;33(6):748–57.
- Nathoo D. Video material as an effective educational tool to address informational and educational needs of cancer patients undergoing radiation therapy. *J Cancer Educ.* 2017;32:219–27.
- Byrne M, Curtis R. Designing health communication: testing the explanations for the impact of communication medium on effectiveness. *Br J Health Psychol.* 2000;5(2):189–99.
- Barkhordar A, Pollard D, Hobkirk JA. A comparison of written and multimedia material for informing patients about dental implants. *Dent Update.* 2000;27(2):80–4.
- O'Sullivan LM, Ahmed N, Sidebottom AJ. Dental pain management - a cause of significant morbidity due to paracetamol overdose. *Br Dent J.* 2018;224(8):626–34.
- Bansal R, Jain A. An insight into patient's perceptions regarding root canal treatment: a questionnaire-based survey. *Journal of family medicine and primary care.* 2020;9(2):1020–7.
- Iyer A, Nair R, Gupta P, Tavane PN, Pawar P. Dental patient's knowledge, awareness and attitude towards root canal treatment: a survey based research. *Int J Recent Sci Res.* 2018;9(1):23214–8.
- Snyder-Ramos SA, Seintsch H, Böttiger BW, Motsch J, Martin E, Bauer M. Patient satisfaction and information gain after the preanesthetic visit: a comparison of face-to-face interview, brochure, and video. *Anesth Analg.* 2005;100(6):1753–8.
- Galmarini E, Marciano L, Schulz PJ. The effectiveness of visual-based interventions on health literacy in health care: a systematic review and meta-analysis. *BMC Health Serv Res.* 2024;24(1):718.
- Habib A, Doumani M, Al saysd T, Shamsy E, Heskul M, Abdulrab S, et al. Dental patients' knowledge and awareness about root canal treatment in Syrian population: Survey-based research. *Int J Recent Sci Res.* 2017;8(10):20583–6.
- Purra AR, Sajad M, Ahangar FA, Farooq R. Patient's awareness and knowledge of the root canal treatment in Kashmiri population: a survey-based original research. *Int J Contemp Med Res.* 2018;5(7):G12–5.
- Sayed A, Joshi P, Lobo W, Patade T, Pansare A, Sapkale K. Knowledge and attitude of urban and rural patients towards endodontic treatment: a questionnaire-based Study. *Clin Dent (0974-3979).* 2024;18(1):12.
- Stalonas PM, Keane TM, Foy DW. Alcohol education for inpatient alcoholics: a comparison of live, videotape and written presentation modalities. *Addict Behav.* 1979;4(3):223–9.
- Campbell FA, Goldman BD, Boccia ML, Skinner M. The effect of format modifications and reading comprehension on recall of informed consent information by low-income parents: a comparison of print, video, and computer-based presentations. *Patient Educ Couns.* 2004;53(2):205–16.
- Askim K, Knardahl S. The influence of affective state on subjective-report measurements: evidence from experimental manipulations of mood. *Front Psychol.* 2021;12:601083.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.