

## KAPE PAGI Flashcard-based Programme Improves Patient Knowledge after Tooth Extraction at Galis Community Health Centre

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### Abstract

Tooth extraction is a common procedure in primary care and has the potential to cause post-operative complications if patients do not understand the aftercare instructions properly. Standardised and easy-to-understand educational media are needed to reinforce patients' knowledge of post-extraction care. This study aimed to assess the improvement in patients' knowledge after tooth extraction following education using KAPE PAGI flashcards at the Galis Community Health Centre, Bangkalan Regency. The study used a pre-experimental one-group pretest–posttest design on 24 patients after tooth extraction. Knowledge was measured using a questionnaire before the intervention (pretest) and after the provision of education (posttest). Data were analysed descriptively and the pretest–posttest difference was tested using a paired *t*-test with a significance level of 0.05. The results showed that the mean knowledge score increased from  $62.1 \pm 12.0$  on the pretest to  $80.2 \pm 10.1$  on the posttest, with a difference of  $18.1 \pm 15.0$  points. The paired *t*-test showed a significant difference ( $t(23)=5.91$ ;  $p<0.001$ ) with a large effect size ( $d=1.21$ ). These findings indicate that education using KAPE PAGI-based flashcards is associated with an increase in patient knowledge after tooth extraction in a primary care setting. The integration of flashcards into the post-procedure education SOP, as well as training and monitoring of implementation, is recommended. Further research with a control group and follow-up on knowledge retention is needed to strengthen the evidence.

**Keywords:** Tooth Extraction; Patient Education; Flashcards; Health Promotion; Knowledge; Community Health Centre

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## INTRODUCTION

Oral health is an integral part of general health and has an impact on physical, mental and social well-being (Fallea et al., 2024; Takeuchi et al., 2023) In healthcare practice, efforts to maintain dental and oral health need to be made from an early age so that the teeth's functions of chewing, speaking, and maintaining facial structure can be preserved throughout the life cycle (Janto et al., 2022; Kapila, 2021) However, in reality, tooth extraction remains one of the most common procedures in dentistry, especially when teeth can no longer be saved through further treatment (Mills et al., 2023) This condition indicates that dental health education is not only important in terms of prevention, but also in the post-treatment phase to ensure optimal healing (Paulson et al., 2024; Tiwari et al., 2022).

Clinically, patients who have undergone tooth extraction face the risk of complications that can hinder healing. Common complications reported include bleeding, pain, dry socket, fracture, persistent trismus, and mandibular dislocation (Chanthavisouk et al., 2023; Schierz et al., 2020). In addition, swelling due to infection is also a common complication in the post-extraction phase (Beaumont et al., 2025; Bramantoro et al., 2020) Thus, the quality of patients' understanding of care instructions is an important determinant in preventing complications and improving healing outcomes.

From a primary care perspective, the high demand for tooth extractions emphasises the urgency of standardised and effective post-extraction education. Data from the 2018 East Java Riskesdas shows a prevalence of caries among the population of East Java of 42.4%, as well as a tendency among the community to be reluctant to have their dental health checked by a dentist,

despite improvements compared to the previous year. Data on dental and oral services at the Galis Community Health Centre also shows an increase in the burden of permanent tooth extraction services, from 90 procedures in 2023 to 105 procedures in 2024. Such an increase in service volume often implies limited time for individual education, while the diverse characteristics of patients (e.g., education level, health literacy, and dental care experience) can lead to variations in understanding of the verbal education provided.

In the context of health promotion, the literature emphasises the importance of educational interventions that facilitate the transfer of knowledge in a clear, concise and easily understandable manner (Bhagat et al., 2020; Prize et al., 2023). Knowledge itself is an important domain that plays a role in shaping health behaviour, and most knowledge is acquired through the sensory process, especially sight and hearing (Arruzza & Chau, 2021; Suwanchatchai et al., 2024). This framework reinforces the argument that visual-based educational media has the potential to improve patient understanding, especially when the message conveyed is procedural and requires careful application (e.g. post-extraction precautions, wound area hygiene, medication consumption, and warning signs that require a return visit) (Ferreira et al., 2022; Kleib et al., 2024).

However, in primary care practice, the implementation of simple, standardised and easily replicable educational media remains a challenge. Post-extraction education often relies on brief verbal explanations, making it prone to problems of information retention and differing interpretations among patients (Card et al., 2023; Demyati et al., 2025; Ho et al., 2025; Kitema et al., 2023). Therefore, there is a need for innovative educational media that not only supports communication between healthcare workers and patients, but also allows patients to review the information independently after returning home.

KAPE PAGI (Post-Tooth Extraction Instruction Card) was developed as a post-treatment educational medium presented in flashcard format to reinforce key messages regarding post-tooth extraction care. Operationally, flashcards allow the material to be conveyed concisely, visually, and systematically, thereby facilitating understanding among patients from various backgrounds. In addition to being used during direct education at the clinic, the flashcard format also supports the repetition of messages at home, which theoretically contributes to increasing patients' knowledge and readiness to carry out care instructions correctly.

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## RESEARCH METHODS

### Research design

This study utilised a pre-experimental one-group pretest–posttest design. (Shadish et al., 2002), namely measuring respondents' knowledge before (pre-test) and after (post-test) providing flashcard-based education on KAPE PAGI (Post-Tooth Extraction Instruction Card) to the same group.

### Location and time

The study was conducted at the Galis Community Health Centre Dental and Oral Clinic, Bangkalan Regency. Data collection took place from July to September 2025.

**Population and sample**

The population in this study consisted of patients who had undergone tooth extraction and visited the Dental and Oral Clinic of the Galis Community Health Centre during the study period, with a total of 24 patients. The sampling technique used was purposive non-probability sampling, which is the selection of participants based on certain considerations so that they adequately represent the population. The final sample size in the analysis was 24 respondents (the total number of respondents who met the criteria and completed the pretest–posttest series during the study period).

Inclusion criteria in the final manuscript should be explicitly stated (e.g., post-extraction patients who are willing to be respondents and are able to communicate/complete the questionnaire). Exclusion criteria should also be included (e.g. conditions that hinder communication/cognition or failure to complete the post-test), to clarify control of selection bias.

**Variables and operational definitions**

The independent variable is education using flashcard-based KAPE PAGI. The dependent variable is respondents' knowledge regarding post-extraction dental care (as well as respondents' satisfaction, which is also evaluated in this innovation project). Knowledge is measured through structured questionnaires administered before and after the intervention (Creswell, 2017).

**KAPE PAGI flashcard-based intervention**

The research intervention took the form of instruction cards/flashcards used as a means of health promotion education after tooth extraction. During implementation, education was provided to patients after tooth extraction using these cards, followed by a post-test to measure knowledge. (In the final manuscript, this section should be supplemented with operational details: the main messages on the cards, the order of delivery, the duration of education, and who the educators were so that the intervention can be replicated consistently.)

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**Research instruments****Data collection procedure**

Data was collected using a structured questionnaire administered to respondents. (Cohen et al., 2018)The data collection process followed these stages: (1) recruitment of respondents according to criteria and informed consent, (2) completion of a pretest knowledge questionnaire, (3) provision of education using KAPE PAGI flashcards, and (4) completion of a posttest knowledge questionnaire. (In the final manuscript, the pretest–posttest interval needs to be specified and standardised to reduce measurement bias.)

**Data analysis**

Univariate analysis was performed to summarise and describe the variables using tables and graphs. (*Research Methodology and Quantitative Techniques : A Guide for Interdisciplinary Research*, 2024)Bivariate analysis was performed to assess differences in knowledge before and after the intervention, using the paired t-test if the data were normally distributed or the Wilcoxon signed-rank test if the data were not normally distributed, with a significance level of  $\alpha = 0.05$ .

**Research ethics**

This research has undergone ethical review at NHM University under number 2836/KEPK/UNIV-NHM/EC/IX/2025. Respondent data confidentiality is maintained and participation is voluntary.

## RESULT AND DISCUSSION

### Results

#### Characteristics of respondents

This study involved 24 respondents who were patients after tooth extraction at the Galis Community Health Centre. The average age of respondents was  $36.8 \pm 12.4$  years (range 18–65 years). Most respondents were female (62.5%) and the highest level of education was in the junior high school–senior high school category (62.5%).

**Table 1. Characteristics of respondents (n = 24)**

Characteristics	Category	n	%
Age (years)	Mean $\pm$ SD	36,8 $\pm$ 12,4	
	Range	18–65	
Gender	Male	9	37,5
	Woman	15	62,5
Highest level of education attained	Primary school/equivalent	6	25,0
	Secondary School/equivalent	7	29,2
	Secondary School Leaving Certificate / equivalent	8	33,3
	Higher education institution	3	12,5
Work	Housewife	8	33,3
	Self-employed	6	25,0
	Farmer/labourer	4	16,7
	Officer	3	12,5
	Pupils/students	3	12,5
History of previous tooth extractions	Yes	10	41,7
	No	14	58,3
Type of tooth extracted	Previous	4	16,7
	Premolar	6	25,0
	Molar	14	58,3

#### Pretest and posttest knowledge scores

The knowledge score before the intervention (pre-test) had an average of  $62.1 \pm 12.0$ . After providing education using flashcard-based KAPE PAGI (post-test), the average knowledge score increased to  $80.2 \pm 10.1$ .

#### Analysis of differences in pretest–posttest knowledge scores

The results of the analysis showed a significant increase in knowledge scores after the intervention. The mean difference in scores (posttest–pretest) was  $18.1 \pm 15.0$  points. The paired t-test showed a significant difference ( $t(23)=5.91$ ;  $p<0.001$ ) with a 95% CI mean difference of 11.8–24.4. The effect size indicated a large effect (Cohen’s  $d=1.21$ ).

**Table 2. Comparison of knowledge scores before and after intervention (n = 24)**

Variable	Pre-test (Mean $\pm$ SD)	Post-test (Mean $\pm$ SD)	Difference (Mean $\pm$ SD)	Uji	Test value	p-value	95% CI difference	Effect size

<b>Knowledge</b>	62,1 ±	80,2	18,1 ±	paire	t(23)=5,9	<0,00	11,8–24,4	d=1,2
<b>e</b>	12,0	±	15,0	d	1	1		1
		10,1						

## Discussion

This study shows an increase in patients' knowledge after tooth extraction following education using KAPE PAGI flashcards. Knowledge scores increased from  $62.1 \pm 12.0$  on the pretest to  $80.2 \pm 10.1$  on the posttest, with a mean difference of  $18.1 \pm 15.0$  points and a statistically significant difference ( $p = 0.001$ ). The large effect size ( $d = 1.21$ ) indicates that the increase in scores is not only statistically significant but also practically relevant in the context of patient education in primary care. However, these findings are understood as an increase in knowledge after intervention in the same group, in accordance with the limitations of the pre-experimental design without a control group.

The increase in knowledge after education using flashcards can be explained by the characteristics of the media that optimise information processing. First, flashcards present key messages in a concise and structured visual format, helping patients focus their attention on critical points of post-extraction care. In procedural education, such as bleeding control, refraining from vigorous rinsing or smoking, medication consumption, oral hygiene, and warning signs, visualisation and simple presentation of steps have the potential to reduce cognitive load and minimise misinterpretation of instructions.

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In general, the results of this study are consistent with findings often reported in health education studies, namely that the use of visual media or structured educational materials tends to increase knowledge compared to verbal education alone (Curnew et al., 2025; Sawatzky & Kline, 2025). In the context of primary care, simple and easy-to-use media (such as educational cards) have the advantage of condensing information, clarifying key messages, and facilitating communication between staff and patients in a limited amount of time (Khodabakhshian et al., 2024; Neher et al., 2025). The increase in knowledge scores in this study supports the argument that standardised educational media can improve patients' understanding of procedural post-operative care topics (Radcliffe et al., 2023; You et al., 2025).

Differences in the magnitude of improvement between studies are generally influenced by several factors, such as respondent characteristics (age and education), research design (presence or absence of a control group), instrument quality (number of items, validity, reliability), and post-test measurement timing (immediately after education versus follow-up several days/weeks later) (Dijk et al., 2020; Karam et al., 2021; Sheehan et al., 2020). In this study, knowledge measurements were conducted at two points in time within the same group, thereby sensitively capturing short-term changes in knowledge following the intervention (Jeppesen et al., 2024; Östensson et al., 2025; Thuraisingham et al., 2023). Consequently, the interpretation of knowledge improvement needs to consider the possibility of a testing effect, whereby respondents become more familiar with the questions on the post-test. Therefore, these findings are more appropriately positioned as preliminary evidence that flashcard-based KAPE PAGI is associated with an improvement in patients' knowledge after education in a community health centre setting.

From an implementation perspective, these results have direct implications for improving the quality of post-extraction education in primary care facilities. Flashcard-based KAPE PAGI

can be integrated into the service flow as part of the minimum service standard for education, with a simple scheme: (1) structured education using a standard sequence of cards after the extraction procedure, (2) reinforcement of precautions and warning signs, and (3) documentation of education provided in service records. This type of integration is important because complications after tooth extraction are often related to patient compliance with self-care instructions. To ensure consistent implementation, operational recommendations in the form of an education SOP are required, which includes the sequence of flashcards to be presented, the minimum duration of education, and a list of mandatory messages that must be conveyed (e.g., bleeding control, prohibition of smoking/hard rinsing in the early phase, use of medication as recommended, oral hygiene, diet, warning signs, and control schedule). In addition, brief training or internal calibration for dental staff is necessary to ensure that the messages conveyed are consistent. Monitoring of implementation compliance can be done simply through an education checklist and periodic audits of a number of service records, so that media innovation does not stop at the provision of tools, but is truly integrated into clinical practice.

This study has several strengths. First, the intervention used standardised flashcards that are easy to replicate, making it potentially applicable in various primary care facilities with limited resources. Second, the study was conducted in a community health centre setting, making it relevant to the context of public dental services, which often have a high patient load and limited time for education. Third, the pretest–posttest design on the same individuals allows for the direct detection of changes in knowledge after the intervention.

However, there are limitations that need to be considered. The one-group pretest–posttest design without a control group limits the ability to rule out threats of bias such as the effects of time (history), maturation, and other external factors. The sample size is relatively small and comes from a single facility, so generalisation of the findings needs to be done with caution. In addition, post-test measurements, which are likely to be conducted shortly after education, reflect short-term knowledge gains and do not yet describe medium- or long-term knowledge retention. The potential for a testing effect also needs to be considered, as completing the pre-test may influence how respondents answer the post-test.

To strengthen the evidence of the effectiveness of KAPE PAGI based on flashcards, further research using a quasi-experimental design or controlled trials (e.g., standard education group compared to KAPE PAGI) is recommended to strengthen causal inferences. In addition to measuring knowledge, more applicable outcomes need to be considered, such as behavioural compliance (e.g. compliance with smoking/hard rinsing restrictions, medication consumption), incidence of complications after extraction (recurrent bleeding, dry socket, infection), and knowledge retention through follow-up 7–14 days later. Patient satisfaction evaluation can be maintained as a secondary outcome to assess the acceptability of the intervention in service practice.

## CONCLUSION

This study shows an increase in patients' knowledge after tooth extraction following education using flashcard-based KAPE PAGI at the Galis Community Health Centre. Knowledge scores increased from  $62.1 \pm 12.0$  on the pretest to  $80.2 \pm 10.1$  on the posttest, with a statistically significant difference ( $p < 0.001$ ). These findings indicate that standardised visual educational media have the potential to strengthen patient understanding in primary care settings. However, interpretation of the results still needs to consider the limitations of the pre-experimental design without a control group, so the findings are positioned as preliminary evidence of knowledge improvement after the intervention.

Based on these findings, KAPE PAGI flashcards are recommended to be integrated into the tooth extraction service flow as a standard post-procedure educational medium.

Implementation should be accompanied by the development of educational SOPs that include the sequence of flashcard delivery, minimum duration of education, a list of mandatory messages (e.g., bleeding control, refraining from vigorous rinsing and smoking in the early phase, medication use, oral hygiene, diet, warning signs, and follow-up schedule), and a mechanism for documenting the provision of education in service records. To maintain consistency of messages and quality of communication, briefings or short training sessions for dental staff are required. In addition, quality monitoring and evaluation can be carried out through education checklists and periodic internal audits to assess implementation compliance and documentation completeness.

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