

Short-Term Health Coaching on Breast Self-Examination in Adolescent Girls: A Randomized Controlled Study

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ABSTRACT

Introduction: Breast cancer remains the leading cancer among women globally, with increasing incidence in low- and middle-income countries. Despite improvements in adolescents' knowledge of Breast Self-Examination (BSE), regular practice remains inconsistent. This study aimed to determine the effectiveness of BSE Calendar-based Health Coaching in improving knowledge, attitudes, and BSE behaviors among adolescent girls.

Research Methodology: A randomized pretest–posttest control-group design was used with 96 female students (intervention n=50; control n=46) at a public secondary school in Makassar, Indonesia. The intervention group received three structured health coaching sessions combined with monthly self-monitoring using a BSE Calendar over three months, while the control group received conventional lecture-based education. Data were analyzed using the Wilcoxon signed-rank and Mann–Whitney U tests, followed by multivariate linear regression to adjust for baseline scores and covariates ($\alpha=0.05$).

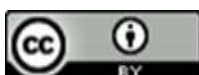
Results: Post-intervention, the intervention group demonstrated significantly higher scores compared with the control group. Adjusted regression analysis showed significant effects on knowledge ($\beta=1.21$; 95% CI: 0.42–2.01; $p=0.003$), attitude ($\beta=1.06$; 95% CI: 0.45–1.67; $p=0.001$), and behavior ($\beta=4.67$; 95% CI: 3.02–6.31; $p<0.001$).

Conclusion: BSE Calendar-based Health Coaching significantly enhances adolescents' cognitive and behavioral preventive outcomes. Integrating structured coaching and self-monitoring tools into school-based health programs is recommended to strengthen early breast cancer detection strategies.

Keywords: Adolescent; Breast Neoplasms; Early Detection of Cancer; Health Education; Self-Examination.



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INTRODUCTION

Breast cancer remains the most frequently diagnosed cancer among women worldwide and represents a leading cause of cancer-related mortality. According to GLOBOCAN 2022, more than 2.3 million new cases were reported globally, with breast cancer accounting for a substantial proportion of female cancer deaths (Abni & Kasim, 2024). The growing incidence in low- and middle-income countries reflects delayed diagnosis, limited screening coverage, and inadequate health literacy (Bluethmann et al., 2025). In Southeast Asia, including Indonesia, the burden of breast cancer continues to increase, posing significant challenges to health systems in terms of early detection and timely management. National data indicate that breast cancer ranks first among all cancers in Indonesian women, contributing to considerable morbidity and mortality (Chae et al., 2025). Despite national campaigns promoting early detection, coverage of clinical screening remains limited, especially among adolescents and young women who are rarely targeted in preventive programs (Chen et al., 2025).

At the local level, school-based reproductive health education often focuses primarily on menstruation and sexual health, with minimal emphasis on early detection of breast abnormalities. Several studies in Indonesian secondary schools report that a large proportion of adolescent girls have never performed Breast Self-Examination (BSE) and possess inadequate knowledge regarding correct techniques and recommended timing (Conley et al., 2025). This situation is concerning because adolescence represents a critical developmental stage characterized by increased body awareness, identity formation, and the establishment of long-term health behaviors. Early introduction of preventive practices, such as BSE, may foster lifelong habits that lead to earlier recognition of breast changes and timely health-seeking behavior (Dang et al., 2025).

Existing literature demonstrates that educational interventions can improve adolescents' knowledge and attitudes toward BSE (Hardcastle et al., 2024). Conventional strategies, including lectures, audiovisual media, and demonstrations using breast phantoms, consistently show statistically significant short-term knowledge gains. However, empirical evidence indicates that improvements in knowledge do not always translate into sustained behavioral practice (Kenis et al., 2025). Many adolescents report understanding the importance of BSE but fail to perform it regularly. This inconsistency highlights a persistent gap between cognitive acquisition and behavioral implementation. Behavioral science theories emphasize that information alone is insufficient to produce lasting change without reinforcement, self-monitoring, and supportive mentoring mechanisms (Le Mat et al., 2024).

Several intervention models integrating peer education, self-efficacy enhancement, or theory-based counseling have shown promising results in strengthening preventive behaviors. Nevertheless, most studies employ short-term follow-up periods and rarely incorporate structured self-monitoring tools that facilitate habit formation (D. J. Lee et al., 2024). Furthermore, few randomized controlled studies in Indonesian school settings have examined behavior-oriented approaches combining personalized coaching with practical reminder systems (Li & Su, 2024). The majority of prior research focuses on knowledge outcomes rather than measurable behavioral consistency, thereby limiting understanding of how to bridge the intention-behavior gap in adolescent health promotion (K. Lee et al., 2024).

The explicit research gap, therefore, lies in the limited evidence regarding the effectiveness of structured health coaching combined with a self-monitoring medium in promoting sustained BSE behavior among adolescent girls within a school context. There remains insufficient

empirical evaluation of interventions that integrate education, mentoring, and habit-reinforcement strategies over an extended period. This study introduces a novel approach that integrates Health Coaching with a BSE Calendar, a structured behavioral reinforcement tool. The novelty of this research lies in its combination of three key components: interactive coaching sessions, continuous mentoring, and a monthly self-recording calendar designed to strengthen self-regulation and habit formation. By operationalizing self-efficacy and habit-formation principles into a practical school-based intervention model, this study provides new evidence on behavior-oriented breast cancer prevention strategies among adolescents. Therefore, the objective of this study is to analyze the effectiveness of BSE Calendar-based Health Coaching in improving knowledge, attitudes, and BSE behaviors among adolescent girls compared with conventional health education methods.

RESEARCH METHODOLOGY

Study Design

This study employed a true experimental design with a randomized pretest–posttest control group. This design was selected to ensure high internal validity and to allow causal inference about the intervention's effects on knowledge, attitudes, and Breast Self-Examination (BSE) behavior. Random allocation minimized selection bias and controlled for potential confounding variables between groups.

Setting & Participants

The study was conducted at SMA Negeri 13 Makassar, Indonesia, from July to September 2025. The school is located within the service area of Bangkala Primary Health Center and represents an urban secondary school population. The target population comprised all female students in grades X and XI (N=154). Inclusion criteria were: (1) female students who had experienced menarche; (2) willingness to participate with written informed consent; and (3) physically and mentally healthy during the study period. Exclusion criteria included: (1) absence during either pretest or posttest assessment; and (2) incomplete questionnaire responses.

Sample size was calculated using the Slovin formula with a 5% margin of error, resulting in a minimum required sample of 112 participants (56 per group). After accounting for attrition (n=16), 96 participants completed the study (intervention n=50; control n=46). A simple random sampling technique was applied, followed by random allocation into intervention and control groups using a computerized randomization procedure.

Variables & Measurement

The independent variable was BSE Calendar-based Health Coaching, defined as a structured intervention comprising three coaching sessions and monthly self-monitoring using a BSE Calendar. The dependent variables were: Knowledge of BSE: defined as the cognitive understanding of breast cancer and BSE procedures, measured using an 18-item multiple-choice questionnaire. Attitude toward BSE: defined as participants' affective disposition toward performing BSE, assessed using an 11-item Guttman-scale questionnaire (Yes/No responses). BSE behavior: defined as the consistency and correctness of performing BSE, measured using a 6-item Likert-scale questionnaire (4-point scale). All instruments underwent validity and reliability testing before data collection. Content validity was assessed by expert review. Reliability analysis demonstrated Cronbach's alpha coefficients greater than 0.70 for all scales, indicating acceptable internal consistency. Data were obtained from primary sources through self-administered questionnaires.

Data Collection

Data collection was conducted in four stages: (1) coordination with school authorities; (2) baseline assessment (pretest) using standardized questionnaires; (3) implementation of the intervention over three months; and (4) post-intervention assessment (posttest). The intervention group received three structured health coaching sessions (60 minutes per session, monthly), incorporating interactive discussion, demonstration, guided reflection, and mentoring supported by the BSE Calendar booklet. Participants recorded monthly BSE practices in the calendar as a self-monitoring strategy. The control group received a single conventional health education session comprising a lecture and a BSE simulation using a breast phantom. Quality control procedures included standardized training of facilitators, use of identical questionnaires for pre- and post-tests, monitoring of attendance, verification of completed calendars, and double-checking data entry accuracy.

Data Analysis

Descriptive statistics were used to summarize participants' characteristics and baseline variables (mean, standard deviation, frequency, and percentage). Normality testing was performed using the Kolmogorov–Smirnov test. Because the data were not normally distributed, nonparametric tests were used. Within-group comparisons were analyzed using the Wilcoxon signed-rank test. Between-group comparisons were performed using the Mann–Whitney U test. To estimate the independent effect of the intervention while controlling for potential confounders (age, class level, prior information exposure), multivariate analysis was conducted using linear regression models with posttest scores as dependent variables and baseline scores as covariates. All statistical analyses were performed using SPSS version 22. Statistical significance was set at $\alpha = 0.05$ with two-tailed testing.

Ethical Approval

This study received ethical approval from the Research Ethics Committee of the Faculty of Public Health, Hasanuddin University. Ethical clearance number: 1334/UN4.14.1/TP.01.02/2025. All participants received detailed information regarding the study objectives, procedures, potential risks, and benefits. Written informed consent was obtained before participation. Confidentiality and anonymity of respondents were strictly maintained throughout the study.

RESULT

A total of 112 eligible adolescent girls were initially recruited and randomly allocated into intervention and control groups. During the three-month follow-up period, 16 participants were lost to follow-up due to illness or incomplete data, resulting in a final analytic sample of 96 respondents (intervention $n=50$; control $n=46$). Baseline analysis demonstrated that both groups were statistically comparable in terms of age distribution, class level, and prior exposure to information about Breast Self-Examination (BSE). There were no significant differences in pretest scores of knowledges, attitude, or BSE behavior between groups ($p>0.05$), indicating homogeneity at baseline.

Post-intervention analysis revealed significant improvements across all outcome variables in the intervention group compared with the control group. Participants who received BSE Calendar-based Health Coaching demonstrated greater increases in knowledge, more positive attitudes toward BSE, and substantially higher behavioral scores. Within-group comparisons confirmed statistically significant pre–post changes in the intervention group ($p<0.001$), whereas improvements in the control group were smaller. These findings indicate that the structured

coaching model with self-monitoring reinforcement produced a stronger effect on adolescent BSE-related outcomes than conventional health education alone.

Table 1. Baseline Characteristics of Respondents

Variable	Intervention (n=50)	Control (n=46)	p-value
Age (mean $\pm$ SD)	15.84 $\pm$ 0.72	15.70 $\pm$ 0.81	0.36
Grade XI, n (%)	33 (66.0%)	30 (65.2%)	0.92
Never received BSE information, n (%)	41 (82.0%)	36 (78.3%)	0.64

There were no significant baseline differences between groups ($p>0.05$), confirming successful randomization.

Table 2. Bivariate Analysis of Pre–Post Changes

Variable	Mean Difference (Intervention)	Mean Difference (Control)	p-value (Between Groups)
Knowledge	+3.20	+1.83	0.003
Attitude	+2.28	+1.31	0.001
Behavior	+8.20	+3.33	<0.001

Effect Size (Cohen's d, between groups posttest):

Knowledge: d = 0.55 (moderate effect)

Attitude: d = 0.60 (moderate effect)

Behavior: d = 1.12 (large effect)

The intervention produced moderate improvements in cognitive and attitudinal domains and a large effect on behavioral outcomes.

Table 3. Linear Regression Analysis of Posttest Outcomes

Outcome Variable	β (Adjusted)	95% CI	p-value
Knowledge	1.21	0.42 – 2.01	0.003
Attitude	1.06	0.45 – 1.67	0.001
Behavior	4.67	3.02 – 6.31	<0.001

After adjusting for potential confounders, participation in the BSE Calendar–based Health Coaching program was independently associated with higher posttest scores. The intervention increased knowledge scores by an average of 1.21 points (95% CI: 0.42–2.01), attitude scores by 1.06 points (95% CI: 0.45–1.67), and behavior scores by 4.67 points (95% CI: 3.02–6.31). The strongest effect was observed in behavioral outcomes, confirming that the structured coaching and self-monitoring approach substantially improved consistency in BSE practice. Overall, these findings demonstrate that BSE Calendar–based Health Coaching had a statistically significant and clinically meaningful impact on adolescents' knowledge, attitudes, and preventive behaviors compared with conventional education alone ($\alpha = 0.05$).

The findings of this study demonstrate that BSE Calendar–based Health Coaching produced statistically significant and practically meaningful improvements in adolescents' knowledge, attitudes, and Breast Self-Examination (BSE) behaviors compared with conventional health education. Baseline comparability between groups strengthens the internal validity of the observed effects. Although both groups experienced improvements, the magnitude of change was consistently greater in the intervention group, particularly in behavioral outcomes. The moderate effect sizes observed in knowledge and attitude domains indicate that structured coaching enhances cognitive understanding and positive perceptions toward BSE beyond standard lecture-based approaches. More importantly, the large effect size and significant adjusted regression coefficients for behavioral outcomes confirm that integrating mentoring and self-monitoring mechanisms substantially strengthens adherence to regular BSE practice. This suggests that

behavior-oriented reinforcement strategies are more effective than information delivery alone in bridging the intention-behavior gap. Analysis further supports the conclusion that the intervention independently contributed to improved outcomes after controlling for potential confounders. Overall, the results indicate that combining education, personalized coaching, and calendar-based habit reinforcement constitutes an effective and scalable school-based model for promoting sustainable preventive health behaviors among adolescent girls.

DISCUSSION

This randomized controlled study demonstrates that BSE Calendar-based Health Coaching significantly improved knowledge, attitudes, and Breast Self-Examination (BSE) behaviors among adolescent girls compared with conventional lecture-based education. While both groups showed improvements, the magnitude of change was consistently greater in the intervention group, particularly in behavioral outcomes, which demonstrated a large effect size. Multivariate analysis confirmed that the intervention independently predicted higher posttest scores after controlling for baseline values and demographic variables (Mercur et al., 2024). These findings indicate that structured coaching combined with self-monitoring reinforcement is more effective than one-time health education in promoting sustained preventive behavior (Mo et al., 2025).

The observed behavioral improvements can be interpreted through the lens of Social Cognitive Theory and Self-Efficacy Theory. According to Bandura's framework, behavior change is strongly influenced by mastery experience, self-regulation, and perceived self-efficacy. The coaching sessions provided guided practice, feedback, and reflective dialogue, which likely strengthened participants' confidence in performing BSE correctly. The BSE Calendar functioned as a self-monitoring tool, reinforcing self-regulatory processes such as goal-setting, progress tracking, and behavioral repetition (Razi et al., 2026).

From a habit-formation perspective, repetition within a stable contextual cue enhances the automaticity of behavior. The monthly calendar served as an environmental cue and behavioral prompt, facilitating the transition from intentional action to habitual practice (Robertshaw & Dobbin, 2025). This mechanism explains why the largest effect size was observed in the behavioral domain rather than in knowledge alone (Schulz et al., 2025). Information acquisition increases cognitive awareness, but habit reinforcement transforms awareness into consistent action. Thus, the integration of coaching and calendar-based monitoring operationalized theoretical constructs into a practical intervention model. Globally, studies in Nigeria, Iran, Nepal, and Colombia have reported that educational interventions can significantly increase adolescents' knowledge and short-term BSE practice (Singh et al., 2025). However, many of these studies relied on single-session education or short follow-up durations, limiting evaluation of sustained behavior change. Similar findings in Southeast Asia indicate that lecture-based reproductive health education improves knowledge but yields modest behavioral adherence (Suprpto, 2026).

Compared with prior regional studies in Indonesia that primarily emphasized audiovisual education or peer-led discussions, the present study adds evidence supporting a structured coaching model with longitudinal follow-up (Tuckey et al., 2025). The large behavioral effect size observed here aligns with international evidence suggesting that interventions incorporating mentoring and self-monitoring produce stronger adherence than passive education (Verschure-Dorsman et al., 2025). Therefore, this study corroborates the global literature, which emphasizes that behavior change requires reinforcement mechanisms beyond information dissemination (Voelker et al., 2024).

The convergence between this study and international findings lies in the consistent improvement in knowledge and attitudes following educational exposure (Walsh et al., 2024). However, there is divergence in the magnitude of behavioral change. While many studies report moderate gains in BSE practice, the present intervention produced substantially higher behavioral improvements. This divergence may be attributed to three factors: (1) repeated structured sessions over three months, enabling consolidation of learning; (2) active mentoring that enhanced self-efficacy; and (3) the use of a calendar as a behavioral cue supporting habit formation. Cultural context may also explain differences. In settings where discussion of breast health is socially sensitive, structured coaching may create a safer environment for dialogue and clarification (Wouk et al., 2025). Additionally, adolescence represents a developmental phase characterized by openness to guided identity formation, which may enhance receptivity to mentoring-based interventions (Wang et al., 2025).

The findings carry important implications for public health strategy, particularly in low- and middle-income countries where access to mammography screening is limited. School-based health promotion offers a cost-effective platform for early cancer prevention education. Integrating structured health coaching with practical self-monitoring tools into national adolescent health curricula could strengthen early detection awareness from a young age (Zakiyyah Putri et al., 2025). From a systems perspective, this model aligns with the World Health Organization's emphasis on early detection and community empowerment within comprehensive cancer control frameworks. The intervention is scalable, low-cost, and feasible within existing school health programs. Policymakers may consider incorporating coaching-based modules into reproductive health education, training school nurses or community health workers as facilitators, and embedding monitoring tools into routine adolescent health initiatives (Zhang et al., 2025). Furthermore, strengthening preventive behavior during adolescence may yield long-term health system benefits by fostering health literacy, self-efficacy, and proactive health-seeking behaviors into adulthood. Thus, the contribution of this study extends beyond breast cancer awareness to broader preventive health promotion strategies.

Strengths and Limitations

This study has several methodological strengths. The randomized controlled design enhances internal validity and reduces selection bias. Baseline homogeneity between groups supports causal interpretation. The three-month follow-up period allows assessment of short-term habit formation rather than immediate post-education effects. Additionally, integrating multivariate analysis strengthens inference by controlling for potential confounders. However, limitations should be acknowledged. First, outcomes were measured using self-reported questionnaires, which may introduce social desirability bias. Second, the study was conducted in a single school, potentially limiting generalizability to rural or socioeconomically diverse populations. Third, the follow-up duration, although longer than single-session studies, does not assess long-term sustainability beyond three months. Future research should consider multi-center trials with extended follow-up periods and objective behavioral verification measures. Despite these limitations, the study provides robust evidence that structured Health Coaching combined with calendar-based self-monitoring is a conceptually grounded and practically effective model for promoting preventive health behaviors among adolescents. The integration of behavioral theory into school-based interventions represents a significant advancement in adolescent health promotion and early cancer prevention.

CONCLUSION

This study confirms that BSE Calendar-based Health Coaching is significantly more effective than conventional lecture-based education in improving knowledge, attitudes, and Breast Self-Examination (BSE) behaviors among adolescent girls. The intervention produced statistically significant and clinically meaningful improvements across all outcome domains, with the greatest impact on behavioral consistency. These findings directly address the study objective by demonstrating that integrating structured coaching with a self-monitoring calendar enhances not only cognitive awareness but also sustained preventive practice.

The results provide evidence that behavior-oriented, theory-informed interventions are essential for bridging the gap between knowledge acquisition and the implementation of actual health behaviors. From a public health perspective, incorporating structured health coaching and practical reminder tools into school-based health education programs is strongly recommended. Policymakers and educational authorities should consider embedding this model within adolescent reproductive health curricula as part of early cancer detection strategies. Scaling up such low-cost, empowerment-based interventions may strengthen preventive health literacy and long-term breast cancer control efforts.

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This research received no external funding and was conducted using independent institutional resources.

Conflict of Interest

The author declares no conflict of interest related to this study.

Authors' Contributions

Indargairi conceptualized the study, led the intervention implementation, conducted data analysis, and drafted the manuscript. Sintawati contributed to study design, supervision, and critical manuscript revision. Fitri Afiati Nur and Nasywa Khaira Syukur assisted in data collection, intervention facilitation, and data management. Imran Pashar contributed to methodological validation, statistical review, and final manuscript editing. All authors read and approved the final version of the manuscript.

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