

Effect of an educational intervention package on knowledge, perception and behavioral intention for breast cancer screening among adolescent students of Kathmandu Metropolitan City

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ABSTRACT

Background: Breast cancer is the most common cancer among women worldwide and is the second most common in Nepal. This study assessed the effect of an educational intervention package on knowledge, perception, and behavioral intention for breast cancer screening among adolescent students of Kathmandu Metropolitan City.

Methods: A pretest-posttest control group study design was used. Each intervention and control groups included 159 participants, selected from two randomly chosen public secondary schools. Both groups completed self-administered pretest-posttest questionnaires. Educational intervention was given to the intervention group. Data was entered in EpiData 3.1 and analysed by using IBM SPSS 16 version. Wilcoxon Signed Rank test compared the difference in pretest-posttest scores within groups, and the Mann-Whitney U tested the difference between the control and the intervention groups.

Results: In pretest-posttest comparisons, the intervention group showed an increase in the percentage of participants scoring at least the median value across knowledge (change: 18.0%, $p < 0.001$), overall perception (change: 20.8%, $p < 0.001$), and behavioral intention (change: 56.6%, $p < 0.001$). There was significant increase in knowledge, perception, and behavioral intention among the intervention group compared to the control group ($p < 0.05$).

Conclusion: The educational intervention package showed a notable effect in increasing adolescent students' intention to get screened for breast cancer. This study emphasizes the need to incorporate breast cancer screening programs into school-level curricula. In addition, this encourages adolescents to take a proactive stance when it comes to health consciousness.

Keywords: behavior, breast cancer, breast self-examination, health belief model, intervention package, screening

INTRODUCTION

Globally, breast cancer is the most common cancer in women and the second leading cause of cancer-related deaths [1]. About half of the cases of breast cancer and 60 percent of breast cancer related deaths are estimated to occur in middle- and low-income countries [2]. According to the World Health Organization (WHO), more than 300,000 children and adolescents are diagnosed with

cancer every year [3]. South Asian females are more likely to be diagnosed with breast cancer at a younger age and at a more advanced stage [4]

In Nepal, breast cancer is the second most prevalent cancer among females accounting for 17.1% of incident cases and 7.7% of all female fatalities from cancer-related diseases. The incidence of breast cancer is high among younger and premenopausal women, who are often

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diagnosed at an advanced stage [5]. Adolescent students usually were found to have poor awareness of breast cancer compared to older women [6].

Educating adolescent students at schools is a potential strategy for raising awareness about breast cancer screening in the society [7]. In a low-resource setting like Nepal, breast cancer awareness and clinical breast examination are essential early detection tools [8]. Integrating health educational intervention packages on breast cancer in schools help adolescents increase their knowledge, translate such knowledge into practice, and ultimately increase their intention toward breast cancer screening [9]. Such interventions promoting healthy behavior and practice in early adolescence have a significant role in preventing breast cancer, as some of these behaviors are developed at this stage of life [10]. It is also evident that the earlier breast cancer is detected, the better the effectiveness of the treatment and the greater chance of survival [11,12].

The sensitivity and specificity of breast self-examination (BSE) may be difficult to determine. However, BSE has a sensitivity of 58.3% and specificity of 87.4%, comparable to magnetic resonance imaging (MRI) in detecting breast cancer [12]. Since no such screening is 100 percent sensitive in detecting breast cancer, it is recommended to adopt a combination of screening techniques for breast cancer [13]. However, only two out of ten adolescent students knew how to perform breast self-examination screening method, and only one out of ten was aware of currently available breast cancer screening services [14].

This study assessed the effect of an educational intervention package on knowledge, perception, and behavioral intention toward breast cancer screening among adolescent students of Kathmandu Metropolitan City.

METHODS

Study design and participants: Pretest - posttest control group study design was adopted to test the effectiveness of an educational intervention package among adolescent students at public secondary schools in Kathmandu from November 2019 to April 2020.

Sample size: The sample size of 159 was calculated using the intervention study formula: :

$$n = \frac{2 \left[Z_{1-\frac{\alpha}{2}} + Z_{1-\beta} \right]^2}{\Delta^2}$$

where, $Z_{1-\alpha/2} = 1.96$ at 95% confidence, $Z_{1-\beta} = 0.84$ at 80% power, and Δ = desired change = increase in number of

students with knowledge of breast cancer by 32% [15,16].

Kathmandu Metropolitan City was selected as the study area, and then the sampling frame of the public schools was obtained from the education section office of Kathmandu Metropolitan City. There were 30 public secondary schools and two schools were randomly selected for the intervention and control group each. All the adolescent students of grades 11 and 12 of the selected public secondary schools were recruited. Those who hadn't attended the pre-test, or education session or post-test, those who did not provide both consent and assent and those who filled out the questionnaire incompletely were excluded from data collection or data analysis of the study.

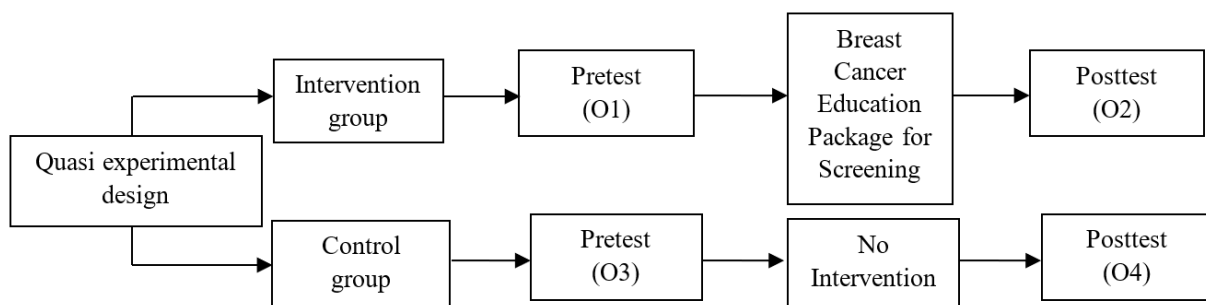
Interventional study and package development: The breast cancer education package for screening (BCEP-S) was designed and developed using Rosenstock's Health Belief Model (HBM) as a theoretical framework [17]. Four constructs of HBM, i.e., perceived susceptibility, perceived severity, perceived benefit and perceived barrier along with knowledge and behavioral intention were considered while designing the promotion package. The breast cancer education package was developed using a P-process framework, which has been used to design strategic health communication programs worldwide since 1991 and was improved in 2003 [17]. The P-process included five steps: (1) analysis, (2) strategy design, (3) development and testing, (4) implementation and monitoring, and (5) evaluation and re-planning.

The promotion package was developed by referencing previously published books, booklets, guidelines, videos, and pamphlets. Experts on the topic were also consulted from time to time to validate the promotional package. The item content validity index from literature review is 0.8 for HBM constructs [18]. Internal consistency of the questions on constructs of HBM with the Likert scale was assessed using 'Cronbach's alpha (α).' An obtained value of α for each construct greater than 0.6 was used for internal consistency and in average, for all constructs internal consistency was 0.8 for this study.

Structured questionnaire were used, referencing the HBM questionnaire construction example given by V. Champion with modification to the local context [19]. Translation and back translation of tools (English-Nepali) was carried out and peer-reviewed. Pretest data were collected from intervention and control groups using a structured questionnaire. Intervention was given to the group of girls, for the purpose of knowledge and self-breast examination practices.

The BCEP-S package was administered once to the intervention group through a one-hour interactive lecture

Figure 1: Design of the study.



session involving brainstorming, group discussion, and audio-visual aids. Further details on B CEP-S are provided as supplementary materials. The first half-session of the B CEP-S package contained information on breast cancer burden, signs and symptoms, and risk factors. The second half-session was about breast cancer screening services and barriers to breast cancer screening services. Four weeks after the intervention, the intervention and control groups underwent a follow-up assessment using the same questionnaire as the pretest. After completing the follow-up assessment, a health promotion and education expert delivered the intervention package and distributed pamphlets to participants in the control group.

Outcome Measurement: Knowledge, perception and behavioral intention for breast cancer screening among the participants were the primary outcomes of this study. The first part contained seven questions related to socio-demographic characteristics. The second part included 12 questions related to knowledge about breast cancer and screening. The third part contained 26 items, using the Likert scale under four domains to measure the adolescents' perception based on health belief model constructs [19]. The fourth part contained five questions measuring behavior intention toward breast cancer screening.

Knowledge: The Knowledge Constructs survey comprised 12 questionnaires totaling 12 points. Participants responded with "yes" for correct answers, scoring 1 point, and "no" or "didn't know" for incorrect answers, scoring 0 points. Scores below the median were classified as below-median knowledge, while scores above the median were classified as above-median knowledge.

Perception: Based on 26 item Likert scale of health belief model, perceived susceptibility consisted of 5 items, and perceived severity, perceived benefit and perceived barrier contained 7 items each. The scoring was done as follows: 1= strongly disagree, 2= disagree, 3= neutral, 4= agree, and 5= strongly agree. Perception was measured by calculating each construct by aggregating its score and taking the median value as the cut off for categorisation.

Behavioral intention: Screening intention has five questions with a total score of 5. Each question had two responses: "yes" coded as "1" and "no" coded as "0," and were measured by aggregating its score and taking the median value as the cut off for categorisation.

Data management and statistical analysis: Collected data was checked, edited, and coded on the same day of data collection. Data entry was done in EpiData 3.1 and exported for analysis in IBM SPSS version 16. P value < 0.05 was considered significant. The normality of the data was tested, and data were distributed in a non-normality fashion, so non-parametric test was used for data analysis. Pre-test and post-test data were analyzed using descriptive analysis to assess change in the variables. The difference in pre-test and post-test scores of knowledge, HBM constructs, and behavioral intention scores were compared by applying the Wilcoxon Signed-Rank test. The difference in the control and intervention groups was compared by using the Mann-Whitney U test.

Safety consideration: There was no risk to the study participants by this study. The study helped to identify the knowledge, perception, and behavioral intention for breast cancer screening. It also provided a health educational package that helped to increase their

Table 1: Socio-demographic characteristics and their association with each group of the participants (n=159 for each group)

Variables	Characteristics	Intervention		Control		χ^2	p-value
		n	%	n	%		
Grade	11	87	54.7	111	69.8	7.71	0.005*
	12	72	45.3	48	30.2		
Age (years)	15-17	91	57.2	92	57.9	0.01	0.910
	18-19	68	42.8	67	42.1		
Ethnicity	Brahmin	24	15.1	69	43.4	30.77	0.001*
	Non-Brahmin	135	84.9	90	56.6		
Religion	Hindu	96	60.4	125	78.6	12.48	<0.001*
	Non-Hindu	63	39.6	34	21.4		
Type of family	Nuclear	64	40.3	68	42.8	0.21	0.649
	Joint	95	59.7	91	57.2		
Education status of parents	Literate	124	78.0	111	69.8	2.76	0.097
	Illiterate	35	22.0	48	30.2		
Occupation of parents	Formal work	48	30.2	43	27.0	0.39	0.535
	Informal work	111	69.8	116	73.0		

Note: χ^2 : Chi-square value; *p < 0.05

Table 2: Scores and absolute difference in pretest-posttest knowledge, perception and behavioral intention scores based on the intervention and control groups (n= 159 each group)

HBM constructs	Intervention(n= 159)							Control(n=159)						
	Pre-test Md (IQR)	Pre-test (%)	Post-test Md (IQR)	Post-test (%)	AD (%)	Z-value#	P-value#	Pre-test Md (IQR)	Pre-test (%)	Post-test Md (IQR)	Post-test (%)	AD (%)	Z-value#	P-value#
Knowledge	4(1-5)	37.4	14(12-15)	55.4	18	10.818	<0.001	4(1-5)	41.5	12(7-14)	37.10	- 4.4	8.454	<0.001
Perceived susceptibility	15(13-18)	47.2	18 (15-20)	53.5	6.3	5.101	<0.001	15(14-18)	51.6	16(12-19)	41.5	-10.1	3.225	0.001
Perceived severity	21(17-25)	35.8	23(20-27)	45.9	10.1	5.038	<0.001	22(20-26)	55.3	24(21-26)	50.3	-5	4.632	<0.001
Perceived benefit	22(19-27)	35.8	28(26-32)	49.7	13.9	6.963	<0.001	27(22-31)	54.1	28(24-32)	45.3	-8.8	4.332	<0.001
Perceived barrier	20(17-24)	36.5	21(16-26)	52.8	16.3	2.990	0.0 03	22(18-24)	56	20(16-23)	47.2	-8.8	1.640	0.101
Perception (overall)	79(70-87)	33.3	93(79-101)	54.1	20.8	4.915	<0.001	87(78-96)	64.8	89(74-99)	39	-25.8	1.327	0.184
Behavioral intention	0	21.4	2(2-3)	78.0	56.6	7.6 31	<0.001	0	26.4	0(0-1)	5.7	-20.7	10.884	<0.001

Note: Md=median; IQR=inter-quartile range; AD=absolute difference (posttest percentage- pretest percentage), Percentage indicates those participants who had score more than median value. Z value# and p value# were computed using Wilcoxon Sign Rank test, *p < 0.05

Table 3: Difference of knowledge, perception, and intention between intervention and control groups (n=159 for each group)

Variables	Difference in difference: Median difference (IQR)			
	Group	MD (IQR)	Z-value#	p-value#
Knowledge	Intervention	2 (-3-8)	-4.453	<.001*
	Control			
Perceived susceptibility	Intervention	2 (-4-9)	-3.288	.001*
	Control			
Perceived severity	Intervention	2 (-5-8)	-2.537	.011*
	Control			
Perceived benefit	Intervention	5 (-4-13)	-4.774	<.001*
	Control			
Perceived barrier	Intervention	3 (-6-3)	-2.284	.022*
	Control			
Behavioral Intention	Intervention	2 (0-3)	-12.832	<.001*
	Control			

Note: *p < 0.05, #Mann-Whitney U test, Median values are available in table 2.

knowledge and behavior intention. Confidentiality of the participant's information and identity was maintained. The educational package was also given to the control group after the post-test.

RESULTS

Each of the intervention and the control group consisted of 159 participants. Majority of the participants were from grade 11, aged between 15 to 17 years, and belonged to a joint family. Results showed a significant difference between the intervention and control groups among with respect to grade, ethnicity and religion. [Table 1]

In the intervention group, after intervention, there was significant increase in the proportion of participants scoring above the median score of the scale in the domain of knowledge of breast cancer, perceived susceptibility, perceived severity, perceived benefit, perceived barrier, overall perception and behavioral intention increased. However, in control group, the proportions decreased in all these study variables. [Table 2]

Differences in knowledge, perception, and behavioral intention related to breast cancer between pretest - posttest assessments in the intervention and the control groups were analyzed. Mann Whitney U test was applied to test the difference in difference between two groups. The test shows a significant increase in knowledge (with median difference: 2, $p < 0.001$), perceived susceptibility (with median difference: 2, $p = 0.001$), perceived severity (with median difference: 2, $p = 0.011$), perceived benefit (with median difference: 5, $p < 0.001$), perceived barrier (with median difference: 3, $p = 0.022$), and behavioral intention (with median difference: 2, $p < 0.001$) in the intervention group compared to the control groups. [Table 3]

DISCUSSION

This study tested the effect of a health belief model (HBM)-based educational package on breast cancer screening knowledge, perception, and behavioral intention among adolescent students of Kathmandu Metropolitan City. Rosenstock 1974, describes the HBM as a psychological model that attempts to explain and predict health behaviors. The HBM is a method used to evaluate and explain individual differences in preventive behaviors. Four constructs of HBM were used in this study, viz. perceived susceptibility, perceived severity, perceived benefit, and perceived barrier [20].

The present study demonstrated that the educational intervention has been effective in increasing the knowledge of adolescent groups regarding breast cancer. The intervention group showed an 18% increase in knowledge scores of participants scoring above the median on the post-test compared to the pre-test ($p < 0.001$). Various studies, including from Sudan ($p < 0.001$), Jordan ($p < 0.001$), Punjab ($p < 0.001$), the United Arab ($p = 0.001$), and Malaysia ($p < 0.001$), showed similar results [16, 21-23]. This study used the health education intervention package which increased in the knowledge scores of participants which was also used by other studies from different countries.

Effects of educational package on adolescents' overall perception of breast cancer screening (perceived susceptibility ($p < 0.001$), perceived severity ($p < 0.001$), perceived benefit ($p < 0.001$), and perceived barrier ($p = 0.003$)) were found statistically significant. The study found that the educational package changed the perception of the students for prevention of breast cancer, and the number of students scoring above median value of the overall perception scale increased by 20.8 percent in the intervention group ($p < 0.001$). Similarly, this study shows that perceived susceptibility, severity, and benefit changed positively whereas, study found negatively increase in perceived barrier which

might be due to low confidence level of participants, cultural barriers and low communication between parents and adolescent in the topic of sexual and sensitive issues. This result was consistent with studies conducted in Turkey, Saudi Arabia, and Iran [23-25] and contrast with the study conducted in Malaysia, United States, and Egypt [20, 23, 24].

The educational package on adolescent breast cancer also had positive effect on behavioral intention. The number of participants with minimum median scores was increased by 56.6 percent after the intervention ($p < 0.001$). A similar result is shown by the studies conducted in Turkey, Saudi Arabia, Iran, and Egypt [23-25]. This may be attributed to transition phases, such as continuing education or dropping out, during which individuals make pivotal decisions about their health, driven by heightened receptivity to knowledge. These decisions can shape lifelong behaviors.

A notable strength of the study lay in its interventional design, allowing for the implementation of an educational package for the intervention group and distributing pamphlets to the control group following the post-test. This design facilitated the assessment of the impact of educational interventions among adolescents, filling a research gap in educational interventions among reproductive-age women within community settings across expansive geographical areas.

The study's limitations included a short time gap of four weeks between the intervention and the post-test, constrained by time, which limited the comprehensive evaluation of the package's effectiveness in breast cancer screening. Additionally, the study focused solely on one metropolitan area, reducing its ability to generalize findings to the broader population.

CONCLUSIONS

The Breast cancer educational package effectively improved the knowledge, perception, and behavioral intention among the intervention group, significantly different from the control group. The findings of this study and the developed promotion package could be utilized to increase the screening intention among adolescent students to decrease the risk of breast cancer. This study can conclude that only educating adolescent students can positively change knowledge, perception, and behavioral intention. Similarly, further longitudinal study need to be conducted to assess the long term effects of the intervention. Breast cancer screening programs should be incorporated into the school-level curriculum of the children and integrated screening programs in the health system by engaging stakeholders and advocate for early detection and management of breast cancer.

Author contributions:

PB1 and BK conceptualized the research along with its design and reviewed the literature; PB1, BK and PB2 conceptualized and developed intervention package; PB1 and BK administered the project and collected data; BK, PB1 and AS analyzed the data; AKP supervised the study; All authors reviewed the manuscript and approved the final version of the manuscript. All authors agreed to be accountable for all aspects of the research. Note: PB1, BK, PB2, AS, and AKP are abbreviated names of the authors (PB1 = Preeti Bhattarai, PB2 = Pratik Bhattarai).

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Ethics approval: This research was approved by Institutional Review Committee of Institution of Medicine, Tribhuvan University with the reference number of 178/(6-II)^{E2} 076/77 on 11 November 2019.

Consent and/or assent: Informed assent and consent was obtained from all the participants and their guardians.

Conflict of Interest: The authors declare that there is no competing interest.

Data availability: Data are available upon request to the corresponding author.

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Appendix 1: Supplementary Materials

Creative brief of the education package

1. **Health area and intervention:** breast cancer screening
2. **Shared vision:** There will be improvement in the intention of breast cancer screening among adolescent
3. **Background:** Global cancer statistics indicate the rising global incidence of breast cancer, and the increase is occurring at a faster rate in populations of developing countries; this is due to the rise in population growth and aging. One potentially important strategy in reducing breast cancer mortality is breast cancer screening to achieve earlier detection of cancer. So, creating awareness, which is an essential tool, entails better screening for breast cancer. Interventions promoting healthy behaviors and practices in early adolescence have a significant role in preventing breast cancer, as some of these behaviors are developed at this stage of life.

4. Priority audience: Adolescents of grade 11 and 12 of age group 10-19 of public secondary schools of Kathmandu metropolitan city

5. Objectives (What should the audience think or feel to do?)

Think:

- A. Breast cancer is one of the common diseases in developing countries like Nepal
- B. Breast cancer can be cured in its earliest stage

Feel that:

- A. There is a high chance of getting breast cancer
- B. Regular breast cancer screening is the best way for breast cancer to be diagnosed early.

Do:

- A. The practice of regular breast cancer screening
- B. Advocacy and making an enabling environment for breast cancer screening

6. Competitive behaviors/ barriers

- Most of them believe that breast cancer can't be cured in its earliest stage.
- Low awareness level about breast cancer and breast cancer screening
- Fear of pain and time
- Women think that getting breast cancer screening costs too much
- The perception that screening services should be sought if they have symptoms

7. Positioning statement/ key promise (and supporting points)

If you choose breast cancer screening, then you will benefit from early diagnosis and prompt treatment

Benefits

- Breast cancer can be diagnosed in its earliest stage.
- It can be ensured that there is no sign of breast cancer.
- Breast cancer can be cured if diagnosed earlier.

Support points

- Breast cancer is the most preventable and treatable of all types of cancer.
- Breast cancer screening is a simple and cost-effective process.

8. Call to action: Perform Breast Self-Examination (BSE) once a month and go to the health facility for other screening methods.

9. Creative considerations

Approach: (Lecture, audio/visual aids, and pamphlet providing general information)

Materials developed: Pamphlets were produced by covering the educational session's content, which was distributed for the control group after posttest.

Creative concept outlines: The pamphlet included a brief description of breast cancer, breast cancer screening, benefits of breast cancer screening, risk factors for breast cancer, and prevention of breast cancer.

Key contents

Knowledge to be increased

- Introduction of breast cancer
- Information on risk factors of breast cancer
- Information on signs and symptoms and prevention of breast cancer
- Introduction of breast cancer screening method and its benefits
- Screening method (Breast self-examination, clinical breast examination, Mammography): appropriate age, interval, and technique

Perception to be changed

- Increased perception of susceptibility and severity of breast cancer as well as the benefit of breast cancer screening and decreased perception of barrier towards breast cancer screening

Behaviors to be developed

- Screening intention of breast cancer

10. Logos: Tribhuvan University, Institute of Medicine

11. Geographic placement: Kathmandu Metropolitan City

12. Language: Nepali

13. Resource person: Preeti Bhattarai (Health Promotion and Education Specialist), Bharat Kafle (Public Health Professional) and Dr. Pratik Bhattarai (Medical Officer)

14. Implementation Plan

Content	Method	Media	Duration
Welcome, introduction, and objective of the session	Lecture	PowerPoint slides	10 minutes
Introduction, risk factors, signs and symptoms, and preventive measures of breast cancer	Lecture Brainstorming	PowerPoint slides	20 minutes
Breast cancer screening methods and barriers to breast cancer screening	Lecture Brainstorming	PowerPoint slides	20 minutes
Breast cancer awareness animated film	Short video film	Audio/visual aids	10 minutes