Original Research

IJNHS

Effect of Breast Cancer Detection Application on Improving Knowledge of Early Detection of Breast Cancer (BSE) among Adolescents

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Article info

Article history:
Received: August 21th, 2022
Revised: September 19th, 2022
Accepted: October 10th, 2022

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International Journal of Nursing and Health Services (IJNHS)
Volume 5, Issue 5, October 20th, 2022
DOI: 10.35654/ijnhs.v5i5.637
E-ISSN: 2654-6310

Abstract

Background: Breast cancer is one of the most common cancers women suffer, especially in adolescents and young adults. **Objective**: This study aims to determine the effect of the application of early detection of breast cancer to increase knowledge about early detection of breast cancer in adolescents. **Method**: This study used a pre-experimental design with a one-group pre-test post-test design approach. The study sample amounted to 100 respondents with sampling using a purposive sampling technique. The analysis used was bivariate and gene analysis using Wilcoxon. **Result**: The characteristics of the majority of respondents are middle-aged adolescents 15 to 17 years (91%), have never received education about breast cancer and how to prevent it (73%), and the level of knowledge about breast cancer is sufficient (54). The Wilcoxon alternative test results compared the knowledge level before, and after using an Android-based breast cancer early detection application obtained p value = 0.000 < (0.05). **Conclusion**: In conclusion, this study has an effect of early detection of breast cancer in increasing knowledge about the early detection of breast cancer in adolescents. **Recommendation**: The results of this study are expected to increase knowledge about breast health education through an Android-based early detection application for breast cancer in adolescents that can apply to the implementation of nursing. Researchers suggest that future researchers can use creativity so that this research can attract more respondents' attention and be able to increase the knowledge of adolescents.

Keywords: Adolescents, Breast Cancer, Knowledge, Realize

INTRODUCTION

Breast cancer is the most commonly occurring cancer in women (1). The incidence rate of cancer is generally higher among women than men because women are more likely to develop cancer, such as breast cancer, which is the most common in Indonesia (2). Breast cancer is now the most common cancer in women, with a very high global case dominance (3). According to data from the Global Cancer Observatory, in 2020, there were 19.2 million new cancer cases worldwide, including 2.2 million women diagnosed with breast cancer. There were approximately 685,000 females who died from breast cancer in 2020, accounting for about 15.5% of all cancer deaths in the world (4).

The prevalence of cancer in Indonesia is relatively high (5). The prevalence of breast cancer in Indonesia shows an increase from 1.4 per 1,000 population in 2013 to 1.79 per 1,000 population in 2018 (6). The incidence of breast cancer in Indonesia has reached 8,625 cases, and it was found that 82% of breast cancer patients are already at an advanced stage. This high incidence is due to the hesitation and ignorance of women to take an early examination (7).

The high prevalence of women with breast cancer is associated with the delay in diagnosis. This is caused by several factors, including the lack of knowledge about the signs and symptoms of breast cancer, the lack of exposure to information, and the lack of early detection through breast self-examination (BSE) (8). A breast cancer diagnosis at an early stage is associated with improved outcomes and increased survival chances. An effective screening program may help patients find specific types of cancer before signs or symptoms appear (9). Early cancer diagnosis through the screening stage can diagnose the disease before it becomes clinically apparent, offer early treatment, reduce mortality and improve quality of life (10).

Breast cancer is the most common cancer in adolescents and young adults aged 15 to 39 years, accounting for 30% of breast cancer patients and 5.6% of all invasive breast cancers in women (11). Currently, many patients with breast cancer are found at a young age (adolescents). Furthermore, breast tumors in teenage girls over fourteen are significantly at risk of becoming breast cancer if not recognized early (12). Based on a literature study conducted by Sukma and Kurniawati (2021) regarding the description of knowledge and behavior about breast self-examination in adolescents, 60% of adolescents were found to have never or rarely performed BSE (13). The results of a preliminary study by researchers of 12 teenage students of SMAN 8 Pekanbaru on March 9, 2022, with the interview method, indicated that 8 out of 12 teenagers did not yet know the signs and symptoms of breast cancer, risk factors, and how to do BSE. The principal of SMAN 8 also stated that counseling about breast cancer had not been carried out for a long time.

Promotive and preventive actions may prevent breast cancer through health education and screening. Oktarida (2020) found a strong relationship between the level of knowledge and efforts to screen for breast cancer in adolescents (14). According to the Regulation of Minister of Health No. 34 of 2015 concerning the Management of Breast and Cervical Cancer, the prevention program for breast cancer and cervical cancer is considered the embodiment of public health services that include promotive and preventive efforts.

Overcoming breast cancer can be done through open socialization by utilizing print media, electronic media, social media, community leaders, and religious leaders (15). Health education can encourage people to actualize healthy living patterns and behaviors. Health education also aims to expand information and increase knowledge, attitudes, and actions in promoting and maintaining health (16). Moreover, the screening stage allows people to find an early diagnosis and increase the success rate of breast cancer treatment.

Early detection is regarded as the first step in preventing cancer and consists of two components: screening and education about early diagnosis. Health education is highly required for people to increase their awareness about the early signs of possible cancer, specifically breast self-examination (BSE) education (15). Efforts to promote early diagnosis are necessary for population-based screening, as early diagnosis will improve outcomes for all breast cancer patients. In contrast, less than half of breast cancers are

screen-diagnosed, even in the most effective screening programs (17). Health education may be carried out using various media, such as print, visual, or audio-visual media (18).

With the use of smartphone technology, Audio-visual media can improve health outcomes through applications containing health information (19). Several studies were conducted by utilizing smartphone application technology, including the analysis by Henriksson (2020), which evaluated whether parent-oriented health smartphone applications (MINI STOP 2.0 application) integrated into primary child health care can improve dietary patterns and physical activity behavior and reduce the prevalence of overweight and obesity in preschool-aged children (20).

Furthermore, expert groups also used smartphone applications for a rapid response to COVID-19 established in Sichuan Province. Experts provided distance education to the medical staff at local hospitals through remote consulting networks, portals, and smartphone applications (21). Another example of using applications is eHealth, mobile health (mHealth). This application can be a resource for better health care and provide quality and low-cost medical care (22).

Referring to the above phenomenon, smartphones can be utilized to educate adolescents about the importance of early detection of breast cancer. Therefore, the researchers intended to study "The Effect of Using Smartphone-Based Breast Cancer Detection Application to Increase Knowledge About Early Detection of Breast Cancer."

OBJECTIVE

This study aimed to determine the effect of using the application for early detection of breast cancer in increasing knowledge and information regarding early detection of breast cancer in adolescent students at the study site. The results of this study are expected to be used as a source of information in the development of science, especially regarding the application of early detection of breast cancer.

METHOD

Design

This study was conducted at SMAN 5, SMAN 8, and SMAN 9 in Pekanbaru, which was initiated by drafting a study proposal up to a result seminar from February 2022 to July 2022. This quantitative study used a pre-experimental method with a one-group pretest-posttest design.

Sample, sample size, & sampling technique

The population in this study involved 2092 teenage girls who attended SMAN 5, SMAN 8, and SMAN 9 Pekanbaru. The study samples were determined using a purposive sampling technique, totaling 100 respondents. The inclusion criteria for the samples of this study were teenage girls who attended SMAN 5, SMAN 8, and SMAN 9 Pekanbaru and had an Android-based smartphone. The exclusion criteria in this study were female students in their final year because they were busy with college entrance exams and refused to participate in this study.

Data collection process

This study was conducted using an Android-based application that provides information on breast cancer prevention methods. This application was utilized as a learning aid for respondents to use for 3 days. This application includes a front page, a content page, and an information page. The front page consists of the main menu display of the application, including the check menu, information menu, and contact menu for people who can be contacted if problems are found in the application. The content page of the application consists of the steps for checking BSE. Furthermore, the information page provides breast cancer information such as definitions, prevention methods, and a list of foods to prevent breast cancer.

An instrument for data collection

The researcher compiled a questionnaire containing knowledge of breast cancer. The media validity test for the application was carried out with a maternity expert. This validation test was conducted to assess the display and content of the application for the early detection of breast cancer. The results of this validation test indicated that the application of early detection

of breast cancer was feasible to be used in this study.

The validity and reliability tests of the questionnaire were conducted at SMAN 4 Pekanbaru. The validity test was carried out on 14 statements containing knowledge of breast cancer. The results obtained in the validity test were then processed using a computer on a questionnaire about knowledge. All questions on the questionnaire regarding knowledge compiled after validity and reliability tests were declared valid or questions with r table > 0.444. The reliability test was carried out after all questions were declared valid. The reliability test of the breast cancer knowledge questionnaire showed that Cronbach's alpha (0.837) > 0.700, meaning that it was declared reliable.

This study was carried out by explaining the aims and objectives of the study. Moreover, this study obtained approval through informed consent using the online Google form. Furthermore, the researchers distributed pre-test questionnaires to the respondents, with the answers attached. If the question remained unanswered, the respondent would be given time for clarification. Subsequently, the researchers distributed the application for early detection of breast cancer through the link and explained to the respondents the content and purpose of using the application. Respondents were asked to use this application and practice breast cancer self-examination for three days. The researchers did not allow respondents to share this application during this study period. The researchers also monitored respondents using the application through the WhatsApp group created during the first meeting. Finally, the researchers distributed post-test questionnaires to examine respondents' knowledge levels after using the application for three days. Respondents were asked to fill out a questionnaire within 30 minutes. The results of the completed questionnaires were then collected and checked for completeness.

Respondents were given the right to either answer or decline to answer the questions. Anonymity, no violation of privacy, and the right to self-determination were observed. All data gathered were handled with strict confidentiality. Measures to avoid possible risks were properly addressed.

Data analysis

The researchers used simple descriptive analysis to determine the characteristics of the studied respondents. Univariate analysis in this study was utilized to explain the features of respondents (age and education background of respondents) and to obtain an overview of the variables studied, namely the level of knowledge.

Bivariate analysis was intended to increase respondents' knowledge about breast cancer. The statistical test used in this study was the paired t-test if it met the requirements to examine the difference in the effect of using the application of early detection of breast cancer (before and after) on the level of knowledge about early detection of breast cancer in the intervention group. However, if it did not meet the requirements, the researchers used an alternative test, namely the Wilcoxon test.

The significant level (α) of 0.05 was used in this test. Suppose the statistical test results showed p value < (0.05). In that case, Ho should be rejected, meaning that there was an effect of using an Android-based breast cancer early detection application on the level of adolescent knowledge about early detection of breast cancer. If the statistical test results showed p value > (0.05), then Ho failed to be rejected, meaning that there was no effect of using an Android-based breast cancer early detection application on the level of adolescent knowledge about early detection of breast cancer.

Ethical consideration

Before data collection, ethical clearance was obtained from the Research Ethics Supervisory Committee of the Faculty of Nursing, University of Riau.

RESULTS

Table 1 Characteristics of respondents

Characteristics	Total Respondents	
	n=100	%
Respondent's Age		
- Early teens (12-14)	1	1
- Middle Teens (15-17)	91	91
- Late Teens (18-20)	8	8
Total	100	100

Respondents who have previously received breast cancer education.		
- Already Received	27	27
- Never Received	73	73
Total	100	100

Table 1 above shows that the majority of respondents in this study were middle teens (15-17), amounting to 91 respondents (91%). Based on the class category, it was found that 64 respondents (64%) were taking the 11th-grade level of high school, and 73 respondents (73%) were found to have never received health education about breast cancer.

Table 2 Distribution of Adolescent Knowledge About Breast Cancer Before Using Early Detection Application

Characteristics	n	%
Good	57	57
Medium	40	40
Low	3	3
Total	100	100.0

Table 3 Distribution of Adolescent Knowledge About Breast Cancer After Using Early Detection Application

Characteristics	n	%
Good	85	85
Medium	14	14
Low	1	1
Total	100	100

Based on tables 2 and 3, it was found that there were 57 adolescents with a good level of pre-test knowledge related to breast cancer, 40 adolescents with a medium level of knowledge, and 3 with a low level of knowledge. After the implementation of breast cancer education using an Android-based breast cancer early detection application, it was found that there were 85 respondents with a good level of knowledge, 14 respondents with a medium level of expertise, and 1 person with a low level of understanding.

Table 4 Average Knowledge Before and After Health Education on Early Detection of Breast Cancer Through Android-Based Application

Knowledge	Mean	SD	Min	Max
Pre-Test	10.53	1.520	6	13
Post-Test	12.05	1.604	8	14

Table 4 shows that the average pre-test knowledge of health education regarding breast cancer through the questionnaire amounted to 10.53, and the standard deviation was 1,520. The average value of post-test health education regarding breast cancer through an android-based application was amounted to 12.05, and the standard deviation of the post-test was found to be 1.604. The minimum pre-test score was 6, and the maximum score was amounted to 13. Meanwhile, the minimum post-test score was found to be 8, and the maximum score was amounted to 14.

Table 6 Differences in Knowledge Before and After being given Breast Cancer Health Education Through Android-Based Applications

Variable	n	Median	SD	Min-Max	P Value
Pre-test	100	10.53	1.520	6-13	0.000
Post-test	100	12.00	1.604	8-14	

Table 6 shows that 100 respondents received health education about breast cancer, and the median of pre-test knowledge amounted to 11.00, and an increase in post-test was found to be 12.00. The standard deviation value of the pre-test of breast cancer health education through an android-based application was amounted to 1.527, and the value of the post-test of breast cancer health education through an android-based application was found to be 1.604. The minimum and maximum values during the pre-test were 6 to 13 and showed an increase in the post-test, which amounted to 8 to 14. The results of the statistical test using the Wilcoxon test showed the p-value (0.000) < α (0.05), indicating that there was an effect provided by breast cancer education through android-based applications on the level of knowledge of adolescents.

DISCUSSION

Characteristics of Respondents

The study on high school students indicated that most of the respondents involved were middle-aged teenagers, with as

many as 91 respondents (91%). Moreover, the study respondents comprised 1 (1%) early teens and 8 (8%) late teens. Breast cancer is the most common cancer in adolescents and young adults aged 15 to 39. Currently, many patients with breast cancer are found at a young age (adolescents). Furthermore, breast tumors in teenage girls over fourteen are at risk of becoming breast cancer if not recognized early (12).

Based on the results of the study conducted on high school students, it was found that 73 respondents (73%) had never received health education about breast cancer, and 27 respondents (27%) had previously received health education about breast cancer. Delayed diagnosis of breast cancer may occur due to several factors, including the lack of knowledge about the signs and symptoms of breast cancer, the lack of exposure to information, and the lack of early detection through breast self-examination (BSE) (8).

The study's results on 100 high school students were obtained through a questionnaire score previously distributed, and an increase in results was found after the study was conducted. Before being given health education through the early detection of breast cancer, the lowest score was 6, and the highest score was 13. Meanwhile, after being given health education through the early detection of breast cancer, the lowest score amounted to 8, and the highest score was found to be 14. Application on android has become effective in adolescents in Indonesia. This is due to the rapid development of smartphone technology, which is now the primary source of information for teenagers (23).

The Effect of Breast Cancer Education Through Android-Based Application

Knowledge is acquired through sensing results. The human senses consist of sight, hearing, smell, taste, and touch. The learning process is mainly done through the purposes of the eyes and ears (24). Education is a purposeful activity intended to acquire knowledge. A person's knowledge base is determined by the amount of formal education they have attended. In addition to formal education, information from sources other than schools, such as social media, electronic media, and the internet, can also impact a person's knowledge level (23).

Mass media, including the web and applications, may be used as a source of data that can be accessed and utilized by many young people, including teenagers. Amid advances in technology and data, everyone is required to be able to access the internet, including teenage students (25). Information increasingly obtained by individuals can raise awareness for their knowledge, attitudes, and behaviour (26).

The android application is a software application running on the smartphone based on android. Users in different positions can still use the android application without being disconnected or experiencing communication problems. The android application is an electronic learning device that can be used as a learning medium to quickly obtain data and information (23). It is also stated in a study conducted by Muyaroah and Fajartia (2017) that the feasibility of android-based learning media on student learning outcomes is considered adequate. The feasibility refers to the level of success of the framework designed to engage students actively and independently in using Android-based learning media (27).

Referring to the results of a study that had been carried out on 100 respondents, respondents' knowledge level before being given breast cancer education showed the lowest pre-test score of 6 and the highest of 13. After being given breast cancer education using an android-based application, there was an increase in post-test scores, with the lowest score of 8 and the highest score of 14. The statistical test results showed the p-value (0.000) < α (0.05), which indicated that there was an effect of breast cancer education through an android-based application on the level of adolescent knowledge.

The increase in knowledge was more likely caused by respondents who already had more than 50% knowledge about general breast examination, despite having never received thorough education about breast cancer. Although the respondents were quite aware of breast cancer screening, they still did not understand some details about breast cancer screening, such as when and who should do it.

After using an android-based application that contains education about breast cancer and how to perform an examination, respondents' knowledge about breast cancer was found to have increased. The increase in knowledge was associated with an attractive application display, easy-to-understand language, and easy-to-use application. Furthermore, this study was conducted during school holidays so that respondents could freely use and practice the application of early detection of breast cancer.

The results of this study are in line with the survey conducted by Putri, Theresia, and Widya (2019), which found that health education carried out by using media applications was more likely capable of increasing knowledge in adolescents because adolescents were more interested, happy and focused when using software application media (28). The smartphone application allows teenage students to use it anywhere and anytime freely (23).

Furthermore, smartphone applications are also considered a cost-effective and widely reachable strategy, as this can benefit users who choose not to attend face-to-face meetings. (29). However, apart from the application's advantages, some disadvantages can be found, such as inadequate application descriptions and incorrect descriptions of application functions without downloading the application. (30). Moreover, the results of a study conducted by Purwadi, Setiaji, and Maryam (2019) also showed that education using electronic media was proven to be more effective in increasing adolescent knowledge and behavior (31).

Limitations of the Study

During the implementation of the study, there were many obstacles and limitations that the researchers encountered, specifically respondents who were not yet capable of installing the application made and some respondents who were inactive during the study, so control needed to be done by the researchers. Furthermore, this study was conducted in a short period, thereby requiring researchers to determine respondents quickly.

Conclusion

Based on the results of a study on 100 adolescent respondents regarding "The Effect of Using Smartphone-Based Breast Cancer Detection Application to Increase Knowledge About Early Detection of Breast Cancer," it can be concluded that 91 respondents (91%) were middle teens aged 15 to 17, and 73 respondents (73%) had never received breast cancer health education. The results of statistical analysis showed that health education about breast cancer through the application of early detection of breast cancer affected increasing the level of knowledge of teenage girls about breast cancer and cancer prevention methods with p-value (0.000) < (0.05).

Acknowledgment

1. Erika, SK., M.Kep., Sp.Mat., Ph.D. as Supervisor I and Ns. Didi Kurniawan, M. Kep as Supervisor II for their constant supervision, guidance, and support for the researchers.
2. Yesi Hasneli, SKp., MNS and Ns. Ganis Indriati, M.Kep., Sp.Kep.An and Ns. Sri Wahyuni, M.Kep., Sp. Jiwa., Ph.D., was the examiner who gave suggestions and constructive criticism while writing this research paper.
3. Dr. Ns. Misrawati, M.Kep., Sp.Mat as Thesis Coordinator for her guidance in facilitating the process of completing this research project.
4. Principal of SMAN 5, SMAN 8, and SMAN 9 Pekanbaru who had provided opportunities and good cooperation during the implementation of this research.
5. All Lecturers and Staff of the Faculty of Nursing, Riau University, who had provided a lot of knowledge and assistance to the researchers.

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