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Research Article

Impact of Short-Duration Video Intervention to Improve Knowledge of Dental Malocclusion Among High School Students: Lessons from A Time-Constrained Study

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KEYWORDS

Educational intervention, high school student, knowledge, malocclusion.

ABSTRACT

Introduction: This study aimed to evaluate the effectiveness of a video-based educational intervention for improving knowledge of dental malocclusion among students at SMAN 39, Jakarta, and to examine the associations between knowledge levels and sociodemographic factors.
Materials and Methods: A quasi-experimental design involving 159 students was employed. Data were collected via structured pre-test and post-test questionnaires assessing students' knowledge of dental malocclusion. Statistical analyses included the Wilcoxon signed-rank test, Mann–Whitney U test, and Spearman correlation coefficient to examine associations between variables.
Results and Discussion: All 159 participants completed both the pre-test and post-test. A statistically significant improvement in knowledge was observed following the intervention (p = 0.001). While sex, age, and socioeconomic status were not significantly associated with baseline knowledge, the post-intervention results indicated that female students, older age groups, and students from higher-income households demonstrated significantly greater knowledge retention (p-value < 0.05).
Conclusion: Video-based interventions effectively enhanced student's knowledge of dental malocclusion; however, the extent of improvement varied across sociodemographic groups. These findings suggest that sex, age, and socioeconomic status may influence educational outcomes. Future oral health education initiatives should consider these factors to increase the effectiveness and inclusivity of digital learning interventions.

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INTROODUCTION

Malocclusion is a prevalent dental condition among adolescents,[1] with its prevalence and severity varying across different populations.[2] In Indonesia, several studies have assessed dental malocclusion, which is still a major problem among adolescents.[3,4] A study in Banjarmasin assessed the complexity of malocclusion in adolescents aged 15–18 years and revealed that the majority of respondents presented with mild malocclusion.[3] In Manado, research among high school students indicated that 66% of participants presented with malocclusion classified as Angle Class I Dewey modification types 1 and 2.[4] Furthermore, a study conducted in Lithuania explored the relationships among dental caries, malocclusion, and oral health-related quality of life in adolescents aged 15–18 years and reported that 27.7% of participants required orthodontic treatment due to malocclusion.[5]

Dental malocclusion can result in a range of issues, including discomfort, challenges in maintaining proper oral hygiene, and potential psychological impacts, particularly concerning social interactions and self-esteem.[6] Despite the proficiency of dental professionals in managing and treating malocclusion, educating adolescents about this condition is crucial for early detection and intervention. High school students must understand the importance of malocclusion and the role of orthodontic treatment in promoting optimal oral health.[7] A survey conducted in Indonesia revealed that most students possess limited knowledge regarding malocclusion and the available treatment options, potentially hindering their willingness to seek professional care.[8] Conversely, a study in Saudi Arabia demonstrated that while awareness of orthodontic needs has increased among school children, misconceptions about the treatment process and its necessity persist.[9]

As digital natives, high school students are particularly adept at visual learning, which can be leveraged to enhance their understanding of complex topics such as malocclusion.[10] Research has shown that video-based learning significantly improves health literacy and the comprehension of health-related material compared with traditional teaching methods.[10,11] Guo et al. reported that short educational videos (under six minutes) effectively sustain engagement and enhance retention.[12] A study conducted among adolescents in Tehran reported a 37% improvement in oral cleanliness and a 64% reduction in gingival bleeding following video-based oral health education, highlighting the effectiveness of video interventions in driving positive behavioral changes and improving oral health outcomes.[13] The dynamic nature of video, with its ability to integrate visuals, animations, and interactive elements, can capture student attention and present complex concepts in a more accessible and relatable manner.[14] Additionally, the flexibility of video platforms allows for personalized learning, enabling students to progress at their own pace and revisit challenging concepts as needed.[15]

Despite existing research on the association between oral health literacy and knowledge, investigations into the impact of video interventions on adolescents' understanding of dental malocclusion are limited.[16] While studies suggest that hands-on oral health training programs are beneficial for individuals with lower education and literacy levels, the effectiveness of video-based educational interventions on oral health literacy remains controversial.[17,18] It is vital to explore how video-based interventions can improve oral health knowledge and beliefs among adolescents. This study aimed to contribute to a deeper understanding of the effectiveness of a video-based educational intervention in improving high school students' knowledge of dental malocclusion.

MATERIALS AND METHODS

A quasi-experimental design with a one-group pre-test and post-test was employed to evaluate the effectiveness of the video intervention. This study was conducted at SMAN 39 Jakarta in January 2025 and involved students from grades 10 to 12. Sample size determination was performed using G*Power software, with parameters set at a medium effect size ($f = 0.25$), $\alpha = 0.05$ and $\beta = 0.80$[19], resulting in 159 participants. A convenience sampling method was employed, and students who did not provide informed consent or

completed only one phase of the survey (either pre- or post-intervention) were excluded from analysis. Ethical approval was obtained from the Dental Research Ethics Committee, Faculty of Dentistry, Universitas Indonesia (Protocol Number: 010010125).

Data were collected via a structured, self-administered questionnaire distributed via Google Forms. The questionnaire comprises two sections: sociodemographic data and dental malocclusion knowledge. Following the pre-intervention survey, participants were directed to a 12-minute educational video that addressed the definition, risk factors, etiological factors, clinical manifestations, consequences, preventive strategies, and treatment options fordental malocclusion.[20,21] The content of the video was developed based on a comprehensive literature review and was subsequently reviewed by the research team to ensure accuracy, clarity, comprehensiveness, and logical flow. Each knowledge question was scored as either correct (5 points) or incorrect (0 points), with a maximum possible score of 20. The participants were categorized based on their total scores as follows: scores ≤ 50 indicated poor general knowledge, scores of 51–75 indicated average general knowledge, and scores ≥ 76 indicated good general knowledge. Socioeconomic status was assessed based on parental income, categorized relative to the regional minimum wage in 2025 (IDR 5.396.761).[22]

The data were exported from Google Forms into Microsoft Excel, coded, and subsequently analyzed via IBM SPSS Statistics for Windows, Version 23.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including means and standard deviations for continuous variables and frequencies and percentages for categorical variables, were calculated. The Wilcoxon signed-rank test was employed to evaluate differences in knowledge scores before and after the intervention. Additionally, the Mann–Whitney U test and Spearman correlation coefficient test were used to examine associations between participants' characteristics and knowledge levels. A p value of less than 0.05 was considered indicative of statistical significance.

RESULTS AND DISCUSSION

Numerous studies have reported that dental malocclusion can adversely impact quality of life among adolescents.[5,23,24] The prevalence of Angle Class I, Class II, and Class III malocclusions varies widely, with mean prevalence rates reported at 51.9%, 23.8%, and 6.5%, respectively, among healthy children and adolescents.[25] Raising awareness about dental malocclusion and the potential benefits of orthodontic treatment is therefore critical, particularly through accessible and engaging platforms such as digital media. To the best of our knowledge, this is the first study conducted in Indonesia that investigated the effectiveness of a video-based educational intervention in improving high school students' knowledge of dental malocclusion.

The sociodemographic characteristics of all the participants are shown in Table 1. Most of the participants were female (59.75%). The majority of the participants were 16 years of age (47.17%). This age distribution aligns with the typical demographic profile of Indonesian high school students, supporting the representativeness of the sample. Approximately 26.41% of the participants reported family incomes below the minimum wage.

Table 1. Participant characteristics

Respondents Characteristics	N (%)
Sex	
Male	64 (40.25)
Female	95 (59.75)
Age	
15 years old	25 (15.72)
16 years old	75 (47.17)
17 years old	39 (24.53)
18 years olds	20 (12.58)
Income	
< Minimum wage	42 (26.41)
= Minimum wage	61 (38.36)
≥ Minimum wage	56 (35.25)

In the pre-intervention assessment, 73 participants (45.9%) demonstrated a good level of knowledge regarding dental malocclusion. However, this number declined to 53 participants (33.3%) in the post-intervention assessment. In contrast, the proportion of participants categorized as having average knowledge increased from 69 (43.4%) in the pre-test to 82 (51.6%) in the post-test, indicating a shift in knowledge levels from good to average following the intervention. Additionally, the

proportion of participants classified as having poor knowledge slightly increased, from 17 participants (10.7%) in the pre-test to 24 participants (15.1%) in the post-test. A slight decline was also observed in the median knowledge scores after the intervention. The median score in the pre-test was 75 (range: 15–100), which decreased to 70 (range: 15–90) in the post-test. (Table 2) The mean pre-test knowledge score was 75.4 ± 16.0, which significantly decreased to 69.1 ± 16.8 on the post-test. The Wilcoxon signed-rank test revealed that this difference was statistically significant between the pre-test and post-test scores (p value = 0.001). The hypothesis that knowledge affects beliefs is still controversial. Some research has shown that oral health education is less effective in changing the beliefs of participants than in changing their knowledge or practices.[26] The limited duration of the video-based intervention may have restricted participants' ability to fully assimilate and internalize the information provided.[27,28] Cognitive load theory posits that working memory has a finite capacity for processing new information.[29] Consequently, the condensed nature of the educational video may have overwhelmed cognitive resources, impeding deep learning and retention.[30] The lack of repetition and insufficient depth in content delivery likely further contributed to the observed decline in post-test performance.[31] Research indicates that student engagement with educational videos peaks at approximately six minutes; attention and retention diminish significantly beyond this threshold.[12] Therefore, video-based learning tools must be designed with a careful balance between content volume, engagement, and reflection to optimize learning outcomes.[32] Short, information-dense videos—such as the one used in this study—may compromise learners' ability to retain material effectively, resulting in reliance on surface-level recall during assessments.

Table 2. Distribution of knowledge levels on the basis of pre-test and post-test questionnaire scores

Knowledge Level	Pre-test	Post-test
	N (%)	N (%)
Knowledge Category		
Good	73 (45.9)	53 (33.3)
Moderate	69 (43.4)	82 (51.6)
Poor	17 (10.7)	24 (15.1)
Median (min–max)	75 (15-100)	70 (15-90)

In the post-test assessment, female participants demonstrated higher knowledge levels than their male counterparts did. Specifically, 44.2% of females achieved a good level of knowledge. In contrast, the poor knowledge category was significantly more prevalent among males, with 25.0% falling into this group. An analysis on the basis of age revealed that participants aged 18 years represented the highest proportion of good knowledge (50.0%). The average knowledge level was most common among 15-year-olds (64.0%). Notably, the poor knowledge category was most frequently observed among 16-year-olds (18.7%) and 17-year-olds (12.8%). Parental income also appeared to influence post-test knowledge outcomes. The participants whose parents earned income equivalent to the minimum wage had the highest proportion of good knowledge (37.8%), followed by those from households earning less than the minimum wage (34.0%) and those earning above the minimum wage (29.2%). The average knowledge level was most prevalent among participants from families earning less than the minimum wage (49.1%) and was similarly high among those with income equal to the minimum wage (50.3%). Interestingly, the poor knowledge category was more common among participants from lower-income households (17.0%), and only 7.2% of participants from higher-income households were categorized as having poor knowledge. (Table 3)

Table 3. Distribution of post-test knowledge levels among participants according to sociodemographic and economic characteristics

Knowledge level in post-test			
Variables	Good	Moderate	Poor
	N (%)	N (%)	N (%)
Sex			
Male	11 (17.2)	37 (57.8)	16 (25.0)
Female	42 (44.2)	45 (47.4)	8 (8.4)
Age			
15 years old	6 (24.0)	16 (64.0)	3 (12.0)
16 years old	22 (29.3)	9 (52.0)	14 (18.7)
17 years old	15 (38.5)	19 (48.7)	5 (12.8)
18 years old	10 (50.0)	8 (40.0)	2 (10.0)
Parents' Income			
< Minimum wage	18 (34.0)	26 (49.1)	9 (17.0)
= Minimum wage	31 (37.8)	25 (30.5)	26 (31.7)
≥ Minimum wage	7 (29.2)	10 (41.7)	7 (29.2)

Table 4 presents the associations between participants' knowledge and their sex, age, and household income. With respect to sex, there was no statistically significant difference in pre-test scores between males (71.56 ± 18.7) and females (76.53 ± 13.8) (p value = 0.127). However, a significant difference was observed in the post-test scores (p value = 0.006), with females scoring notably higher (73.63 ± 12.7) than males (63.27 ± 17.5). Females outperformed males in the post-test, indicating a potentially greater capacity for knowledge retention. Research suggests that males and females may employ different cognitive strategies in learning contexts.[33,34] For example, females are often reported to have stronger verbal memory and detailed processing abilities, whereas males may exhibit strengths in spatial and holistic processing. These cognitive differences, alongside sociocultural influences, may contribute to the observed disparity in learning outcomes.[35]

There is no significant differences were found in the pre-test scores across age groups (p value = 0.129). In contrast, post-test scores varied significantly by age (p value = 0.012, r = 0.198), with a weak positive correlation indicating that older participants generally achieved higher scores of knowledge. Age appeared to significantly influence knowledge retention. While pre-test scores did not vary significantly across age groups, post-test scores improved with increasing age, with older students consistently achieving higher scores. This suggests that cognitive maturity may enhance the ability to process, retain, and apply newly acquired knowledge. This finding aligns with those of previous studies that identified a positive correlation between age and oral health knowledge.[26]

With respect to household income, pre-test scores did not differ significantly between participants from households earning below the minimum wage (76.07 ± 13.2) and those earning above it (73.97 ± 17.0) (p value = 0.758). However, post-test scores were significantly higher among participants from higher-income households (70.13 ± 16.1) than among those from lower-income households (66.07 ± 14.5) (p value = 0.047). Socioeconomic status also emerged as a significant factor influencing post-test performance. Students from higher-income households scored better than their lower-income counterparts did. This discrepancy may be attributed to varying access to educational resources and conducive learning environments.[36] While students from higher-income families may enter the intervention with stronger foundational knowledge, the brevity of the educational content might not be sufficient to build significantly upon that base. Conversely, students from lower-income backgrounds may face additional barriers, such as limited access to technology, suboptimal learning environments, and lower baseline knowledge, all of which could inhibit their ability to benefit from a short, digital intervention.[37]

Table 4. Associations between knowledge scores and sociodemographic characteristics among participants

Variables	N	Knowledge Mean (SD) Pre-test	*p* value	Post-test	*p* value
Sex[a]			0.127		0.006*
Male	64	71.56		63.27	
Female	95	(18.7)		(17.5)	
		76.53		73.63	
		(13.8		(12.7)	
Income[a]			0.758		0.047*
< Minimum wage	42	76.07 (13.2)		66.07 (14.5)	
≥Minimum wage	117	73.97 (17.0)		70.13 (16.1)	
Age[b]		r_s = 0.121	0.129	r_s = 0.198	0.012*

[a]Mann–Whitney test, [b]Spearman correlation test, *statistically significantly different p value < 0.05

Several limitations should be acknowledged. First, the nonrandom selection of participants may limit the generalizability of the findings. Second, reliance on self-reported data, although practical for knowledge assessment, is susceptible to bias, including socially desirable responses. Furthermore, the assumption that all participants had equal access to and familiarity with digital platforms may not hold true, thereby introducing variability in the learning experience. Finally, the short interval between the pre- and post-tests may not have allowed sufficient time for knowledge consolidation and behavioral change. Future studies should aim to address these limitations by incorporating longer follow-up periods, random sampling, and potentially integrated mixed-method approaches to capture deeper insights.

CONCLUSION

The present study demonstrated that video-based educational interventions can influence adolescents' knowledge of dental malocclusion; however, their effectiveness varies significantly across demographic subgroups. While there was a reduction in the proportion of students classified as having good knowledge postintervention, the increase in the average knowledge category suggests redistribution rather than an absolute decline, potentially reflecting differences in cognitive processing and retention. Notably, female and older participants presented greater postintervention knowledge gains, indicating that sex and age are influential factors in knowledge acquisition. Additionally, students from higher socioeconomic backgrounds performed better, underscoring the role of social determinants in educational outcomes.

These findings underscore the importance of developing educational strategies that are sensitive to demographic variability, particularly in terms of cognitive maturity, learning preferences, and access to resources. Future interventions should consider extending the duration and frequency of exposure, incorporating culturally relevant and pedagogically sound multimedia content, and ensuring equitable access to digital learning environments. Such refinements may enhance the depth of information processing, promote sustained engagement, and ultimately lead to more meaningful improvements in oral health literacy among adolescents.

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