JPHTD
Journal of Public Health and Tropical Diseases

Volume 1 Issue 1 (2025) December
Email: jphtd@unimus.ac.id
https://jurnalnew.unimus.ac.id/index.php/jphtd

ORIGINAL ARTICLE

Implementation of the BREAST-EDU SMART KIT to Improve Knowledge and Breast Self-Examination Skills among Adolescents in a Tropical Area

Erien Luthfia[1], Hadi Kusuma Atmaja[1]

[1] Poltekkes Kemenkes Mataram, Indonesia

Corresponding author: Erien Luthfia; email: erien.luthfia@gmail.com

Submitted: November 14, 2025

Accepted: December 11, 2025

Published: December 31, 2025

Abstract

Background: Breast cancer remains a major public health problem among women in tropical countries, where early detection plays a crucial role in reducing morbidity. Breast Self-Examination (BSE) is an essential preventive behavior that should be introduced during adolescence. The BREAST-EDU SMART KIT is an interactive health education media designed to enhance adolescents knowledge and practical skills in performing BSE. **Objective:** To assess the effectiveness of the BREAST-EDU SMART KIT in improving knowledge and BSE skills among adolescent girls in a tropical area school setting. **Method**: This study employed a pre-experimental one-group pretest–posttest design involving 30 female students at Mataram City, West Nusa Tenggara. Knowledge and BSE skills were measured before and after the intervention. Data were analyzed using the Wilcoxon Signed Rank Test. **Results**: All participants (100%) demonstrated improvement in both knowledge and BSE performance following the intervention. The Wilcoxon test showed a statistically significant difference between pretest and posttest scores ($p = 0.001$; $p < 0.05$), indicating that the BREAST-EDU SMART KIT had a significant effect on learning outcomes. **Discussion**: The BREAST-EDU SMART KIT is an effective health education media for improving knowledge and Self-Breast Examination skills among adolescent girls in tropical school settings. This innovation has the potential to support early breast cancer prevention programs in public health and adolescent health promotion.

Keywords: breast-edu smart kit, breast self-examination, health education, adolescent girls, tropical area

INTRODUCTION

Breast cancer remains one of the most prevalent cancers among women worldwide and continues to contribute significantly to global morbidity and mortality. Data from international cancer registries indicate that millions of women are diagnosed with breast cancer each year, with a substantial proportion of deaths occurring in low-and middle-income countries where early detection and screening programs are limited [1, 2]. Early identification through preventive behaviors such as Breast Self-Examination (BSE) plays an important role in promoting breast health awareness, particularly in resource-

constrained and tropical regions where health service accessibility may vary [3].

In Indonesia, breast cancer is reported as one of the leading causes of cancer-related death among women. Many cases are detected at an advanced stage, which is frequently associated with delayed health-seeking behavior and limited knowledge regarding early detection methods such as BSE [4, 5]. National health data indicate that although clinical breast examination programs have been implemented, the proportion of women performing routine breast checks remains relatively low, and suspected breast lumps continue to be identified among screened populations [6].

At the provincial level, reports from West Nusa Tenggara show that only a small proportion of women of reproductive age have practiced BSE, with regional variations across districts and cities, including Mataram City as one of the areas with low participation in breast examination activities [6, 7].

Adolescents represent a strategic target group for preventive health education. According to global and national health classifications, adolescence is defined as the age range of approximately 10–19 years, during which health-related behaviors and attitudes begin to form [8]. Introducing BSE awareness at this developmental stage is essential to foster lifelong preventive practices and strengthen early recognition of breast health problems. However, preliminary findings in the study setting revealed that most adolescent girls had never received education about BSE and had never practiced the procedure.

Several previous studies have demonstrated that interactive learning media such as smart box–based tools can improve knowledge, learning motivation, and practical skills in school-based education programs [9-11]. Smart box media have been reported as valid, feasible, and effective instructional tools across various educational contexts. Nevertheless, the application of such media for breast health education particularly for enhancing BSE knowledge and skills among adolescent girls in tropical-area school environments remains limited.

Based on these conditions, innovative and engaging health education approaches are required to strengthen adolescents' understanding and practical competence in performing BSE. The BREAST-EDU SMART KIT was developed as an interactive health education media designed to facilitate learning through visual, tactile, and structured instructional components. This study was conducted to evaluate the implementation of the BREAST-EDU SMART KIT in improving knowledge and BSE skills among adolescent girls in a tropical-area school setting in Mataram City, West Nusa Tenggara.

METHOD

This study applied a quantitative pre-experimental One Group Pre-test Post-test Design to evaluate the effect of health education using the BREAST-EDU Smart Kit on adolescents knowledge and Breast Self-Examination (BSE) skills.

The study was conducted at Mataram city, located in a tropical urban area, from 10–30 May 2025. The population consisted of 240 female students, and a total of 33 participants were selected using purposive sampling to anticipate potential drop-out cases.

Data were collected using two instruments: (1) a structured knowledge questionnaire, and (2) a BSE skills observation checklist.

The intervention comprised BSE health education and demonstration using the Smart Kit, followed by return demonstration practice. Knowledge and skills were measured before and after the intervention.

Data processing included editing, coding, entry, and cleaning. Univariate analysis was used to describe respondent characteristics and score distributions, while the Wilcoxon Signed Rank Test was applied for bivariate analysis to assess differences between pretest and posttest outcomes, with a significance level of $p < 0.05$.

RESULTS

The normality of pre-test knowledge scores was tested using the Shapiro–Wilk test. The pretest score distribution was non-normal ($p = 0.000$), and the post-test score distribution was also non-normal ($p = 0.001$), indicating that the data did not meet the assumption of normality (Table 1)

Table 1. Normality Test for Knowledge Scores

Variable	Treatment	Statistic	df	Sig
Knowledge	Pre-test	0,750	30	0,000
	Post-test	0,863	30	0,001

The BSE skills were tested by the Shapiro–Wilk normality test. The pretest had a non-normal distribution ($p = 0.000$), while the posttest had a normal distribution ($p = 0.133$). A non-parametric test was applied for further analysis.

Table 2. Shapiro–Wilk Normality Test for BSE Skills

Variable	Treatment	Statistic	df	Sig
BSE Skills	Pre-test	0,312	30	0,000
	Post-test	0,946	30	0,133

The mean score of knowledge levels before intervention was 63 (SD = 8.77), increasing to 89 (SD = 9.37) in the post-test (Table 3).

Table 3. Knowledge of Breast Self-Examination Before and After the Intervention

Variable	n	Min	Max	Mean	SD
Pre-test	30	40	70	63	8,77
Post-test	30	70	100	89	9,37

There was a substantial increase in the minimum, maximum, and mean scores following the BREAST-EDU Smart Kit–based health education.

The pre-test mean score of the BSE skills was 0.40 (SD = 1.45), increasing markedly to 17.17 (SD = 1.70) during the post-test assessment (Table 4).

Table 4. BSE Skills Before and After the Intervention

Variable	n	Min	Max	Mean	SD
Pre-test	30	0	7	0,40	1,45
Post-test	30	14	20	17.17	1,70

These findings indicate a pronounced improvement in practical BSE performance among adolescent participants.

All respondents (100%) demonstrated increased knowledge after the intervention. No negative or tied ranks were identified. The mean rank was 15.50, with a p-value of 0.001 ($p < 0.05$), indicating a statistically significant difference between pre-test and post-test scores (Table 5).

Table 5. Wilcoxon Signed-Rank Test for Knowledge

Comparison	n	Mean rank	Sum of Rank	Z	p-value
Negative Ranks	0	0,00	0,00	-4,852	0,001
Positive Ranks	30	15,50	465,00		
Ties	0				
Total	30				

Thus, the BREAST-EDU Smart Kit significantly increased adolescents' knowledge regarding BSE.

The Wilcoxon Signed-Rank Test results for BSE skills show that all respondents (100%) experienced improvement, with no negative or tied ranks. The mean rank was 15.50, and the p-value was 0.001 ($p < 0.05$), confirming a statistically significant improvement in BSE skills (Table 6).

Table 6. Wilcoxon Signed-Rank Test for BSE Skills

Comparison	n	Mean rank	Sum of Rank	Z	P Value
Negative Ranks	0	0,00	0,00	-4,800	0,001
Positive Ranks	30	15,50	465,00		
Ties	0				
Total	30				

These results demonstrate that the implementation of the BREAST-EDU Smart Kit effectively enhanced both knowledge and practical BSE performance among adolescent girls in the study setting.

DISCUSSION

Knowledge of Adolescent Girls Regarding BSE Before and After the Intervention

Prior to the intervention, all 30 participants who met the inclusion criteria were provided informed consent and completed the pretest questionnaire and checklist. The findings showed that 100% of respondents experienced an increase in knowledge after receiving the intervention, with a statistically significant result ($p = 0.001$; $p < 0.05$). This indicates that the BREAST-EDU Smart Kit was effective in improving adolescents' knowledge related to Breast Self-Examination (BSE).

The Smart Kit was developed based on respondents' learning needs and included educational materials on breast cancer, BSE procedures, warning signs, and risk factors. The visual and interactive design featuring colorful layouts and illustrative graphics supported engagement and facilitated comprehension, which is consistent with the theory of print-based learning media proposed, stating that instructional media enhance knowledge acquisition when appropriately aligned with learning objectives and delivered through direct educator learner interaction [9].

The results of this study are consistent with previous research [10], which demonstrated that health education significantly improved knowledge of BSE ($p < 0.001$). Similarly, a report that counselling interventions significantly increased students' BSE knowledge uses the Wilcoxon test ($p < 0.001$) [11]. Another report also found substantial improvement in early breast cancer detection knowledge following structured health education [12].

The integration of an engaging and contextualized Smart Kit likely contributed to better cognitive processing and retention of information. This is in line with a reported improved knowledge and preventive health behavior following the use of a Smart Box–based educational medium in oral health promotion [13].

Further analysis of item responses revealed that the lowest pretest scores were found in the domain of breast cancer risk factors, in which only 3 respondents answered correctly. After the intervention, this increased to 16 respondents. This suggests that information on risk perception is less familiar among adolescents and requires explicit and interactive reinforcement.

Overall, these findings highlight the importance of innovative, age-appropriate, and visually engaging media in school-based health education to optimize knowledge transfer and support long-term preventive behaviors.

Skills of Adolescent Girls in Performing BSE Before and After the Intervention

The results of this study showed a significant improvement in Breast Self-Examination (BSE) skills after the intervention. All respondents demonstrated increased skill performance, with a Wilcoxon test p-value of 0.001 ($p < 0.05$). This finding indicates that the BREAST-EDU Smart Kit effectively enhanced adolescents' practical competence in performing BSE.

To improve BSE skills, the Smart Kit was designed to include step-by-step procedural illustrations and breast models representing normal and abnormal conditions. The abnormal breast model allowed respondents to experience tactile simulation of lumps and retraction, enabling them to practice BSE techniques directly through hands-on demonstration. This type of experiential learning is essential in developing psychomotor skills, particularly in health education that requires correct technique and sequence of actions.

According to learning media theory, demonstration-based learning and the use of teaching aids significantly enhance psychomotor learning outcomes through direct practice and repetition [9]. Simulation-based media allow learners to actively engage in the learning process, facilitating better skill acquisition compared to passive learning methods. This approach is particularly effective for adolescents, who tend to learn more effectively through interactive and concrete experiences.

The findings of this study are consistent with research conducted by Rizky et al., which reported a significant increase in BSE skills among adolescent girls following health education interventions using demonstration and simulation methods [14]. Similar results were reported by Habibah and Anwar, who found that the utilization of Smart Box–based learning media significantly improved students' skill performance outcomes [15]. Rosida et al. also emphasized that repeated exposure to Smart Box learning media strengthens psychomotor skill development and learning retention [16].

Additional studies further support the effectiveness of simulation-based health education in improving BSE skills. A study by Secginli and Nahcivan reported that structured BSE training significantly improved adolescents' examination skills and confidence in performing BSE correctly [17]. Likewise, research by Karayurt et al. demonstrated that practical BSE training using breast models resulted in better skill mastery and long-term retention among young women [18]. Another study by Birhane et al. found that hands-on BSE education significantly increased correct BSE practice among female students [19]. Furthermore, a study by Ozkan and Dundar showed that interactive breast health education programs effectively improved both technical accuracy and consistency of BSE practice among adolescents [20].

Before the intervention, BSE skill performance among respondents was very low, as reflected by minimal checklist scores. After the intervention, the majority of respondents achieved good skill performance levels. This substantial improvement highlights the importance of using interactive, tactile, and simulation-based educational media to enhance adolescents'

practical skills. The clarity of instructional content, opportunity for repeated practice, and active learner involvement contributed to increased confidence and competence in performing Breast Self-Examination correctly.

CONCLUSION

This study demonstrates that the BREAST-EDU Smart Kit is effective in improving both knowledge and skills of adolescent girls in performing Breast Self-Examination (BSE). All respondents (100%) experienced improvement after the intervention, with no decline in scores. The Wilcoxon Signed-Rank Test showed statistically significant results for both knowledge and skills ($p = 0.001$; $p < 0.05$), indicating that the Smart Kit had a meaningful positive impact on adolescents' BSE competence.

The integration of interactive educational materials and practical simulation supports cognitive understanding, increases engagement, and enhances psychomotor performance. The BREAST-EDU Smart Kit has strong potential to be adopted as an innovative, school-based breast health promotion tool in tropical and resource-limited settings.

RECOMMENDATIONS

Future research is recommended to involve a larger and more diverse sample across different schools and tropical area settings, and to employ comparative or randomized controlled designs to evaluate the effectiveness of the Smart Box against other educational media. Longitudinal studies are needed to assess long-term retention, consistency of SADARI practice, and behavioral change over time. Further studies are also encouraged to integrate parents, teachers, and school health programs, as well as to implement the intervention in community and clinical settings. The development of a hybrid or digital enhanced Smart Box model, combined with QR-code or interactive learning platforms, is suggested to increase engagement and skill mastery, while future research may also explore psychosocial factors such as self-efficacy and motivation related to adolescents' willingness to perform breast self-examination

ACKNOWLEDGEMENTS

The authors would like to express sincere appreciation to the adolescent students who participated as respondents, as well as the school management for granting research access and support. We also thank the collaborating partners who facilitated the implementation of this study. Our gratitude is extended to colleagues and field assistants whose assistance ensured the research was carried out smoothly.

REFERENCES

[1] World Health Organization. Breast cancer. Geneva: World Health Organization; 2023.

[2] International Agency for Research on Cancer. Global Cancer Observatory: Cancer Today (GLOBOCAN 2020). Lyon: IARC; 2020.

[3] World Health Organization. Early detection of breast cancer. Geneva: WHO; 2021.

[4] Kementerian Kesehatan Republik Indonesia. Profil Kesehatan Indonesia 2023. Jakarta: Kemenkes RI; 2024.

[5] Marfianti E. Improving breast cancer knowledge and breast self-examination skills for early detection. J Abdimas Madani Lestari. 2021;3(1):25–31.

[6] Dinas Kesehatan Provinsi Nusa Tenggara Barat. Profil Kesehatan Provinsi Nusa Tenggara Barat 2023. Mataram: Dinkes NTB; 2024.

[7] Badan Pusat Statistik Provinsi Nusa Tenggara Barat. Profil Kesehatan Nusa Tenggara Barat 2022. Mataram: BPS NTB; 2023.

[8] Kementerian Kesehatan Republik Indonesia. Peraturan Menteri Kesehatan RI Nomor 25 Tahun 2014 tentang Upaya Kesehatan Anak. Jakarta: Kemenkes RI; 2014.

[9] Arsyad A. Media pembelajaran. Jakarta: RajaGrafindo Persada; 2017.

[10] Fitrianti S, Haryani J. The effect of health education toward adolescent girls' knowledge of BSE. J Psikologi Jambi. 2018;3(1):52–58.

[11] Qoyyimah UA, Rohmawati W, Ropitasari R. Effectiveness of counseling in improving BSE knowledge. J Kebidanan. 2022;14(2):183–189.

[12] Listiyorini D, et al. Effect of BSE health education on early breast cancer detection knowledge. J Alaqoh. 2020;10(1):5–9.

[13] Abral A, Kristianto J, Maryani Y, Setiawaty N, Sofian R. Smart Dental Box as a health education media. Quality J Kesehatan. 2020;14(1):38–45.

[14] Rizky A, Nuruniyah, Hastuti L, Arfan I, Marlenywati. Improving awareness and BSE skills among adolescent girls. J Pembelajaran Pemberdayaan Masyarakat. 2024;5(4):805–812.

[15] Habibah L, Anwar AS. The effect of Smart Box-based media on students' skills. J Pendidikan. 2024;8(3):525–537.

[16] Rosida I, Nugraha MF. The effect of Smart Box learning media on skill improvement. J Pendidikan Dasar. 2024;1(2):720–733.

[17] Secginli S, Nahcivan NO. The effectiveness of a structured breast self-examination training program on skill development. Cancer Nurs. 2006;29(2):127–134.

[18] Karayurt O, Ozmen D, Cetinkaya AC. Effects of breast self-examination training on knowledge and skills. J Adv Nurs. 2008;63(3):309–317.

[19] Birhane K, Alemayehu M, Anawte B, et al. Practices of breast self-examination and associated factors among female students. BMC Cancer. 2017;17:1–7.

[20] Ozkan A, Dundar PE. The effects of breast self-examination training on adolescent girls' skills and health beliefs. Asian Pac J Cancer Prev. 2009;10(4):653–658.