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Effect of Poster-Based Oral Health Education on Oral Health Knowledge Among Elementary School Children: A Quasi-Experimental Study in Surakarta, Indonesia

Sri Lestari¹, Aem Ismail¹

¹Politeknik Insan Husada Surakarta



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Corresponding author

Sri Lestari*
Politeknik Insan Husada Surakarta
Jl. Letjen Sutoyo Gg. Jodhipati No.10, Genengan,
Mojosongo, Kec. Jebres, Kota Surakarta, Jawa
Tengah 57127
Phone : 0896-9090-5010
Email: lestarii.srri@gmail.com

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Abstract

Background: Oral health is an essential component of a child's overall health, playing a vital role in physical growth, psychological well-being, and quality of life. School-aged children are highly susceptible to dental caries due to inadequate oral hygiene practices and limited knowledge. Health education using visual media, such as posters, is recognized as an effective strategy for improving children's understanding and awareness regarding oral health behaviors.

Objective: This study aimed to determine the effect of oral health education using posters on the knowledge levels of elementary school students.

Methods: This quantitative study employed a quasi-experimental, one-group pretest-posttest design and was conducted at Setabelan Christian Elementary School in Surakarta, Indonesia. The study involved 48 students selected via total sampling. Participants completed a validated oral health knowledge questionnaire before and after receiving the poster-based education. Data were analyzed using descriptive statistics and a paired t-test with a significance level of $p < 0.05$.

Results: The mean knowledge score increased from 12.25 ± 1.57 prior to the intervention to 14.48 following the intervention. Before the educational session, 77% of participants demonstrated good knowledge, whereas after the intervention, all participants (100%) achieved the "good knowledge" category. The paired t-test results indicated a statistically significant improvement in oral health knowledge following the educational intervention ($p = 0.001$).

Conclusion: Poster-based oral health education significantly improves the knowledge of elementary school students. Posters represent an effective, practical, and affordable educational approach for school-based oral health promotion programs.

Keywords: Dental health education; elementary school children; knowledge; oral health; poster media.

INTRODUCTION

Oral health is an essential component of overall health and well-being, particularly during childhood, when growth and development are rapidly occurring. Good oral health enables children to eat comfortably, speak clearly, and interact confidently in social and school environments. Conversely, poor oral health may result in pain, impaired chewing function, speech difficulties, reduced nutritional intake, and decreased academic performance. Therefore, establishing healthy oral hygiene practices during school age is an important preventive strategy to support children's physical, psychological, and social development (1,2).

Despite substantial advances in oral health promotion, dental caries remains one of the most common chronic diseases affecting children worldwide. According to the World Health Organization (WHO), approximately 60–90% of school-aged children experience dental caries. In Indonesia, oral health problems continue to pose a major public health concern, with the 2018 National Basic Health Research (Riskesdas) reporting that 57.6% of the population experienced oral health problems, while the prevalence of dental caries among school-aged children is estimated to reach 80–90% (3). These findings indicate that oral diseases continue to represent a significant burden despite ongoing preventive efforts.

Multiple factors contribute to the persistence of dental caries among school-aged children. Limited knowledge regarding oral hygiene, inadequate tooth-brushing practices, frequent consumption of sugary foods and beverages, and insufficient parental supervision are among the major determinants of poor oral health (4,5). Knowledge is recognized as a fundamental prerequisite for adopting healthy behaviors; therefore, improving children's understanding of oral health from an early age is essential for preventing dental diseases (6,7). Health education has consequently become one of the most effective preventive strategies for promoting lifelong oral hygiene practices.

Among various educational approaches, visual media have been widely used because they facilitate learning through attractive and easily understandable messages. Posters, in particular, represent a simple, inexpensive, and practical educational medium that can be easily integrated into school-based health promotion

activities. Their combination of concise text, illustrations, and colors helps attract children's attention, enhances comprehension, and improves retention of health-related information (8).

Previous studies have consistently demonstrated that school-based oral health education improves children's knowledge and preventive behaviors. A systematic review reported that most school-based oral health promotion programs significantly increased oral health knowledge and positively influenced oral hygiene behaviors among children and adolescents. Likewise, studies by Andriani and Azhari found that poster-based education effectively improved children's oral health knowledge. International evidence further supports these findings. Subedi et al. reported that oral health education interventions not only enhanced knowledge but also improved attitudes, oral hygiene practices, and plaque control among school-aged children, highlighting the effectiveness of school-based health promotion in establishing healthy behaviors from an early age (9–11).

Although previous studies have confirmed the effectiveness of oral health education using various educational media, evidence regarding the effectiveness of poster-based education in specific Indonesian elementary school settings remains limited. Most studies have focused on comparing different educational methods or evaluating broader oral health promotion programs rather than examining the effectiveness of posters as a stand-alone educational intervention. Furthermore, no published study has specifically evaluated the impact of poster-based oral health education among students at SD Kristen Setabelan Surakarta. This represents both a contextual and practical research gap that warrants further investigation.

Therefore, this study aimed to examine the effectiveness of poster-based oral health education in improving oral health knowledge among elementary school children at SD Kristen Setabelan Surakarta. The findings are expected to strengthen the evidence supporting the use of posters as a simple, low-cost, and sustainable educational medium for community nursing and school health promotion programs, while providing practical recommendations for schools and healthcare professionals to enhance oral health education among children.

METHODS

Study Design

Study Design This study employs a quantitative approach with a quasi-experimental design, specifically a one-group pretest-posttest design. This design was selected to evaluate changes in respondents' knowledge levels before and after an intervention involving oral health education delivered via posters. Under this design, all respondents received the same treatment without a control group, allowing changes in knowledge scores following the intervention to be compared against the respondents' baseline conditions. The quasi-experimental design was deemed appropriate because the study was conducted in a school setting, making respondent randomization unfeasible.

The research was conducted at Setabelan Christian Elementary School in Surakarta City from November 2025 to February 2026, encompassing the stages of preparation, implementation of educational activities, data collection, data analysis, and research report writing. The research stages were systematically structured, proceeding from proposal submission, the proposal seminar, and proposal revision to the execution of the research, report preparation, and the research findings seminar. This research design aims to determine the effectiveness of oral health education using posters in increasing the knowledge levels of school-age children, enabling direct measurement of knowledge score changes through pre-intervention (pretest) and post-intervention (posttest) measurements using the same instrument (12).

Sample

The study population comprised elementary school students at Setabelan Christian Elementary School, Surakarta. A total sampling technique was employed, involving all 48 eligible students as study participants. This sampling approach was selected to maximize representation and capture the full scope of knowledge changes within the target school population.

Instrument

Data were collected using a validated oral health knowledge questionnaire administered at baseline and post-intervention. The questionnaire evaluated participants' understanding of key oral hygiene practices,

dental caries prevention, and general dental care. The intervention utilized educational posters specifically tailored for school-age children, incorporating visually engaging graphics and clear, concise messaging to facilitate knowledge comprehension and retention.

Data Collection

Data collection proceeded in three sequential phases:

1. **Pretest Phase:** Prior to the educational session, participants completed the validated questionnaire to establish their baseline knowledge levels regarding oral and dental health.
2. **Intervention Phase:** Participants received a interactive oral health education session utilizing the designed poster media.
3. **Posttest Phase:** Immediately following the intervention, participants completed the same questionnaire to evaluate short-term improvements in their knowledge scores.

Data Analysis

Data were processed and analyzed using statistical software. Descriptive statistics, including means, standard deviations (SD), and percentage distributions of knowledge categories ("good knowledge"), were calculated for both pretest and posttest measurements. To assess statistically significant differences between pre- and post-intervention scores, a Paired t-test was conducted, with the statistical significance threshold set at $p < 0.05$.

Ethical Considerations

The study was conducted in strict accordance with ethical standards for human research. Institutional permission was obtained from Setabelan Christian Elementary School prior to study initiation. Written informed consent was secured from the participants' parents or legal guardians, along with verbal informed assent from the participating students. Participant confidentiality and data anonymity were maintained throughout all stages of the research process.

RESULTS

Univariate Analysis

Univariate analysis was conducted to descriptively describe respondent characteristics and the distribution of research

variables. Respondent characteristics included gender and age, while research variables included the level of oral health knowledge before and after the provision of education using posters.

Respondent Characteristics

Based on Table 1, the majority of respondents were female, comprising 27 students (55%), while male respondents accounted for 19 students (45%). These results indicate that the study's respondents were predominantly female students from Setabelan Christian Elementary School in Surakarta City.

All research respondents fell within the 6–12 age group, comprising 48 students (100%), whereas there were no respondents in the 13–15 age group. These findings indicate that all respondents were primary school-aged children, consistent with the study population.

Prior to receiving oral health education using posters, the majority of respondents specifically 37 students (77%) already possessed a good level of knowledge. Meanwhile, 6 students (12%) fell into the fair category, and 5 students (11%) fell into the poor category.

Following oral health education using posters, all respondents (48 students; 100%) fell into the "good" knowledge category. There were no

longer any respondents in the "fair" or "poor" knowledge categories, indicating an improvement in the distribution of knowledge levels after the intervention.

Bivariate Analysis

Bivariate analysis was conducted to evaluate differences in respondents' knowledge levels before and after an oral health education intervention using posters. Based on the normality test results, the data were normally distributed; therefore, the analysis was performed using a Paired t-Test.

The analysis results indicate that the respondents' mean knowledge score increased from 12.25 at the pre-test to 14.48 at the post-test. The mean score difference of 2.229 points demonstrates an improvement in knowledge following the provision of oral health education using posters. The Paired t-test results yielded a p-value of 0.001, which is lower than the established significance level ($\alpha = 0.05$). Thus, there is a statistically significant difference between the knowledge scores before and after the intervention. Based on these results, it can be concluded that oral health education using posters influences the improvement of knowledge among school-aged children at Setabelan Christian Elementary School, Surakarta City.

Table 1. Distribution of Respondents by Gender

Gender	Frequency (n)	Percentage (%)
Male	19	45
Female	27	55
Total	48	100

Table 2. Distribution of Respondents by Age

Age (Years)	Frequency (n)	Percentage (%)
6 – 12	48	100
13 – 15	0	0
Total	48	100

Knowledge Levels Before and After the Intervention

Table 3. Distribution of Knowledge Levels Before the Intervention

Knowledge Category	Frequency (n)	Percentage (%)
Good	37	77
Fair	6	11
Poor	5	12
Total	48	100

Table 4. Distribution of Knowledge Levels After the Intervention

Knowledge Category	Frequency (n)	Percentage (%)
Good	48	100
Fair	-	-
Poor	-	-
Total	48	100

Table 5. Differences in Knowledge Scores Before and After the Intervention

Knowledge Variable	Mean	SD	Difference in Means	P-Value
Pre test	12.25	1.574	-2.229	0,001
Post test	14.48			

DISCUSSION

Oral health education is a key strategy in promoting oral health among school-aged children. Schools serve as strategic environments for instilling healthy lifestyle habits from an early age, given that children at this stage possess developing cognitive abilities and are beginning to form behaviors that will persist into adulthood. Previous studies indicate that schools are effective and efficient settings for implementing oral health interventions, as they can reach a large population of children and consistently improve their oral health knowledge and behaviors (13–15).

Univariate analysis revealed that all respondents fell within the 6–12 age range, a "golden period" for the formation of health-related behaviors. At this stage, children exhibit high curiosity and a strong capacity to absorb new information. Health education delivered in a structured manner, utilizing media appropriate for the children's developmental stage, tends to be more readily accepted and understood (16). Meanwhile, bivariate analysis showed a significant increase in knowledge levels between the pre-test and post-test stages following oral health education using posters. This demonstrates that the intervention was effective in enhancing the knowledge of school-aged children.

The World Health Organization (WHO) states that oral health promotion efforts should be undertaken as early as possible as part of a life-course approach, given that oral health is integral to overall health and influences an individual's quality of life and well-being throughout their lifetime. Effective education utilizing visual media, such as posters, can serve

as an initial step in building sound knowledge, which in turn contributes to improved oral health behaviors in the future. Supporting research confirms the effectiveness of posters and similar media in enhancing oral health knowledge; for instance, a study evaluating an educational program using posters and videos found that both media formats successfully increased knowledge regarding dental caries prevention and oral hygiene status among school-aged children following the intervention. Previous research supports these findings by demonstrating a relationship between pre-test and post-test results, evidenced by a pre-test score of 63.38 versus a post-test score of 81.08 and a significance value (Sig.) of 0 (< 0.05). This indicates that digital posters have a positive impact on improving dental health knowledge (17,18).

The increase in knowledge levels following oral health education via posters aligns with the WHO perspective that health education is a key strategy for preventing dental health issues among school-aged children (19). As a visual medium, posters have proven effective in enhancing children's understanding and retention of health information (20). Posters present information in a concise, clear, and engaging manner, making it easier for school-aged children to receive and comprehend the conveyed health messages. School-aged children tend to grasp information presented through images and colors more readily than information conveyed solely through verbal explanations. Consistent with previous research, digital posters used for education when combined with guidance from PKK (Family Welfare Empowerment) volunteers proved more effective in fostering positive behaviors among

the elderly regarding removable denture care, particularly in the practical application of the educational information provided (20,21). Supporting findings from earlier studies indicate that oral health education combining posters with reinforcement is effective in improving the knowledge and understanding of santri (Islamic boarding school students) regarding oral health care.

Poster-based educational media have proven to be an effective strategy for improving oral health knowledge among elementary school students. Visual media, such as posters, are considered capable of capturing students' attention and conveying oral health information in a more engaging and easily understandable manner compared to conventional lecture methods. This is supported by research (20), demonstrating a significant impact of Arduino Mega-based poster media on increasing students' oral health knowledge. Furthermore, research involving school-aged children indicates that while oral health knowledge improves following education using both poster and animation media, animation media is superior to poster media in enhancing such knowledge among this demographic (22).

STUDY LIMITATIONS

This study has several limitations that should be considered when interpreting the findings. First, the one-group pretest-posttest design did not include a control group, making it difficult to completely rule out the influence of external factors, testing effects, or maturation on the observed improvement in knowledge. Second, the study was conducted in a single elementary school with a relatively small sample size ($n = 48$), which may limit the generalizability of the findings to other school settings or populations. Third, the posttest was administered immediately after the educational intervention; therefore, this study evaluated only short-term knowledge improvement and did not assess long-term knowledge retention or behavioral changes related to oral health practices.

Despite these limitations, the study provides preliminary evidence that poster-based oral health education is an effective, practical, and low-cost educational strategy for improving oral health knowledge among elementary school children. Future studies should employ randomized controlled or controlled quasi-experimental designs involving multiple schools,

larger sample sizes, and longer follow-up periods to evaluate the sustainability of educational outcomes and their impact on oral health behaviors.

CONCLUSION

This study aimed to evaluate the impact of oral health education using posters on the knowledge levels of school-aged children at Setabelan Christian Elementary School in Surakarta City. A quasi-experimental one-group pretest-posttest design was employed to compare respondents' knowledge levels before and after the health education intervention.

The results indicated that prior to the intervention, the majority of respondents possessed a "good" level of knowledge (77%), although some fell into the "fair" (12%) and "poor" (11%) categories. Following the oral health education using posters, all respondents (100%) achieved a "good" level of knowledge. Furthermore, Paired t-Test analysis revealed an increase in the mean knowledge score from 12.25 in the pretest to 14.48 in the posttest, representing a mean difference of 2.229 points. This difference was statistically significant ($p = 0.001$), leading to the conclusion that oral health education using posters is effective in improving the knowledge of school-aged children.

The findings of this study imply that posters serve as an effective health promotion tool for enhancing oral health knowledge among school-aged children. These results support the use of visual media as a health education strategy in school settings and offer an alternative for health professionals, teachers, and educational institutions seeking to develop health promotion programs that are more engaging and accessible to children. Furthermore, this study contributes to the body of scientific evidence regarding the effectiveness of visual-based health education media in improving health knowledge among school-aged children and provides a foundation for future research involving larger samples, control groups, and long-term evaluations of changes in health-related behaviors.

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Author Contributions

SL: Conceptualization, methodology, investigation, data curation, formal analysis, writing—original draft, visualization, and project administration. AI: Conceptualization, methodology, supervision, validation, writing—review and editing, resources, and final approval of the manuscript. All authors have read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

Conflict of Interest

The author declares that there are no conflicts of interest—whether financial, personal, professional, or institutional—that could influence the conduct, analysis, interpretation, or reporting of this research. The research was conducted independently, and the author has no competing interests regarding the publication of this article.

Data Availability Statement

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request. The data are not publicly available to protect the privacy and confidentiality of the study participants.

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