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Effect of Dental Health Education Media Using Posters on Knowledge of Oral and Dental Care Among Patients

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Abstract

Low public awareness regarding oral hygiene can lead to a high prevalence of dental diseases such as caries and periodontal conditions. Health education using appropriate media is expected to improve public knowledge, one of which is through poster media. Objective: To determine the effect of dental health education using poster media on improving patients' knowledge of oral hygiene at Aceh Jaya Public Health Center. This study employed a quasi-experimental design with a pretest-posttest control group approach. A total of 58 patients were assigned to both the intervention and control groups using purposive sampling. The intervention group received dental health education using posters, while the control group received no intervention. A validated questionnaire on toothbrushing knowledge was used as the assessment tool. Data were analyzed using the Wilcoxon Signed Ranks Test due to non-normal data distribution. There was a statistically significant increase in knowledge in both the intervention group ($p = 0.000$) and the control group ($p = 0.007$), with a greater improvement observed in the intervention group. All respondents in the intervention group either showed improvement or maintained their knowledge level, with no decrease observed. Dental health education using poster media is effective in increasing patients' knowledge of oral hygiene at Aceh Jaya Public Health Center. This method is recommended as part of health promotion strategies in primary healthcare settings.

Keywords: Dental Health Education, Posters, Knowledge

Introduction

Oral and dental health is an integral part of overall health, as the condition of the teeth can significantly affect general well-being (Riskesdas, 2013). Neglecting oral hygiene can lead to various problems, including tooth damage, commonly known as caries or cavities.(Evie Oktaviani, Yusi Sofiyah, 2020). Dental caries is damage confined to the tooth structure, starting from the enamel and extending to the dentin. The structure of the enamel plays a crucial role in the development of dental caries (Nufus & Reca, 2024; Rahayu et al., 2024). The outer

enamel surface is more resistant to caries compared to the underlying layers because it is denser and harder. Dental caries also results from the interaction of bacteria on the tooth surface, dental plaque, and diet—particularly carbohydrate components that can be fermented by plaque bacteria into acids, mainly lactic acid and acetic acid. Caries occurs when the enamel and dentin are destroyed, accompanied by the formation of cavities in the teeth (Anneke Tahulending, 2018). Oral and dental health education encompasses all efforts or activities aimed at influencing individuals to adopt proper behaviors in maintaining oral and dental health, raising public awareness, and providing knowledge on effective methods of care. Health education is an integral component of health promotion and disease prevention, designed to improve the overall health and well-being of all patients(Suryenti Putri et al., 2021). Educational media, such as posters, have been widely explored as effective tools for improving oral and dental health in children. Posters serve as visual aids that support teaching techniques by presenting information in a clear, engaging, and easily understood manner (Saidah et al., 2022).

Based on a preliminary study conducted at SDI Darul Mu'minin, Banjarmasin City, it was found that 77.8% of respondents had improper tooth-brushing habits, while only 22.2% demonstrated proper habit (novai al et al., 2017)). Tooth brushing plays a vital role in preventing the growth of bacteria that can cause tooth damage (Wiradona et al., 2013). Brushing teeth is the act of removing debris or plaque adhering to the tooth surface, primarily performed after meals and before bedtime, which helps reduce the risk of dental health problems (Harahap et al., 2019). Previous studies have made efforts to improve knowledge through oral health education, specifically by using poster-based counseling with visual aids. These interventions demonstrated that the use of posters effectively increased public knowledge regarding oral and dental health (Hanif & Prasko, 2018). Illustrated posters provide a visual effect that stimulates the eyes to engage with images and understand the accompanying explanatory text in an appealing format, enhanced by educational illustrations. They serve as one of the methods to deliver information, monitor awareness, and encourage the community to regularly and effectively maintain oral and dental health(Santoso et al., 2019).

Dental and oral health problems in Indonesia, including in Aceh Jaya, remain a significant public health challenge. The high prevalence of dental caries, periodontal disease, and low public awareness of proper dental care highlight the urgent need for effective educational interventions. The 2023 Indonesian Health Survey (SKI, 2023) reported that an average of 57% of individuals aged ≥3 years experienced dental and oral health problems in the past year, showing a slight decrease of 0.5% compared to Riskesdas 2018. The provinces with the highest prevalence were West Sulawesi and South Sulawesi (68.4%), Central Sulawesi (66.5%), North Sulawesi, and Maluku (64.9%). In contrast, the lowest rates were found in Bali (46.5%), Bangka Belitung (46.9%), and Papua (49.4%).

Preliminary observations in the working area of Krueng Sabee Community Health Center, Aceh Jaya District, revealed that between 2023–2024, approximately 60% of patients experienced dental problems, while Calang Community Health Center reported 55%. Many patients visited healthcare facilities with dental complaints, yet their understanding of proper dental care practices remained limited. Initial dental examinations at the Calang Health Center indicated dental caries in 25 out of 30 patients, with a prevalence rate of 83.3% (Calang Health

Center, 2025). Furthermore, interviews with ten patients revealed that nine had no prior knowledge or exposure to poster-based educational sessions, while only one reported having received such education. This study aims to examine the effect of dental health education media using posters on knowledge of oral and dental care among patients at Aceh Jaya Community Health Center, Indonesia.

Literature Review

Posters are inherently visual, communicative, and able to convey information in a concise, clear, and engaging manner (Pedwell et al., 2017). In the context of primary healthcare services such as community health centers, where interactions between healthcare providers and patients are often limited, posters serve as an efficient educational tool that can be accessed anytime, especially while patients wait for their appointments. It is assumed that patients who repeatedly view educational media—such as posters displayed in waiting areas or dental clinics—are likely to develop an increased perception of the importance of maintaining oral hygiene, which ultimately contributes to improved knowledge(Linus & Bassey, 2025). The repetition effect and visualization effect are key mechanisms in reinforcing the conveyed messages. From the perspective of Jean Piaget's cognitive learning theory, learning is an internal process that involves receiving, processing, and storing new information within an individual's cognitive structure.

Research Method

This study employed a quasi-experimental design with a pretest–posttest nonequivalent control group approach. The design consisted of two groups: an intervention group and a control group. The intervention group received dental health education using poster media, while the control group received education using leaflet media. Both groups were assessed through pretests before the intervention and posttests one week afterward to measure changes in knowledge. The research design can be summarized as follows: O1 (pretest), X (poster-based intervention), and O2 (posttest).

The population in this study comprised all patients visiting the dental clinic at Aceh Jaya Community Health Centers, with an average of 240 patients per month. The sample size was determined using Lemeshow's formula (Lemeshow, 1997), with the following parameters: N = 240, Z = 1.96 (95% confidence level), p = 0.5, q = 1 – p = 0.5, and d = 0.0655, resulting in a calculated sample size adequate for statistical analysis. Purposive sampling was applied to select respondents based on predetermined criteria. Inclusion criteria included: (1) cooperative patients, (2) aged 18–45 years, (3) willingness to participate as respondents, and (4) allocation to intervention or control groups through a lottery method. Exclusion criteria were patients above 45 years of age and those unwilling to participate. The study was conducted at the dental clinics of Calang and Krueng Sabee Community Health Centers in Aceh Jaya District during May 2025. Data collection employed a structured questionnaire as the primary research instrument (Notoatmodjo, 2005).

Primary data were obtained directly from patient responses to the questionnaire, while secondary data were collected from clinic records, including patient demographics and visit statistics. Data processing consisted of several steps: (1) editing to ensure completeness, accuracy, and consistency of responses; (2) coding to classify data into relevant categories; (3) entry of data into a statistical software program (SPSS); and (4) tabulation to organize data for analysis. Data analysis was carried out in two stages: univariate analysis to describe the distribution and percentages of study variables, and bivariate analysis to assess the effect of the intervention. The Shapiro-Wilk test was applied to evaluate the normality of data distribution. If data were normally distributed, paired-sample t-tests were used to compare pretest and posttest scores within groups, while independent t-tests compared differences between groups. For non-normally distributed data, the Wilcoxon signed-rank test and Mann-Whitney U test were applied accordingly (Notoatmodjo, 2010).

The research procedure consisted of two main phases: preparation and implementation. In the preparation phase, ethical approval was obtained from the Ethics Committee of Poltekkes Kemenkes Aceh, along with research permits from relevant institutions. Calibration sessions were conducted with enumerators to ensure consistency in administering questionnaires and interventions. The implementation phase involved pretesting knowledge levels in both groups, delivering poster-based education to the intervention group (repeated twice to strengthen knowledge retention), and posttesting after one week. The control group received educational materials only after posttest completion to avoid bias in the study results.

Result

This study was conducted from May 6–13, 2025, involving 116 respondents, consisting of 58 participants in the intervention group (who received dental health education using poster media) and 58 participants in the control group (who did not receive the intervention). The primary objective was to examine the effect of poster-based dental health education on improving patient knowledge at Aceh Jaya Community Health Center.

1. Univariate Analysis

a. Age

Table 1 Frequency Distribution of Respondents by Age

Age Category	Intervention Group (Poster)	Control Group	Total
	n (%)	n (%)	n
<35 years	26 (44.8%)	21 (36.2%)	47
≥35 years	32 (55.2%)	37 (63.8%)	69
Total	58 (100%)	58 (100%)	116

The age distribution of respondents indicated that most were aged ≥35 years, accounting for 55.2% in the intervention group and 63.8% in the control group.

b. Gender

Table 2 Frequency Distribution of Respondents by Gender

Gender	Intervention Group (Poster)	Control Group	Total
	n (%)	n (%)	n
Male	29 (50.0%)	35 (60.3%)	64
Female	29 (50.0%)	23 (39.7%)	52
Total	58 (100%)	58 (100%)	116

In the intervention group, male and female respondents were evenly distributed (50.0% each), whereas males dominated the control group (60.3%).

c. Occupation

Table 3 Frequency Distribution of Respondents by Occupation

Occupation	Intervention Group (Poster)	Control Group	Total
	n (%)	n (%)	n
Teacher	18 (31.0%)	9 (15.5%)	27
Housewife	13 (22.4%)	10 (17.2%)	23
Trader	9 (15.5%)	20 (34.5%)	29
Student	8 (13.8%)	7 (12.1%)	15
Farmer	10 (17.2%)	12 (20.7%)	22
Total	58 (100%)	58 (100%)	116

d. Knowledge Level (Intervention Group)

Table 4 Knowledge Levels of Respondents in Intervention Group

Knowledge Level	Pretest n (%)	Posttest n (%)
Good	5 (9%)	32 (55%)
Moderate	18 (31%)	23 (40%)
Poor	35 (60%)	3 (5%)
Total	58 (100%)	58 (100%)

Based on the table above, it was found that prior to the health education session using poster media (pretest), most respondents were in the poor knowledge category, totaling 35 respondents (60%). Only 5 respondents (9%) had good knowledge. After the education session (posttest), the number of respondents with good knowledge increased significantly to 32 (55%). The number of respondents in the moderate category also increased slightly to 23 (40%), while those in the poor category decreased drastically to only 3 (5%). This indicates an improvement in the respondents' knowledge level following the poster-based education, suggesting that this method was effective in enhancing health knowledge in the intervention group.

e. Knowledge Level (Control Group)

Table 5 Knowledge Levels of Respondents in Control Group

Knowledge Level	Pretest n (%)	Posttest n (%)
Good	4 (7%)	15 (26%)
Moderate	17 (29%)	22 (38%)
Poor	37 (64%)	21 (36%)
Total	58 (100%)	58 (100%)

The table above shows that before the intervention (pretest), most respondents in the control group were in the poor knowledge category, totaling 37 respondents (64%). Only 4 respondents (7%) demonstrated good knowledge. In the posttest, the number of respondents with good knowledge increased to 15 (26%), while those in the moderate category also rose to 22 (40%). Meanwhile, the number of respondents in the poor category decreased to 21 (36%). Although the control group did not receive health education using posters, this improvement may have been influenced by external factors such as personal experience, discussions with others, or access to information from alternative sources. However, the increase in knowledge within the control group was still smaller compared to the intervention group, confirming that poster-based education was more effective in improving knowledge.

Bivariate Analysis (T-Test)

a. Normality Test

Before conducting the bivariate analysis, the researcher first performed a normality test using the Kolmogorov-Smirnov test. In principle, the Kolmogorov-Smirnov normality test is a non-parametric test used to determine whether the data are normally distributed, particularly for samples larger than 50.

Table 6 Normality Test of Knowledge Scores (Pretest and Posttest) by Group

	Group	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Pretest	Intervension (Poster)	,138	58	,007	,944	58	,010
	control	,155	58	,001	,959	58	,048
Postest	Intervesion (Poster)	,171	58	,000	,944	58	,010
	control	,164	58	,001	,959	58	,048

Based on the results of the normality test using both the Kolmogorov-Smirnov and Shapiro-Wilk tests, it was found that all data groups—both the intervention group (poster) and the control group, at pretest and posttest—had significance values (p-value) < 0.05. This indicates that the distribution of knowledge scores in each group is not normally distributed. Since the assumption of normality was not met for all groups and measurement times, non-parametric statistical tests are more appropriate for further analysis, such as the Wilcoxon

Signed-Rank Test (for paired data) and the Mann-Whitney U Test (for two independent groups).

Hypothesis Testing with Wilcoxon Signed-Rank Test

Hypothesis testing was conducted to compare knowledge about tooth brushing after the Dental Health Education (DHE) intervention, in order to determine whether there was a difference between the conditions before and after the intervention. Based on the results of the normality test, it was found that some of the data were not normally distributed. Therefore, the analysis was performed using a non-parametric test, namely the Wilcoxon Signed-Rank Test. The results obtained in this study are presented in the following table:

Table 7. Results of the Wilcoxon Signed-Rank Test on Knowledge Scores (Pretest and Posttest)

Group	Types of Change	N	Mean Rank	Sum of Ranks
Post_Intervension - Pre_Intervension	Negative Ranks (a)	0	–	–
	Positive Ranks (b)	47	21,74	1022,00
	Ties (c)	11	–	–
	Total	58	–	–
Post_control - Pre_Kontrol	Negative Ranks (d)	0	–	–
	Positive Ranks (e)	43	7,76	333,50
	Ties (f)	15	–	–
	Total	58	–	–

The results of the Wilcoxon Signed-Ranks Test indicate that in the intervention group, 47 respondents (81.0%) experienced an increase in toothbrushing knowledge after receiving the Dental Health Education (DHE) intervention, while 11 respondents (19.0%) showed no change, and none experienced a decrease. In the control group, 43 respondents (74.1%) demonstrated an increase, 15 respondents (25.9%) showed no change, and none experienced a decrease. Although both groups showed an improvement in knowledge, the proportion of improvement was higher in the intervention group compared to the control group. Therefore, it can be assumed that the DHE intervention was more effective in improving toothbrushing knowledge compared to no intervention.

Table 8 Results of the Wilcoxon Signed-Ranks Test on Differences in Knowledge Scores Before and After Dental Health Education Intervention Using Poster Media

Group	N	Z Value	p-value	Interpretation
Intervention Group	58	-6.532	0.000*	Significant difference in knowledge before and after DHE
Control Group	58	-4.276	0.000*	Significant difference in knowledge before and after routine care

Based on the results of the Wilcoxon Signed Ranks Test, it was found that there was a significant increase in knowledge in the intervention group that received dental and oral health education through poster media (Z = -5.065; p = 0.000). This indicates that providing education using posters is effective in improving the knowledge of patients visiting Aceh Jaya Community Health Center. Meanwhile, in the control group, which did not receive the poster intervention, there was also a significant increase in knowledge, although lower than that in the intervention group (Z = -2.697; p = 0.007). These findings suggest that although an overall increase in knowledge occurred, the use of poster media had a greater impact on improving patients' knowledge regarding dental and oral health care. After obtaining the rank output results, the next step was to analyze the test statistics to determine the significance of changes in toothbrushing knowledge following the DHE intervention.

Table 9 Test Statisticsa

Test Statisticsa	Post_Intervention - Pre_Intervention	Post_Control - Pre_Control
Z	-5.065b	-2.697b
Asymp. Sig. (2-tailed)	0.000	0.007

The results of the Wilcoxon Signed Ranks Test indicate a significant difference between pre-intervention and post-intervention knowledge scores in both groups. In the intervention group, the Z value was -5.065 with a significance level of p = 0.000, indicating a highly significant statistical difference ($p < 0.05$). This finding demonstrates that providing education through Dental Health Education (DHE) significantly improved the participants' knowledge. Meanwhile, in the control group, the Z value was -2.697 with a significance level of p = 0.007, which also indicates a statistically significant difference, though the improvement was lower compared to the intervention group.

Discussion

The study findings indicate that dental and oral health education using poster media significantly influences patients' knowledge improvement. In the intervention group, which received poster-based education, there was a remarkable change in the participants' knowledge level. Prior to the intervention, the majority of respondents were categorized as having "poor" knowledge (60%), with only 9% in the "good" category. After the education session, the proportion of respondents with "good" knowledge significantly increased to 55%, while those in the "poor" category dropped drastically to only 5%. The effectiveness of poster media in enhancing knowledge was further supported by the Wilcoxon Signed Ranks Test results, which showed a highly significant statistical difference (Z = -5.065; p = 0.000).

According to the authors, the use of poster media as a visual educational tool can capture attention, clarify messages, and simplify the understanding of materials for patients and the community visiting health centers in Aceh Jaya. The control group, which did not receive poster-based intervention, also showed improvement, albeit to a lesser extent. The percentage of respondents with "good" knowledge rose from 7% to 26%, while those with "poor"

knowledge decreased from 64% to 36%. Statistical analysis confirmed that this improvement was also significant ($Z = -2.697$; $p = 0.007$), although the degree of change was lower than in the intervention group. This improvement in the control group may be attributed to various external factors, such as personal experiences, discussions with others, information from mass media, or participation in offline and online training sessions in the workplace. Based on interviews with health workers at Aceh Jaya Public Health Center, it was also revealed that during Posyandu and Lokmin activities, oral hygiene education was delivered through lectures and video presentations.

This study aligns with previous findings on the effectiveness of posters as a health education medium. For instance, a cluster randomized trial conducted in Hong Kong over two weeks found that educational posters on dental trauma management for primary and secondary school teachers significantly increased knowledge scores, with an average improvement of 2.67 points ($p < 0.0001$) (Wong & Cheung, 2014). Subsequent research on secondary school students in Hong Kong also reported a knowledge increase of 1.25 points after the installation of posters for two weeks ($p = 0.0407$) (elkhodery et al., 2020). Not limited to adults and adolescents abroad, meta-analyses and other observational studies, such as the research by (Laforgia et al., 2025) demonstrated that posters displayed over an extended period could significantly enhance public understanding of dental injury management ($p < 0.05$) These collective findings reinforce the conclusion that posters are an effective visual education medium, capable of improving dental and oral health knowledge across different groups, consistent with the significant improvements observed in the intervention group. The researchers assume that delivering dental and oral health education through posters assisted patients in enhancing their understanding.

In the context of dental and oral health education, the use of posters can serve as a visual stimulus that attracts attention, aids in the encoding of information, and facilitates retrieval when needed. Well-designed posters that are informative and visually appealing can capture patients' focus on health messages, increasing the likelihood that the information will be deeply processed and stored in long-term memory.

Conclusion

Based on the findings, this study concludes that Dental Health Education (DHE) using posters has a significant positive effect on improving patients' knowledge of oral hygiene at Aceh Jaya Community Health Center, demonstrating its effectiveness as an educational tool. The intervention group showed a marked improvement, with the proportion of patients in the "good" knowledge category rising from 9% before intervention to 55% after, and a substantial reduction in the "poor" category from 60% to 5%, supported by highly significant statistical results ($Z = -5.065$; $p = 0.000$). The control group, although not exposed to posters, also exhibited a statistically significant increase in knowledge ($Z = -2.697$; $p = 0.007$), likely influenced by external factors such as personal experience, social interactions, and indirect counseling through lectures and videos during Posyandu and mini-workshop activities, though the improvement was less pronounced than in the intervention group. Furthermore, a

significant difference was observed in the mean knowledge scores between the two groups post-intervention, indicating that poster-based education is more effective than non-structured educational methods in enhancing oral hygiene knowledge.

Declaration of conflicting interest

The authors declare that there is no conflict of interest in this work.

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