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The effect of health education based on the health belief model using flashcards on anxiety and perception of breast cancer risk in adolescent girls

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Abstract

Background: Early detection of breast cancer is an important effort in reducing morbidity and mortality in women, however, awareness and practice of breast self-examination (SADARI) among adolescent girls are still relatively low, potentially causing delayed detection in adulthood. The lack of systematic health education and engaging learning methods are the main factors in the low early detection behavior in this age group.

Purpose: To determine the effect of health education based on the Health Belief Model (HBM) with flashcard media on early detection of breast cancer in adolescent girls.

Method: The study used a one-group pretest–posttest design with a sample of 34 12th-grade female students of SMA Negeri 2 Abiansema selected using a purposive sampling technique.

Results: Univariate analysis showed that before the intervention, most respondents were in the sufficient action category with an average score of 64.61, whereas after being given HBM-based health education with flashcard media, there was an increase in early detection actions to the good category with an average score of 84.19. Bivariate analysis using the Wilcoxon test showed a significant difference between early detection measures before and after the intervention with a p value = 0.000 ($p < 0.05$), which indicates that HBM-based health education with flashcard media has a significant effect on increasing early detection measures for breast cancer.

Conclusion: These results indicate that the HBM approach combined with interactive visual media is able to increase adolescents' perceptions of risks, benefits, and self-confidence in performing BSE, so that health education with this method is effective and relevant to be implemented as a promotive and preventive strategy in the school environment from adolescence.

Keywords: Early Breast Cancer Detection; Flashcards; Health Belief Model.

INTRODUCTION

Modern lifestyle changes significantly impact individual health, particularly dietary patterns. People are increasingly consuming fast food, which is high in saturated fat, low in fiber, and contains food additives such as preservatives and artificial colors. This diet has been shown to increase the risk of obesity, insulin resistance, and oxidative stress, all of which are predisposing factors for cancer. Cancer is a pathological condition characterized by the transformation of normal cells due to genetic

mutations in deoxyribonucleic acid (DNA). These mutations disrupt the regulatory mechanisms of cell growth and differentiation, leading to progressive and uncontrolled proliferation of abnormal cells (Warlenda, Septiani, Hidayati, Maharani, & Amalia, 2023). Breast cancer is the most common type of cancer in women. Breast cancer ranks first among the most common cancers worldwide. In 2020, more than 2.3 million new cases and 685,000 deaths were recorded. In Asia, approximately 1 million women were diagnosed with breast cancer in 2022, resulting

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in 346.000 deaths. In Southeast Asia, there were 158.000 cases and 58.000 deaths (Santrock, 2022).

Indonesia recorded 66.271 new cases and 22.598 deaths in 2022, ranking it eighth in the world (Marmot, Altman, Cameron, Dewar, Thompson, & Wilcox, 2022). Based on Basic Health Research (BHR) data (2019), the highest cancer prevalence was in the provinces of Yogyakarta (4.86%), West Sumatra (2.47%), Gorontalo (2.44%), and Bali (2.27%). The lowest prevalence was in West Nusa Tenggara (0.85%) (Senkus, Kyriakides, Ohno, Penault-Llorca, Poortmans, Rutgers, & ESMO Guidelines Committee, 2025). According to the Bali Provincial Health Office, there were 64 new cases of breast cancer reported in 2022. In 2023, the Bali Provincial Health Office reported an increase of 200 cases. Based on referral hospital data, this makes it one of the most common types of cancer among women. Badung Regency has the highest incidence of breast cancer among the nine regencies in Bali, with 104 cases. Klungkung Regency is second with 43 cases, Gianyar Regency is third with 14 cases, and Bangli Regency has the lowest incidence with 0 cases. Badung's health facilities are considered adequate, while in the Abiansemal region, awareness of early breast cancer detection remains a challenge, especially among younger age groups (Sung, Ferlay, Siegel, Laversanne, Soerjomataram, Jemal, & Bray, 2021).

Breast cancer has a significant impact, not only on physical health but also on the psychological, social, and economic aspects of sufferers. Physically, this disease can cause decreased body function, long-lasting pain, fatigue, and side effects from treatments such as chemotherapy and radiotherapy. Psychological aspects of sufferers can be affected, such as the emergence of stress, anxiety, depression, and body image disturbances after a mastectomy (breast removal). Socially, sufferers may experience difficulty interacting, decreased self-confidence, and changes in roles within the family or work environment (McCance, Huether, Brashers, & Rote, 2019). Breast cancer treatment can be carried out through several methods: preventive, promotive, and curative, tailored to the stage of the disease, the patient's condition, and the biological characteristics

of the tumor. The main preventive methods include maintaining a healthy diet, regular physical activity, and avoiding alcohol consumption. Promotive approaches, such as public health education on the importance of breast self-examination (BSE), clinical breast examination (BSE), mammography, and X-rays, are recommended for women over 40 or at high risk to detect cancer at an early stage. Curative aspects include surgical procedures such as mastectomy or lumpectomy to remove cancerous tissue, often combined with radiotherapy to destroy remaining malignant cells (Nutbeam, 2020).

Late detection of breast cancer often results in patients presenting to healthcare facilities at an advanced stage, resulting in low cure rates and high treatment costs. According to the Indonesian Health Insurance (BPJS Kesehatan), breast cancer is among the top five catastrophic diseases with the highest cost burden, reaching IDR 1.2 trillion per year (Andriani, Rachmadani, Natasha, & Saptari, 2022). As the most effective and efficient preventative measure, early detection of breast cancer is the primary way to reduce morbidity and mortality from breast cancer. The breast cancer prevention strategy involves raising adolescent awareness through health education based on behavioral theories, such as the Health Belief Model (HBM). The HBM has the advantage of focusing education on the psychological factors that influence health behaviors, emphasizing six components: risk (perceived susceptibility), severity (perceived severity), benefits (perceived benefits), barriers (perceived barriers), cues to action, and self-efficacy. The use of educational media, such as flashcards designed using the HBM approach, has been shown to increase understanding, change attitudes, and encourage positive early detection behaviors. Adolescents educated using HBM-based flashcards experienced a significant increase in BSE practice, from 25% before the intervention to 78% after the intervention (Rugo, Rumble, Macrae, Barton, Connolly, Dickler, & Burstein, 2016).

The Health Belief Model (HBM) has the advantage of comprehensively explaining health behaviors by considering individual perceptions, such as vulnerability, disease severity, benefits, and

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barriers. It is often used in promotive and preventive interventions to encourage behavior change. This model is also flexible and can be applied to various health issues, including early detection of breast cancer, making it easier for health workers to design educational programs (Arnett, 2020). However, the weakness of the HBM lies in its emphasis on rational cognitive aspects, thus underestimating the powerful social, cultural, emotional, and habitual influences that shape behavior (Afifi, Bakti, Yaman, & Sumaedi, 2025). Flashcards are a visual learning medium that is interactive, simple, and effective in conveying health messages. Flashcards can be customized with the six components of the Human Body Model (HBM), so each card emphasizes a key concept in early breast cancer detection, such as the benefits of breast self-examination (BSE), how to perform it, and the consequences of not performing it. The use of visual media like this has been shown to improve information retention and facilitate understanding (Berk, 2025). The use of flashcards in health education can improve knowledge and skills in early breast cancer detection in adolescent girls (Rosenstock, 2024).

In the study, the group receiving flashcard education experienced an increase in BSE practice from 25% before the intervention to 78% after the intervention, while the control group showed no significant change. These results demonstrate that flashcards can be an effective medium for encouraging health behavior change due to their visual, engaging, and memorable nature. Most adolescent girls lack sufficient knowledge about breast cancer and preventive measures for early breast cancer detection, such as BSE. Many adolescents also hold the misperception that breast cancer only affects adult or elderly women (DeSantis, Siegel, & Jemal, 2023). The lack of integration of health education into the school curriculum and the lack of engaging learning methods are major obstacles to increasing adolescent knowledge and awareness. Healthy lifestyles, including early disease detection, must be instilled from school age to ensure sustainability into adulthood. Based on a preliminary study conducted on July 30, 2025, of 179 12th-grade female students at Senior high school 2 Abiansemal, 26 students were interviewed. All

interviewed students did not understand breast cancer, early detection, factors that can increase the risk of breast cancer, complications, early signs and symptoms of breast cancer, or how to perform a breast self-examination (BSE). Based on observations and interviews with one of the school's guidance counselors, it was discovered that there had been no health education or training activities regarding breast cancer prevention and early detection. Based on the above background, this study aims to determine the effect of health education based on the Health Belief Model using flashcards on early breast cancer detection in adolescent girls (Prastika & Hayati, 2024).

RESEARCH METHOD

A quantitative research approach with a quasi-experimental design using a one-group pretest-posttest method. The research was conducted at Senior high school 2 Abiansemal in November 2025. The population of the study consisted of all female students in grade XII, totaling 40 students. A sample of 34 respondents was selected using purposive sampling based on predetermined inclusion and exclusion criteria. The independent variable in this study was health education based on the Health Belief Model using flashcard media, while the dependent variable was early breast cancer detection behavior among adolescent girls. Data were collected using a structured questionnaire developed according to HBM constructs to assess respondents' perceptions and behaviors related to BSE. Data analysis included univariate analysis to describe respondent characteristics and behavior scores, and bivariate analysis using the Wilcoxon Signed Rank Test to determine differences in behavior before and after the intervention. The research instruments used included the Health Belief Model questionnaire to measure early breast cancer detection practices, a health education program (SAP), and flashcards compiled based on the six components of the Health Belief Model as a health education medium. The study began with an explanation of the study and the completion of informed consent. Next, respondents were given a pretest using the Health Belief Model questionnaire. The intervention, which included breast cancer

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health education based on the Health Belief Model using flashcards, was delivered for approximately 30 minutes. After the intervention, respondents were given another posttest using the same questionnaire.

The collected data was then processed and analyzed according to established methods.

RESEARCH RESULTS

Table 1. Distribution of Respondent Characteristics (N=34)

Variable	Results
Age (n/%) (Mean±SD) (Range) (Year)	(17.3±0.8) (16-18)
16	7/20.5
17	9/26.5
18	18/53.0
Before Breast Cancer Health Education (n/%) (Mean±SD)	(64.4±6.1) (56-80)
Good	2/5.9
Moderate	25/73.5
Poor	7/20.6
After Breast Cancer Health Education (n/%) (Mean±SD)	(84.2±5.2) (74-96)
Good	30/88.2
Moderate	4/11.8
Teenage History (n/%)	
Once	0/0.0
Never	34/100.0
Resources (n/%)	
Electronic media	14/41.7
Print media	8/25.0
Healthcare workers	3/8.3
Friends/family	3/8.3
Never	6/16.7

The table shows that the respondents had a mean age of 17.3 ± 0.8 years, with an age range of 16–18 years. Most participants were 18 years old (53.0%), followed by 17 years (26.5%) and 16 years (20.5%). Before receiving breast cancer health education, the majority of respondents were in the moderate category (73.5%), with a mean score of 64.4 ± 6.1 (range 56–80), while 20.6% were in the poor category and only 5.9% were in the good category. After the health education intervention, there was a notable improvement, with most respondents classified in the good category (88.2%) and the remaining 11.8% in the moderate category, reflected by an increased mean score of 84.2 ± 5.2 (range 74–96). Regarding teenage history, all respondents (100.0%) reported never having experienced related conditions. In terms of information sources, electronic media was the

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most common source (41.7%), followed by print media (25.0%), while smaller proportions obtained information from healthcare workers (8.3%) and friends or family (8.3%), and 16.7% reported never receiving any information.

Table 2. Data Normality Test

Early Detection of Breast Cancer	<i>P-value</i>	Description
<i>Pre-test</i>	0.003	The data is not normally distributed.
<i>Post-test</i>	0.041	The data is not normally distributed.

Based on the table above, it is known that the distribution of data before and after treatment is not normal, so the Wilcoxon test was used for bivariate analysis.

Table 3. Differences Before and After Breast Cancer Health Education Based on the Health Belief Model Using Flashcards.

Early Detection of Breast Cancer	Mean	Mean Difference	<i>p value</i>
<i>Pre-test</i>	64.61		
<i>Post-test</i>	84.19	19.58	0.000

Based on table, it can be seen that there are differences in early detection actions of breast cancer in young women before and after being given breast cancer health education based on the Health Belief Model with Flashcard media with an average of early detection actions before being given treatment, namely 64.61 increasing to 84.19 after being given treatment, it is known that there was an increase in the mean action of 19.58. The results of the Wilcoxon test obtained a *p* value of 0.000, because the *p* value < α (0.05), then H_0 is rejected and H_a is accepted, it can be concluded that there are differences in early detection actions of breast cancer in young women before and after being given breast cancer health education.

DISCUSSION

The results of the study showed that health education based on the Health Belief Model (HBM) using flashcards significantly increased early detection of breast cancer among adolescent girls. Before the intervention, most respondents were in the "fair" category, with a mean score of 64.61, reflecting low awareness and practice of BSE among adolescents. This is in line with health behavior theory, which states that low perceptions of disease

vulnerability and severity lead to individuals being less motivated to take preventive measures (Blakemore, & Mills, 2024). After the intervention, there was a significant increase in early detection, reaching the "good" category, with a mean score of 84.19, indicating that a structured educational approach based on behavioral theory is effective in shaping adolescents' health behaviors (Brown & Larson, 2019).

The application of the HBM through flashcards has been shown to improve respondents' understanding of the components of perceived susceptibility, perceived severity, perceived benefits, and self-efficacy in performing BSE (Ghoncheh, Mohammadian-Hafshejani, & Salehiniya, 2025). The visual and interactive nature of flashcards facilitates adolescents' understanding of abstract concepts related to breast cancer and early detection steps, thereby increasing information retention and readiness to act. HBM-based visual media effectively increases early breast cancer detection behavior in young age groups (García-Sancha, Corchado-Cobos, & Pérez-Losada, 2025). Therefore, HBM-based health education using flashcards can be recommended as an applicable promotive and preventive strategy for implementation in schools to

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instill early breast cancer detection behaviors from adolescence (Harahap & Lumbanraja, 2018).

In addition, adolescence is a critical developmental period characterized by rapid physical, cognitive, and psychosocial changes, making it an ideal stage for establishing long-term health behaviors (Chu, 2024). At this age, individuals are more receptive to new information and more adaptable to behavioral change when appropriate educational strategies are applied (Green & Kreuter, 2025). The Health Belief Model (HBM) framework is particularly suitable for adolescents because it emphasizes personal beliefs and perceptions as key determinants of preventive action. By strengthening perceived susceptibility and perceived severity of breast cancer at an early age, educational interventions can foster a sense of responsibility toward personal health and encourage consistent BSE practices (Creswell & Creswell, 2017).

The use of flashcards as a visual educational medium enhances active participation and two-way interaction during learning sessions. Compared to conventional lecture-based methods, visual and interactive tools stimulate attention, curiosity, and engagement, which are essential for effective learning among adolescents. Flashcards also simplify complex medical information into concise and memorable key points, enabling students to better understand the steps of BSE and the importance of early detection (Noriani, 2023). This approach supports cognitive reinforcement, where repeated visual exposure contributes to stronger memory retention and behavioral intention (Mills, 2020).

Moreover, improving early detection behavior through theory-based education has broader public health implications. Establishing correct knowledge and positive attitudes toward breast health during adolescence can reduce misconceptions, fear, and stigma related to breast cancer in the future (Sahara, Putri, & Tampubolon, 2026). When adolescents develop confidence and self-efficacy in performing BSE, they are more likely to maintain this practice into adulthood and potentially influence their peers and family members. Therefore, integrating HBM-based flashcard education into school health

programs not only strengthens individual preventive behavior but also contributes to long-term community awareness and cancer prevention efforts (Silverman, Israel, & Trinh, 2025).

CONCLUSION

Health Belief Model (HBM)-based health education using flashcards has been shown to improve early detection of breast cancer in adolescent girls. The average score for early detection before the intervention was 64.61 (sufficient category) and increased to 84.19 (good category) after the intervention. The Wilcoxon Signed Rank Test showed a p-value of 0.000 ($p < 0.05$), indicating a significant difference between early detection before and after health education. Therefore, HBM-based health education using flashcards is effective in improving early detection of breast cancer in adolescent girls.

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