

Innovative hybrid health education (Digital Media and Phantom Simulation) to improve knowledge among adolescent girls

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Abstract. One of the leading causes of death among women in Indonesia is breast cancer. Breast self-examination (BSE) can be performed by every woman as an early detection effort. However, women's knowledge and awareness of performing BSE remain low. This study aimed to determine the effect of health education using multimedia and demonstration on adolescent girls' knowledge regarding early detection of breast cancer through BSE. The research employed a pre-experimental one-group pretest-posttest design. The sample was selected using total sampling, involving 55 junior and senior high school girls at PKBM STQ Telaga Ilmu Yogyakarta. Data were collected using a questionnaire consisting of 20 dichotomous items. The education was delivered using multimedia and demonstrations with a breast examination phantom. The results showed that the average pretest score was 8.13, while the posttest score was 19.44. The findings demonstrated that the educational intervention improved participants' knowledge about early detection of breast cancer. This study indicates that multimedia-based health education can effectively enhance adolescents' knowledge of breast cancer early detection. Therefore, PKBM and similar institutions need to integrate reproductive health education into continuous, practical, and accessible learning for adolescent girls.

1 Introduction

Breast cancer is the most frequently occurring disease in women and is one of the most serious worldwide. Every year, the number of women affected by the disease grows, and the number of women who die from the disease grows by hundreds of thousands. These statistics make it clear, and public health officials have identified it as an ongoing public health concern, as it moves along the lines of prevention and early detection [1-2]. According to the GLOBOCAN database, as of 2020, the world suffers 2.3 million cases of breast cancer yearly, with an annual mortality of 665,000. Indonesia has the highest number of all cancer cases of breast cancer, with an incidence of 16.6% and 22,430 deaths. The Yogyakarta Provincial Health Office announced that for the year 2022, breast cancer was the most

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common cancer among women, making up 24.8% of all cases of women's cancer and in the Bantul District. Scenarios have shown that breast cancer was the most detected noncommunicable disease in the early detection of primary health care activities [3-5].

Various literature examines how most teens suffer from insufficient knowledge concerning breast cancer and the execution of breast self examination (BSE). Many are unaware of the procedure and understand it poorly owing to its uncommon nature. This phenomenon of BSE neglect can be explained by limited access to information, lack of motivation, and BSE advantage ignorance. Several BSE studies point to the associations between knowledge, attitudes, motivation, and BSE practices. In conclusion, education and breast self examination BSE focused interventions have to be enhanced to better equip adolescents [6].

Detecting breast cancer at an early stage and improving survival rates through early treatment intervention is very important. However, early breast cancer screening in Indonesia faces serious challenges such as people's ignorance, and lack of awareness regarding breast cancer and its risks. Self breast examination is the most form of detection and is both cheap and easily accessible to all women. In Indonesia, breast cancer screening is carried out in a stepwise manner starting from Self Breast Examination (SADARI), Clinical Breast Examination (CBE) by a trained health professional and other supportive examinations such as mammography in referral cases. Screening is initiated by educating community members about self breast examination and the SADARI technique. SADARI is the foremost intervention that is supposed to bring awareness of and the need for the early detection of breast cancer to the community. Despite such community awareness, breast health education seems ineffective; most women present to health services at advanced stage cancer [7-8].

One of the potential target populations for educational intervention research are adolescent girls because negative health behaviors developed during adolescence will continue into adult life. Prior to any intervention, research indicates that most adolescents know very little and do very little in regards to breast self-examination (BSE). This underscores the value of community and school health education in improving knowledge and health practice [9].

Educational methods that have been employed are immeasurable. They range from traditional education methods that use lectures, leaflets, and direct demonstrations to the more advanced methods that include educational videos, interactive multimedia, smartphone apps, podcasts, and the like. The findings of research have substantiated that adolescent knowledge and practice of breast self-examination in the community is more positively affected by the use of audio visual or multimedia based approaches than by more traditional methods of education. Of course, this is not to say that the outcome is the same in all studies. The difference is likely due to the design of the study, length of the intervention, and the outcome of interest [10].

Research shows that demonstration methods such as using models or mannequins or instructor-guided practical work can enhance self-examination practical skills and self-examination confidence. However, direct comparison between demonstration methods and multimedia presentations such as videos, animations, and audiovisual materials is still lacking among adolescents and findings are contradictory across studies. There is, therefore, a need to evaluate the two approaches to measure knowledge, attitude, and practice of early detection to develop evidence-based approaches to the most effective educational methods for schools and communities [2], [11]. Consequently, the purpose of this study is to measure the effects of two different approaches to health education using multimedia presentations and demonstrations on adolescents' knowledge on early detection of breast cancer. The findings will facilitate the formulation of health education interventions that are more relevant, effective, and practical to the school setting and adolescent health services.

PKBM STQ Telaga Ilmu Yogyakarta is a nonformal educational institution that provides equivalency education integrated with a pesantren system. Collaboration with the local primary health center is done to obtain periodic health check, but the PKBM does not yet have a well systematized reproductive health education program along with the educational media. Students with health complaints are mainly dealt with the School Health Unit (UKS), but the PKBM do not have any follow up reproductive health education system. Consequently, this study aims to measure how much adolescent girls know about early breast cancer detection and gain information that can become the basis to design a more reproductive health education system.

2 Methods

This study was a quantitative investigation using a pre-experimental design with a one-group pretest–posttest approach. In this design, respondents first completed a pretest to assess their baseline knowledge of early breast cancer detection. They then received an educational intervention in the form of counseling, followed by a posttest to measure changes in knowledge after the intervention.

The study was conducted in June 2025 at PKBM STQ Telaga Ilmu Yogyakarta, involving a single intervention group without a comparison group. A total of 55 adolescent girls actively enrolled at the institution participated as respondents. The sampling technique used was total sampling, as all members of the population met the inclusion criteria. These criteria included being an active female student, agreeing to participate, being present during the counseling session, and completing both the pretest and posttest questionnaires. The independent variable in this study was counseling on early breast cancer detection, while the dependent variable was the adolescents' level of knowledge regarding early detection.

Primary data were obtained directly from respondents using a closed-ended questionnaire consisting of 20 true false items. The instrument had been previously validated, yielding a validity score of 0.851 and a Cronbach's Alpha reliability score above 0.6, indicating that the questionnaire was both valid and reliable. The same instrument was used for the pretest and posttest to maintain consistency in measurement.

The research process involved gathering all respondents in a single room. The activity was conducted face-to-face, using PowerPoint media as a visual guide and a breast phantom to demonstrate the practical steps of breast self-examination (BSE). The session followed three sequential stages: pretest, counseling, and posttest.

This study received ethical approval from the Health Research Ethics Committee of Universitas 'Aisyiyah Yogyakarta, with approval number 4503/KEP-UNISA/V/2025. The collected data were analyzed through univariate and bivariate analyses. Univariate analysis was used to describe the frequency distribution and percentage of respondent characteristics, as well as the mean knowledge scores before and after the intervention. Bivariate analysis was conducted to determine differences between pretest and posttest scores. Because the data were not normally distributed based on the Kolmogorov–Smirnov test ($p < 0.05$), the nonparametric Wilcoxon Signed-Rank Test was used to assess the effect of counseling on knowledge levels.

3 Results and discussion

3.1 Results

The following figure presents the respondents' characteristics.

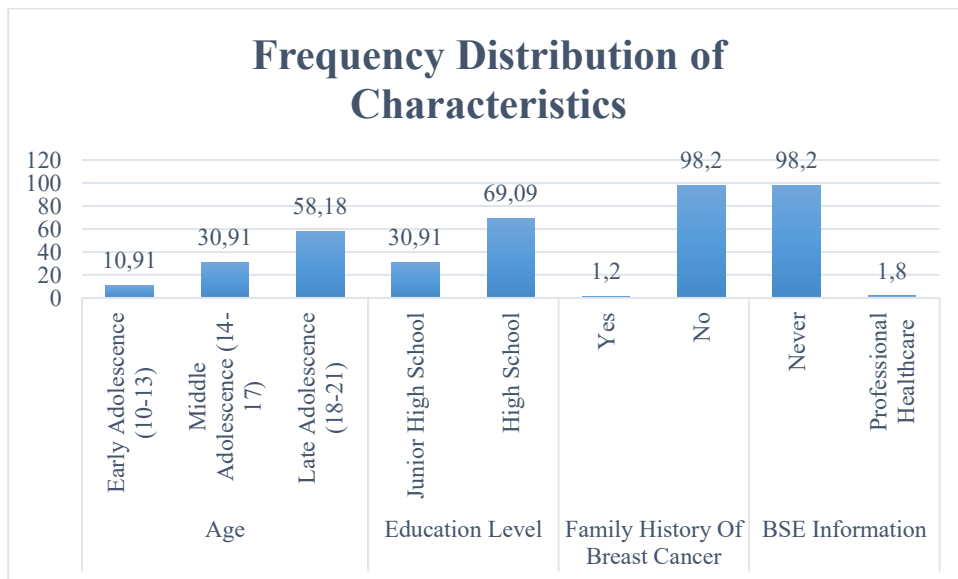


Diagram 1. Characteristics of Respondents

Table 1. Distribution of pretest knowledge scores

Scores	Mean	Standar Deviation	p-value
Pretest Scores	8,13	2,109	
Posttest Scores	19,44	0,918	0,000

3.2 Discussion

Most participants were aged between 18 to 21, which is 58.18% which corresponds to the late adolescence period. At this stage in the life cycle, people tend to reach what Piaget calls the formal operational stage, where they can deal with abstractions much better. Most of the participants were in the last year of Senior High School (69.09%), which is in line with the results of the study which revealed that the higher the education level, the better the health literacy. All participants had never done BSE, which is consistent with several previous studies that reported adolescents showed undertakings with early detection practices. BSE information had ever been provided to only 1.8% of the participants, indicating the lack of reproductive health education among PKBM students.

Before counseling the average knowledge score was 8.13, and the standard deviation was 2.109. This means that there was a lot of diversity among the answers, as the respondents' scores varied by large amounts, and the standard deviation was somewhat small as it was 10% of the maximum score. This means that before knowledge was very spotty and varied by large amounts. Overall, there was doubt among respondents. On average, then level of knowledge was 2.109. However, after scoring counseling it went up to 19.44 and the standard deviation was 0.918. This means that respondents scored 19, 20, and all scores were about the same. Overall, this means that scores were very close to and around the maximum level of knowledge. There was far greater homogeneity in the scores which suggests respondents understanding improved also the counseling achieved better balance in knowledge levels among the respondents. Knowledge scores were improved with a Wilcoxon Signed Ranks Test to capture pair statistics and this are reliable with 0.000 obtained. This means that counseling gave respondents knowledge gains in early breast cancer detection.

Participants from this study show a remarkable increase in knowledge among adolescents in relation to early breast cancer detection after introduction to a variety of education and

media demonstrations. These outcomes align with other studies examining the effects of health education initiatives and their positive impact on adolescent knowledge and understanding of BSE. Most participants were in the senior high school late adolescent. This developmental theory states that older adolescents should be able to process and understand health information on a more sophisticated and abstract level. This is also true for more complex topics in reproductive health such as cancer screening. BSE knowledge and practice had never been received by the respondents prior to the initiative. This has been documented in studies in Indonesia that indicate poor knowledge and practice of BSE among adolescents. The lack of health education access in the school and family context is still the main reason these students lack BSE knowledge and practice.

Following the instruction, there was a statistically significant increase in knowledge scores ($p = 0.000$). There is literature supporting the increased knowledge and behavior change towards BSE resulting from the use of audiovisual materials. We more readily retain information when we have the opportunity to interact with materials on more levels, such as in the case of dual coding where information is presented both visually and verbally alongside a narrative [13]. The effectiveness of the instruction was also due to the use of hands-on training. Evidence demonstrates that adolescents' competency and confidence in BSE can increase with the use of breast models [14]. As such, the use of multimedia and demonstrations increased knowledge on BSE in adolescents and in this case, Indonesia, is particularly appropriate due to the lower levels of health literacy. Although both methods of BSE education (demonstration and video) have shown to be effective, it has been documented that the video materials tend to be more engaging [15].

In summary, the message from this study is the necessity of using a combination of audiovisual and hands-on teaching strategies in the school health curriculum to improve adolescents' health literacy, especially in areas such as breast cancer.

4 Conclusion

This research shows that education about health with the use of media and hand-on demonstrations with models improves the knowledge and understanding of early breast cancer detection among adolescent girls. Their knowledge score before the education intervention was 8.13 and it increased to 19.44, and with the use of the Wilcoxon test, it was determined that this score increase is statistically and significantly different. This is one of the many studies that shows that education is most successful with the use of interactive and visual aids and practice rather than with traditional methods. This means that nonformal education institutions like PKBM should have and implement complete and continuing educational modules about reproductive health, so that adolescents get the skills and knowledge to perform breast self self-examination with the confidence that breast cancer can be detected early.

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